Initial Validation of the Balloon Analogue Risk Task (BART) in Virtual Reality

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Master Thesis

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Acknowledgement

To begin with, I am very grateful to have Allah SWT as my saviour in difficult times and a place for me to say my prayer. I could not have undertaken this journey without my parents' endless support. Words cannot express my gratitude to my supervisor, Simone Borsci, for his patience, feedback, and knowledge he gave me. Additionally, thanks to the generous support from my partner, Azka, who is always there for me.

I am also grateful to my friends, Silvi and Neilshan, for helping me with statistics in completing this thesis. I would also thank my classmates, Calslaan 1A roommates, and Karang Taruna Enschede, for their moral support. Thanks should also go to The BMS Lab staff for their help in facilitating my experiment.

Thanks to my best friends, brothers, sisters, uncles, and aunts in Indonesia, who always ensured I was never alone in this journey. Finally, I would also like to thank songs made by BTS RM for his impactful lyrics that keep me away from my depression.

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Abstract

Measuring risk-taking has been challenging because of the wide variety of behaviours considered risky. Self-report is one way to measure risk-taking behaviours, but the limitation is the possibility of individuals not answering truthfully. Lejuez et al. (2002) developed a computer-based Balloon Analogue Risk Task (BART) to address self-report limitations. BART is significantly correlated to risk-related constructs such as sensation seeking and impulsivity, as well as risky behaviours such as drug and cigarette consumption. However, the BART limitation is that the two-dimensional task does not have high fidelity and immersion, which leads to the participant's awareness being tested. Thus, a modification that increases fidelity and immersion is needed to measure risk-taking. Therefore, this study aims to replicate and validate the original study of BART by Lejuez et al. (2002) in virtual reality (VR). Moreover, VR technology can reduce negative user experiences. The expectation in replicating BART to VR is that the tool is positively correlated with risk-related constructs. The design is within subjects where the participants performed both conditions (Computer Based (CB) and VR versions) and filled in risk-related questionnaires used in the original study. The result shows positive correlation between VR version BART with risk-related constructs, no difference in participants' performance between CB and VR versions, the VR version has higher immersion than CB version, and satisfying as a tool. In conclusion, the VR version of BART still needs further study with more variety of samples and the VR version of BART is an acceptable tool for measuring risk-taking.

Keywords: Risk-taking behaviour, Balloon Analogue Risk Task (BART), Virtual Reality

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1. Introduction

1.1. Concept of Risk-Taking

Different situations and perspectives lead to different definitions of risk-taking (Trimpop (Ed), 1994). Leigh (1999) defines risk-taking as a tendency to engage in activities with potential danger or harm. Moreover, Jungermann & Slovic (1993) made a risk-taking concept where choice depends on the probability of outcome occurrence and consequence of a risk event. Furthermore, an individual's decision to take or avoid risks is called risk-taking propensity (Sitkin & Pablo, 1992). There are two types of individuals in risk-taking. First, risk-averse individuals tend to protect what they gained (Tversky & Kahneman, 1981), are more reluctant to make a risky decision (Sitkin & Pablo, 1992), and weigh more toward negative rather than positive outcomes (Schineider & Lopes, 1986). In contrast, the second type is risk-seeking individuals that are more adventurous and eager to take risks (Sitkin & Pablo, 1992) and tend to overestimate the probability of gain instead of loss (Brockhaus, 1980).

1.2. Risk-Taking Assessment

Measuring risk-taking has been challenging because of the wide variety of behaviours considered risky (Leigh, 1999). Daily activities such as driving a car or extreme sports such as sky diving can be considered risk-taking (Leigh, 1999). The wide variety of risk-taking leads to confusion about which precision is being measured (Bran & Vaidis, 2020). Most researchers employ self-report instruments to measure risk-taking that is specific to an overlapped domain. For example, impulsiveness and venturesomeness (Eysenck & Eysenck, 1978), sensation seeking (Zuckerman et al., 1978), and gambling attitude (Bouju et al., 2014). Self-report instruments are beneficial if a researcher needs to quickly administer the test to a large sample of people without much effort and little cost (Demetriou et al., 2015), also adequately measure the targeted dimensions (Weiner, 2005). However, Demetriou et al. (2015) state that self-report is biased because of the possibility of individuals not answering truthfully, especially on sensitive questions (social desirability bias) or individuals tend to respond to the questions in a certain way regardless of the question (response bias). Moreover, individuals' responses are limited to their recollection of memory instead of their current state during the test, which leads to less reliability (Pekrun, 2020). Rather than only relying on self-report measures, behavioural assessment can be utilised to measure risk-taking (Aklin et al., 2005). Behavioural assessment allows researchers to observe individuals when they are completing the task (De-Juan-Ripoll et al., 2020) and minimise the likelihood of response bias (Weiner, 2005). Thus, the effective

approach to measure risk-taking is to conjoint administration of self-report and behavioural assessment (Weiner, 2005).

1.3. Balloon Analogue Risk Task (BART)

One behavioural assessment that measures risk-taking propensity is the balloon analogue risk task (BART) developed by Lejuez et al. (2002). The BART is a computerised behavioural assessment to measure risk-taking. The task begins with a balloon displayed in the middle of the screen and the instruction is to pump the balloon by clicking on the computer mouse. The participants earn $0.5 in each pump which they can accumulate in their temporary bank. At a random point, the balloon may explode and cause the participants to lose the money in their temporary bank. The participants can save their money in the permanent bank by pressing a collect button before the balloon explodes. Each participant gets 30 trials and is rewarded with the amount of their permanent bank. Participants' decision to pump in each trial balances the potential gain of accruing more money against losing all the money. The performance from the amount of pump indicates individuals' risk-taking; the higher the pump, the more individual will take risks.

Lejuez et al. (2002) found that BART is correlated with self-reported risk-related constructs and risky behaviours. The self-report risk-related constructs include sensation seeking, impulsiveness, and behavioural constraint. The risky behaviours include gambling behaviour, alcohol, cigarette, and drug consumption, stealing experience, usage of a safety belt, and the number of sexual intercourse without using a condom with different partners in the past year. Additionally, Canning et al. (2022) found that BART is correlated with alcohol use and suggested BART scores increase after consuming alcohol and Lejuez et al. (2003) also found that BART can differentiate smokers from non-smokers.

Although BART is significantly correlated with other risk constructs, the computer-based task of BART has limitations. BART does not involve strong physical interactions and only requires simple actions such as clicking the mouse to pump the balloon, which makes the measurement lack ecological validity (De-Juan-Ripoll et al., 2018). Two-dimensional BART has low fidelity and leads to low perceived risk because the participants do not feel immersed (Sanchez et al., 2021). De-Juan-Ripoll et al. (2018) added that a setting where individuals' awareness of being assessed could alter the outcomes.

1.4. Behavioural Measure of Risk-Taking in VR

Virtual reality can be the solution to deal with BART limitations. Virtual reality (VR) provides greater immersion, fidelity, and a higher level of active user involvement than traditional assessment methods (Hedberg & Alexander, 1994). Moreover, Virtual environments provide a sense of presence and support users to interact with virtual objects (Heydarian et al., 2015). The result of the sense of presence from VR can make the individuals forget that they are in a VR environment, then evoke the perception that what is happening in the VR is happening in reality and it allows participants to interact and behave as they might in real life (Slater, 2009). In addressing ecological validity, VR allows researchers to recreate an interactive real-world setting where users can perform the tasks while the responses are recorded (Parsons, 2015). Therefore, a higher sense of presence can make the participants less aware of being tested and portray their actual risk propensity due to the physical and visual sensation from the virtual environment.

Studies found that VR is more enjoyable than paper-test or traditional way (Ozgen et al., 2021; Zeng et al., 2017), which can lead to higher user satisfaction. Chiossi et al. (2022) also found that virtual reality systems can improve user satisfaction in a wide range of scenarios. If the participants satisfy with the usability of VR, then researchers can have more adaptive experiment because VR system allows to make flexible manipulation (Choi, et al., 2019).

Robert et al. (2021) developed an assessment of decision-making in risk environments (AEMIN). AEMIN is a maze-like virtual environment where participants have to pass from start to finish within the given time. The participants need to accumulate "karma", and they could lose "karma" if they were attacked by "risks". The participants are also provided with an option to activate a shield that can protect them from the "risks". In association with measuring risk-taking, AEMIN can measure sensation seeking and identify risk-taking behaviour in varying situations. However, the AEMIN limitation is that participants must have a higher technicality understanding because it was found that participants might not fully understand the rules (De-Juan-Ripoll et al., 2021). While computer-based BART only involves pumping a balloon by the participants, pumping is part of activities of daily living (ADL), a fundamental skill typically needed to manage basic physical needs (Mlinac & Feng, 2016). Hence, BART has less complex tasks to complete than AEMIN. With this stance, the current study will replicate BART to VR to measure risk-taking.

1.5. Current Study

The current study will investigate the initial validation VR version of BART. The prototype of the BART VR version was developed as the first step of a tool to measure risk-taking with higher ecological validity than the computer-based (CB). Furthermore, the current study will examine how the VR version is valid in measuring risk-related constructs and risk behaviours.

The current study will compare people's performances in the computer and VR versions of the BART. Our main assumption is that there is no difference between performing the BART in the CB and the VR version. Lejuez et al. (2002) define the performance by the number of pumps across 30 trials. Therefore, we expect that people performing CB and VR versions will not significantly differ. By the idea that VR has the benefits of higher immersion and less participant bias, the current study compares the sense of presence between the CB and VR version. Lastly, in capturing users' satisfaction, a usability test enables the researcher to measure users' subjective reactions to using the system. Therefore, the current study will also apply usability testing to compare users' satisfaction with CB and VR.

Accordingly, four hypotheses will be tested in the current study:

H1: Riskiness on the BART in the VR version is positively correlated with self-reported risk-related constructs and risky behaviours.

H2: There is no significant difference between CB and VR versions performance across 30 trials.

H3: The sense of presence in VR version is significantly higher than in CB version.

H4: Participants' satisfaction using BART in the VR version is higher than in the CB version.

2. Methods

2.1. Research Design

This study is an attempt to replicate Lejuez et al. (2002) by adapting Balloon Analogue Risk Task (BART) to Virtual Reality (VR). The design is within subjects as the participants performed both conditions: Computer-Based (CB) and VR versions and answered risk-related questionnaires used in the original study.

2.2. Participants

In total, 54 participants participated in this study. Thirty-six were recruited from SONA, a system provided by the BMS (Behavioural, Management, & Social Sciences) faculty at the University of Twente, which allowed us to recruit BMS bachelor students who needed to participate in a study with the exchange of 1.5 SONA credits for 90 minutes. The other 17 participants were colleagues who were asked to participate in this study voluntarily.

Three participants were excluded due to a system failure in the CB and VR that was caused by data loss. One participant experienced severe nausea during the VR BART task, so the experiment had to be stopped. One participant stated that the voice of CB BART made him/her uncomfortable that he/she only pumped once to twice in all trials to finish it as soon as possible, making the data irrelevant. In the end, there were 48 participants' data used for analysis.

A total of 13 males and 35 females between 18 to 32 years old (M =21.8, SD= 4.1) partook in the study (see Appendix 1). Most participants had a high school degree (73%), followed by a bachelor's degree (21%). There were 14 different nationalities, and three participants had dual nationalities. Most participants had experience with VR (69%), and more than half of the participants had visual impairments.

The participants were informed that they would get a chance to win a goodie bag if their earnings were among the top five of all participants to encourage participants to take the task more seriously.

2.3. Material

In total, there were 135 items that the participants needed to answer, including risk-related constructs questionnaires, risky behaviours questionnaires, IPQ, UMUX-Lite, and VRSQ.

2.3.1. Measures of Risk-Related Constructs and Risky Behaviours

During the adaptation from the original study, some risk-related scales and self-report questionnaires were adjusted. The updated and briefer scales that still covered a similar or the same dimension as the original study were used. See Appendix 2 to see the comparisons.

2.3.1.1. Risk-related Constructs.

Impulsiveness (abbreviated to BIS). In measuring impulsivity, the original study used a 34-item Barratt Impulsiveness Scale – Version 1.0 (BIS; Barratt, 1985). Questions in BIS focussed on motor impulsivity, cognitive impulsivity, and future-planning

impulsivity. For the current study, the Barratt Impulsiveness Scale – short form (BIS – 15; Bhat et al., 2018) was used instead.

Venturesomeness. The original study used the 54-item Eysenck Impulsiveness Scale (Eysenck,' et al., 1985) with three subscales: impulsivity, venturesomeness, and empathy. The current study only used the venturesomeness subscale. The reason is that empathy was not correlated with BART and impulsivity is redundant with BIS.

Behaviour constraints (abbreviated to BC). The original study also used the Multidimensional Personality Questionnaire (MPQ; Patrick et al., 2002), precisely the Behavioural Constraint super factor. The Brief Form of Multidimensional Personality Questionnaire (MPQ – BF; Patrick et al., 2002) was used for the current study.

Sensation seeking (abbreviated to BSSS). The original study used a 40-item Sensation Seeking Scale (SSS) developed by Zuckerman et al. (1978), included questions focusing on thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility. The Brief Sensation Seeking Scale (BSSS; Zuckerman et al., 1978) was used.

2.3.1.2. Risky behaviours.

Alcohol consumption (abbreviated to AUDIT). The same measurement was used, which is a 10-item Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) consisting of the quantity and frequency of drinking, drinking intensity, and dependence symptoms over the past 12 months.

Cigarette consumption (abbreviated to cigarette). The same questions for the average number of daily cigarettes were used.

Drug consumption (abbreviated to Drug). The original study examined the number of drug classes tried over the past 12 months with the following categories: marijuana, stimulants, cocaine, hallucinogens, opiates, sedatives, and others. Some items were added, namely, heroin, amphetamines, inhalants, tranquillizers, ecstasy, synthetic drugs, anabolic androgenic, and steroids for a more comprehensive estimation of drug use (Oliveira et al., 2013).

Gambling behaviour (abbreviated to GABS). For gambling attitudes, the Gambling Attitudes and Beliefs Scale (GABS; Breen & Zuckerman, 1999) was adjusted into Gambling Attitudes and Beliefs Survey (GABS-23; (Bouju et al., 2014). The original study also used South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1986), but it was excluded because of the redundancy with GABS.

Sex behaviour (abbreviated to sex). The same questions were used for the number of sexual intercourses with different partners without using a condom for the past 12 months.

2.3.2. Measures of Sense of Presence and Usability

To evaluate VR presence experience, I-group Presence Questionnaire (IPQ) was used. Originally, IPQ was developed in German to measure the sense of presence experienced in a virtual environment, then psychometrically adapted into English by Berkman & Çatak (2021). IPQ covers three subscales, namely: spatial presence (the sense of being physically present in the virtual environment), involvement (measuring the attention devoted to the virtual environment and the involvement experienced), and realism (measuring the subjective experience of realism in the virtual environment). Additionally, one general item assesses the general "sense of being there", in total IPQ have 11 items. Other than IPQ to assess the sense of presence, Usability Metric for User Experience Lite (UMUX-Lite) was also used to assess the usability of performing BART in CB and VR. UMUX-Lite is a 2-item developed by Lewis et al. (2013) that is associated with efficiency, effectiveness, and satisfaction with a score ranging from 1 to 100.

2.3.3. Measures of Virtual Reality Sickness

VR can make participants experiencing virtual reality sickness (VRS). VRS can become an issue while experiencing VR because it causes health-related issues and limits the interaction of VR systems (Chatta et al., 2020). Chang et al. (2020) mentioned some factors that may cause sickness which are relevant to current study. First, users are more likely to feel sick if exposed for more than 10 minutes. Considering that 30 trials of BART in VR can take up to 10 minutes, it can cause participants to feel sick. Additionally, participants need to carry the weight of the head mount, which can also influence the duration effect on participants' discomfort. Second, participants without prior experience in VR are reported to have more significant discomfort.

To monitor participants' cybersickness, the virtual reality sickness questionnaire (VRSQ) is administered, a 9-symptom item with a 1 to 4 Likert scale developed by Kim et al. (2018), to have a real-time monitor of the participants' condition while performing BART in VR. The participants are asked about symptoms that affect their condition. The symptoms include general discomfort, fatigue, eyestrain, trouble focusing, headache, fullness of the head, blurred vision, dizziness, and vertigo. VRSQ must be filled before they start the BART in VR as a pre-condition assessment, then each after the first, second, and third round. If they score

high (indicated by at least four symptoms scaled as three), the experimenter should give the participants a break and ask if they want to quit the tasks. An ANOVA test was conducted to compare the sickness difference in every ten trials. The ANOVA test result showed that the VR version did not cause them to experience VR sickness and they could finish all 30 trials (see Appendix 4 for the visualization in every ten trials). Throughout the study, the participants did not show a significant increase in VR sickness in each round (F (3,188), p = .47, eta2[g] = .013).

2.3.4. Participant's Performances in Computer-Based and VR-Based BART

For the current study, a red balloon was used with an average break point of 64 pumps (maximum 128 pumps). The highest breakpoint was chosen to capture the greatest variability in task performance, as indicated by Lejuez's study. Another adjustment in current study, compared to the original study, was that the participants would collect 50 points for each pump instead of $0.5 because most participants were students. Thus, earnings were calculated by the number of adjusted pumps times 50 points. Aside from that, the number of trials was the same as the original study (30 trials).

By using the same tasks, it was also possible to assess the same performance of participants by focusing on the following variables:

1. Adjusted pumps: the number of pumps, excluding the trials that exploded.
2. Absolute pumps: the number of pumps accumulated in 30 trials (regardless of exploded or saved points).

Two digital versions of the BART were used in this study. Despite the different applications in developing the CB and VR version of BART, the tasks were the same. The code script allowed researchers to have the same output, and both had a similar display, so the participants were familiar with how both versions work. The major difference was only the environment, as CB was 2D and VR was 3D.

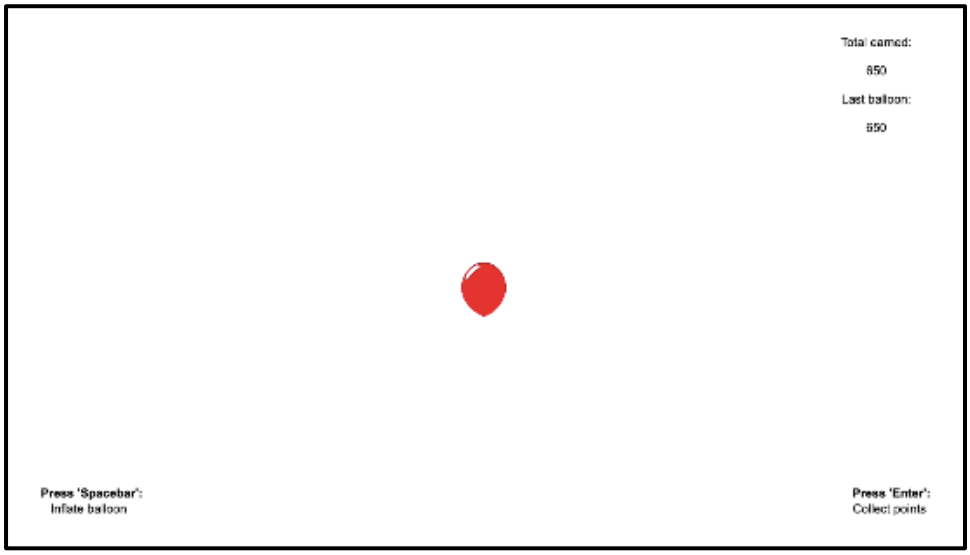
Detailed descriptions of the two applications used for the development as below:

The computer-based (CB). For the CB version, Opensesame was used for the development. Opensesame is a free, open-source software for hosting psychology, neuroscience, and experimental economics experiments that supports python to power the experiment (Mathôt & March, 2022). Participants operated the task by pressing the spacebar key to pump and the "enter" key to save the points on the keyboard (see Figure 1). The output was comma-separated values (CSV) file consisting of the participant ID, time of data

collection, number of pumps, and code for the balloon explosion in each trial (1 means exploded, 0 means the participants collected the money).

Figure 1

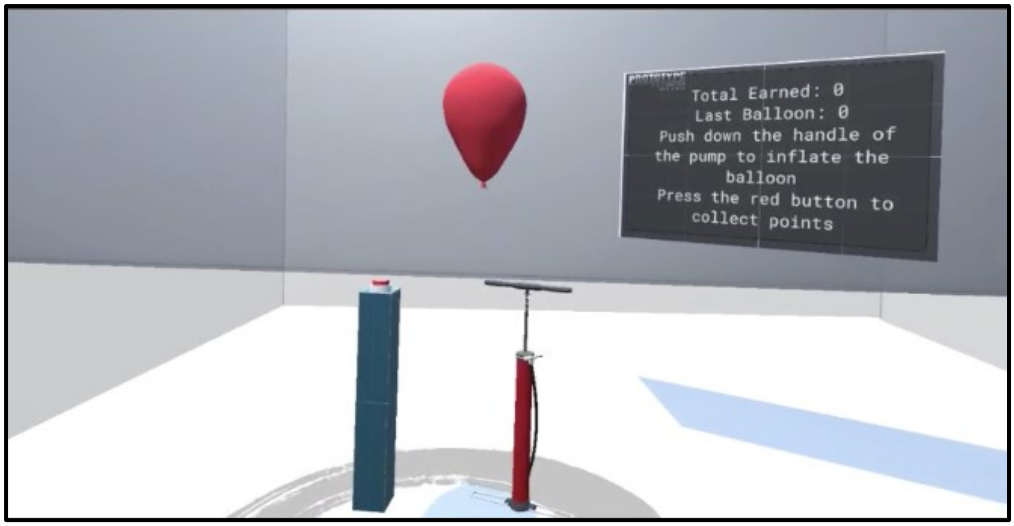
Computer-based Version BART Display in Participant's Perspective After the Instructions



The Virtual Reality Based (VR). In developing the VR environment, an application named Unity, a game engine developed by Unity Technologies released in June 2005 (Samuel Axon - Sep 27, 2016) was used. For a complete manual on operating Unity, see Appendix 13. See Figure 2 to see the VR environment. The participants inflated the balloon with a pump and saved the points with a red button. The output was a text file consisting of the participant ID, time of data collection, number of pumps, and code for the balloon explosion in each trial (1 means exploded, 0 means the participants collected the money). The VR headset used for this study was Oculus Rift S by Lenovo Technologies and Facebook Technologies. The virtual reality area only needed a chair with no wheels for stability. In the VR environment, the participants were allowed to walk around the room as much as they wanted. However, once they entered the task zone on the BART task, an invisible glass wall would appear, indicating that they could only get out of the zone once they finished all 30 trials.

Figure 2

Virtual Reality Environment BART Display in Participant's Perspective After They Enter the Task Zone



2.4. Procedure

The experiment was conducted in The BMS Lab, room B205 (ManouVR) which had enough space for computer-based, virtual reality, and experimenter areas (see Appendix 6 to see the room layout). After explaining about the study and informing the participant about what to do, researchers reassured whether participants had a phobia towards balloons or not, which may cause them discomfort in completing the task. Then, proceed to starting the experiment.

When the participants were well-informed and ready to start the study, the participants were led to the seat with the CB version computer. All questionnaires were filled in Qualtrics site and when the participant were seated, the informed consent was already displayed. According to Lejuez et al. (2002) study, all the risk-related questionnaires and performing the BART were all randomized to limit the influence of order effects. Current study also randomized all questionnaires, the CB and VR version BART for this study. Thus, all participants had a different order in completing the questionnaires, and either CB or VR version BART could occur randomly during the questionnaire-completion period. After they agreed with the informed consent, they answered the demographic questions. The randomization started after the participants filled in the demographic questions. To do this, the randomizer function in Qualtrics was used (see Appendix 5 to see how this study uses the functions). All instructions and information needed are provided in each Opensesame, Unity, and Qualtrics.

When Qualtrics show the information page about starting the CB version, the researcher opened and ran the Opensesame, then let the participants do the task. The participant stayed seated in the same computer and the instructions were displayed right after the Opensesame ran. CB version BART was performed by clicking the “space” button to pump and “enter” button to save the money. The “enter” button was also used to proceed to the next trial.

Participants must play 30 trials before Opensesame able to save the data. After they finished the CB version, the researcher re-opened the Qualtrics. Then, participants needed to fill UMUX-Lite and IPQ, respectively. See Appendix 7 to see the instructions for CB and VR.

When Qualtrics showed the information page about starting the VR version, the participant filled in the pre-test of VRSQ. After the participants finished the VRSQ pre-test, the researcher led the participants to the VR area. The researcher started the Unity program before helping the participants wore the headset to prevent unwanted stimuli. After the Unity was started, the participant entered the virtual environment. The participant needed to walk to a grey circle using the controller to trigger the task zone. The task zone function was to indicate that the game was activated and ready to be played. VR version BART was performed by pumping the balloon by pushing down the lever and save the money by pressing a red button located beside the pump. The red button was also used to proceed to the next trial. The participants had to play 10 trials, then the trigger zone deactivated, and the Unity was stopped. After the participant finished 10 trials, the participants returned to the PC with the Qualtrics to fill in the VRSQ for the first round. This process, where the participants performed ten trials in the VR version and filled the VRSQ, was repeated twice, with ten trials each run. In between the ten trials, the researcher asked if they felt comfortable or sick and gave them some break if needed. After the VR version task was done, the Qualtrics proceeded to UMUX-Lite and IPQ. Participants also got five practice trial in each CB and VR version.

After the participants finished the CB and VR tasks and the questionnaires were filled, the experiment was done. See Appendix 8 for the procedures' flowchart.

2.5. Data Analysis

All results were compiled into Microsoft Excel, because all the outputs were in a different format (i.e., the questionnaires' format was Microsoft Excel, CB format was CSV, and VR format was text). Then, the results were analyzed using R studio, utilized with packages tidyverse, dplyr, mice, and ggplot.

A major limitation of the VR version system happened, causing a probability of data loss across 30 trials in VR. The system error happened when the participants got out from the grey circle marking where they should stand, that triggered the game to stop working. When this error happened, the participants was forced to stop the game and the researcher had to re-run the program. Additionally, there was possibility of participants skipping a trial by accidentally pressing the red button twice to save the point, causing them to unintentionally skip a trial. Researchers dealt with data loss by conducting multiple imputations (MI).

Imputation helps to balance the data in incomplete trials, makes it easier to compute necessary data for statistical summaries, and interprets the data filled in summaries (Little & Rubin, 2002). Then, MI combines possible numbers into a complete data set (Rubin, 1987). See Appendix 9 to see which trials have missing data.

Before answering the first hypothesis, a normality test was conducted to decide which statistical analysis would be used. Appendix 10 shows that the absolute pumps are skewed to the left, indicating that the distribution is not normal. Then, the Saphiro-Wilk test was performed for each questionnaire and total of pumps (adjusted and absolute pumps) to test the normality. As a result, some data were not normally distributed, namely: AUDIT (W(47) = .84, p-value = .001), Drug (W(47) = .32, p-value = .000), cig (W (47) = .29, p-value = .001), sex (W (47) = .70, p-value = .001), steal (W (47) = .00, p-value = .001), and GABS W (47) = .94, p-value = .001). For the detailed result of the normality test in each variable, see Appendix 11.

2.5.1. H1: Riskiness on the BART in the VR Version is Positively Correlated with Self-Reported Risk-Related Constructs and Risky Behaviours

Since some questionnaires were not normally distributed, Spearman-rank correlation was used to answer the first hypothesis. Spearman-rank correlation is chosen because it allows the researcher to analyze the relationship between two variables on an ordinal scale (most of the questionnaires are Likert scale which is considered an ordinal scale) and more appropriate for nonparametric test because the data is not normally distributed (Corder & Foreman, 2009). Table 1 shows the distinction of two variables for correlation.

2.5.2. H2-H4: Performance, sense of presence, and usability test

In answering the second, third, and fourth hypotheses, t-test method is used. Statistical method t-test was used to compare between two groups, specifically, current study used paired t-test. Paired t-test was used because current study design was repeated-measures design, where the same group of participants was measured in two conditions (Gravetter & Wallnau, 2011). The first condition was CB version BART, and the second condition was VR version BART. To answer the second hypothesis, participant's performance in CB version BART was compared to VR version BART. Moreover, as the hypothesis had no specific direction, the computation was a two-tailed test. Cohen's D was also used for measuring the effect size of VR version BART to the original study's performance. For the third hypothesis, participant's self-reported IPQ in CB version BART was compared to IPQ VR version BART. Lastly, participant's self-reported UMUX-Lite in CB version BART was compared to UMUX-Lite in VR version BART. The third and fourth hypothesis were assumed to have positive direction,

thus the computation was one-tailed test. Table 2 shows the distinction of two groups being compared.

Table 1

The Detailed Distinction between Dependent and Independent Variables and Statistical Analyses Used in Each Hypothesis

	Hypotheses	Variable 1		Variable 2		Statistical Analysis
		Variables	Metrics	Variables	Metrics	
H1	Riskiness on the BART in the VR version is positively correlated with self-reported risk-related constructs and risky behaviours.	BART performance in VR version	The number of pumps, excluding the trials that exploded (adjusted pumps of VR version) in 30 trials	Self-reported risk-related risk constructs and risk behaviours	Total score in each BIS 15, EV, BC, and BSSS, AUDIT, cig, drug, GABS, steal	Spearman-Rank Correlation Cohen's D

Notes. Abbreviations: BART = Balloon Analogue Risk Task; CB = Computer-based BART; VR = Virtual reality version BART; CB = Computer-based version BART; BIS= Barratt Impulsiveness Scale; EV= Eysenck Venturesomeness subscale; BC= Multidimensional Personality Questionnaire – Behavioural Constraints; BSSS= Brief Sensation Seeking Scale; AUDIT= Alcohol Use Disorders Identification Test; Drug= number of drug classes tried over the past 12 months; Cigarettes= average number of daily cigarettes; Sex= number of sexual intercourses without using a condom for the past 12 months, steal= the number of stealing for the past 12 months; GABS= Gambling Attitudes and Beliefs Scale.

Table 2

The Detailed Distinction between Two Groups Being Compared for t-test in Second, Third, and Fourth Hypothesis

	Hypotheses	Group 1		Group 2		Statistical Analysis
		Variables	Metrics	Variables	Metrics	
H2	There is no significant difference between CB and VR versions performance across 30 trials.	CB version BART Performance	The number of pumps, excluding the trials that exploded (adjusted pumps of CB version) in 30 trials	VR version BART Performance	The number of pumps, excluding the trials that exploded (adjusted pumps of VR version) in 30 trials	Paired t-test, two-tailed
H3	The sense of presence in VR version is significantly higher than in CB version.	Sense of Presence in CB version	Total score of IPQ in CB	Sense of Presence in VR version	Total score of IPQ in VR	Paired t-test, one-tailed
H4	Participants' satisfaction using BART in the VR version is higher than in the CB version.	Usability test (satisfaction) in CB version	Total score of UMUX-Lite in CB	Usability test (satisfaction) in VR version	Total score of UMUX-Lite in VR	Paired t-test, one-tailed

Notes. Abbreviations: BART = Balloon Analogue Risk Task; CB = Computer-based BART; VR = Virtual reality version BART; CB = Computer-based version BART; IPQ= I-group Presence Questionnaire, UMUX-Lite= Usability Metric for User Experience Lite.

3. Results

3.1. H1: Riskiness on the BART in the VR version is positively correlated with self-reported risk-related constructs and risky behaviours

Spearman-rank correlation was performed to examine the correlation between the VR version BART with self-reported risk-related constructs and risky behaviours. Table 3 presents the result of the Spearman-rank correlation in absolute pump and adjusted pump VR version. Either absolute or adjusted pump has similar result. For the risk-related construct, result shows a positive correlation except for BIS. Furthermore, positive correlation also shows in risky behaviour, except for cigarettes. Thus, H1 is partially accepted. Cohen's D result also found that the VR version effect sizes is 1.11 to the original study (see Appendix 12 for details).

Table 3

Result of Spearman-rank correlation between VR version performance with demography, risk-related constructs, and risky behaviours questionnaires

	VR absolute pump	VR adjusted pump
Risk-Related Constructs		
BIS	-.1	-.1
EV	.34*	.31
BC	.19	.17
BSSS	.44**	.4*
Risky Behaviours		
AUDIT	.24	.26
Drug	.11	.11
Cigarettes	.00	-.01
Sex	.3	.33
Steal	.18	.13
GABS	.16	.14

Note. Abbreviation: VR= Virtual Reality; BIS= Barratt Impulsiveness Scale; EV= Eysenck Venturesomeness subscale; BC= Multidimensional Personality Questionnaire – Behavioural Constraints; BSSS= Brief Sensation Seeking Scale; AUDIT= Alcohol Use Disorders Identification Test; Drug= number of drug classes tried over the past 12 months; Cigarettes= average number of daily cigarettes; Sex= number of sexual intercourses without using a condom for the past 12 months, steal= the number of stealing for the past 12 months; GABS= Gambling Attitudes and Beliefs Scale.

*** p <0, ** p <.001, * p <.05, p < .1, ( ) p > 1.

3.3. H2: There is no significant difference between CB and VR versions performance across 30 trials

On average, participants pump more in the CB version (M = 20.39, SD = 6.88) than in the VR version (M = 18.30, SD = 6.84). Table 4 shows the detailed participant's performance in adjusted pumps. Paired t-test was performed to compare the differences between participants' performance in CB and VR version. The paired t-test result shows that there is no significant different between participants' performance in VR and CB t(47) = 1.725, p = .09, two-tailed. Thus, H2 is accepted.

Table 4

Statistic summary of earnings, explosions, and number of adjusted pumps

Dependent Measures	Average Adjusted Pumps	CB	VR
Earnings	M	30585	27464
	SD	10322	10262
Explosions	M	7.16	6.27
	SD	3.68	3.02
Total Pumps	M	20.39	18.3
	SD	6.88	6.84
First 10	M	20.11	17.39
	SD	9.63	8.14
Middle 10	M	20.75	17.13
	SD	8.09	7.05
Last 10	M	20.31	20.4
	SD	8.09	8.9

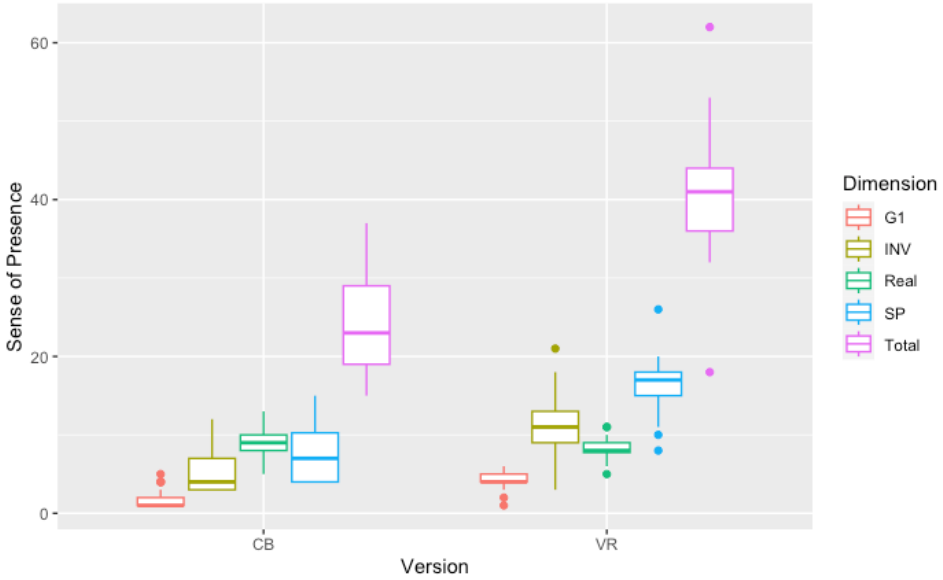
Note. Earnings are calculated by total adjusted pump times 50 points. The total adjusted pump is calculated using row summary code, while the average adjusted pump uses row means code. The explosion is calculated from the number of balloons that exploded. The total absolute pump is calculated using row summary code, while the average absolute pump uses row means code.

3.4. H3: The sense of presence in VR version is significantly higher than in CB version

A paired-sample t-test was conducted to test if there is a significant difference in the sense of presence between the CB and VR version. The t-test result reported that the VR version has significant higher sense of presence (M = 40.22, SD = 6.57) than the CB version (M = 23.85, SD = 6.02) with t (47) = -13.32, p = .001, one-tailed. Therefore, H3 is accepted.

Figure 3

Boxplots Comparing Levels of Sense of Presence Between CB And VR Versions

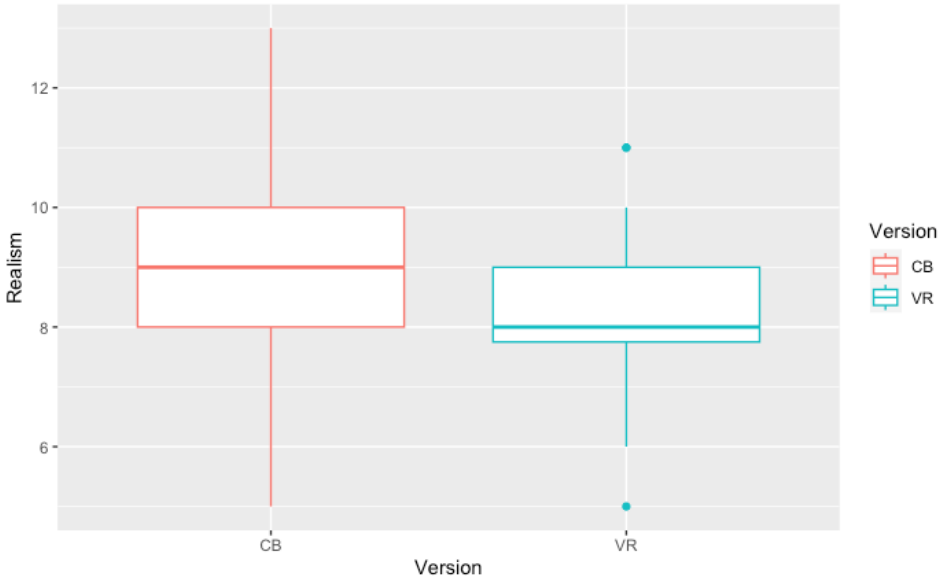


Notes. Abbreviation: G1: general question; INV: involvement, Real: realism; and SP: spatial presence.

Even though the total score of sense of presence in the VR version is significantly higher, the realism dimension in the VR version is lower than the CB version, with t (47) = 3.7 (p = .001). The t-test result indicates that VR version realism is lower. Figure 4 shows that the boxplot of realism in the CB version is higher than the VR version.

Figure 4

Boxplots Comparing Levels of Experienced 'Realism' Between CB And VR Versions

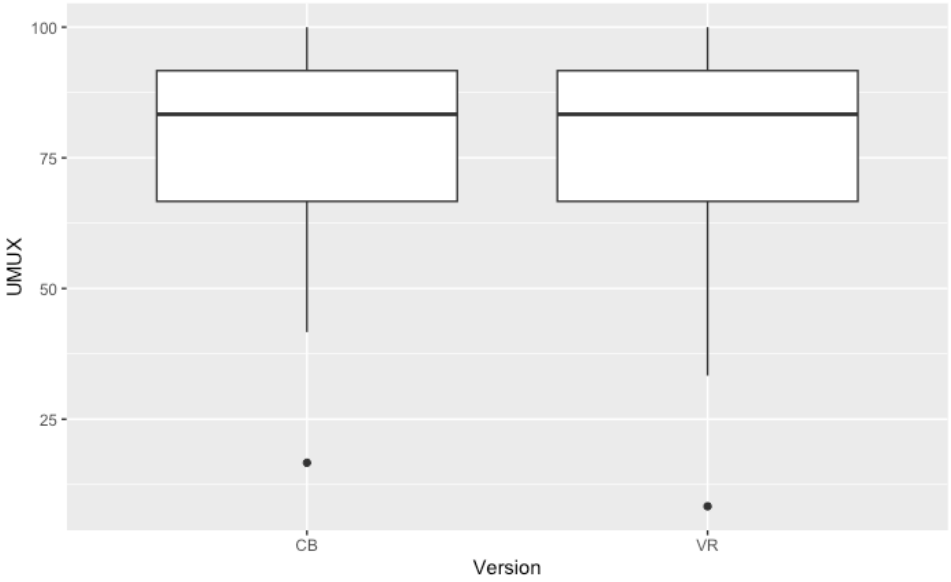


3.5. H4: Participants' satisfaction using BART in the VR version is higher than in the CB version

A paired-sample t-test was conducted to test if there is a significant difference in satisfaction between the CB and VR version. The t-test result reported that the CB version (M = 78.23, SD = 18.14) has higher satisfaction than VR version (M = 76.02, SD = 19.06) with t(47) = .65, p = .51, one-tailed. Therefore, the result from the t-test means that the VR version is less satisfying than the CB version, but the difference is not significant. Thus, H5 is rejected. Figure 5 presents the visualization of the UMUX-Lite score, indicating that the boxplot height is slightly different between the CB and VR versions.

Figure 5

Boxplots Comparing Levels of Satisfaction Between CB And VR Versions



4. Discussion

The current study is an attempt to replicate Balloon Analogue Risk Tasks (BART) to virtual reality (VR) from the original study by Lejuez et al. (2002) to measure risk-taking. The hypotheses analyzed in the current study are that the validation of BART in measuring risk-taking is indicated by the correlation between self-reported risk-related constructs and risky behaviours. Furthermore, to evaluate the VR version BART as a tool, some variables were analyzed, including performance, sense of presence, and usability test by comparing the CB and VR versions.

4.1. H1: Riskiness on the BART in the VR version is positively correlated with self-reported risk-related constructs and risky behaviours

In an attempt to replicate BART to VR version, the current study found different results than the original study. In the original study, adjusted pumps BART are significantly correlated with self-reported risk-related constructs and risky behaviours. However, in the current study, adjusted pumps VR version BART is only significantly correlated with sensation seeking (i.e., BSSS). Adjusted pumps were chosen in the original study because it only included trial in which participants' behaviour was not constrained by the explosion point of the balloon (Lejuez et al., 2002). However, researchers can also use absolute pumps for analyses (Reed et al., 2012). The current study's absolute pumps result shows a significant correlation between VR version BART with venturesomeness (i.e., EV) and sensation seeking (i.e., BSSS). Although some risk-related constructs are significantly correlated with VR version BART, the results are not as expected as the original study. In the original study, BART was significantly correlated with risk-related constructs, which include sensation seeking, impulsiveness, and behavioural constraint. Then, risky behaviours include gambling behaviour, alcohol, cigarette, and drug consumption, stealing experience, and the number of sexual intercourses without using a condom with different partners in the past year.

Additionally, according to Cohen (1988), Cohen's D result equal to and greater than 0.80 is considered a large effect size. Cohen's D result of the VR version indicates a high difference between participants in the current study and the original study. The large effect size might be caused by the difference in the number of participants in the current study and the original study, which were N=48 and N=84, respectively. Furthermore, current study samples are not representing an equal distribution between risk-seeking and risk-averse. As mentioned in the methods section, the samples in the current study have a lower average in self-reported risk-related constructs, risky behaviours, and absolute pumps. Specifically, self-reports in venturesomeness, alcohol, drug, and cigarettes consumption, sex, and stealing behaviour (see Appendix 3 for details). In the original study, the samples had a balanced gender, with 43 males and 43 females. They were asked, "Are you a risk taker?" to increase the likelihood of more risk-taking individuals, while the current study consists of 13 males and 35 females. Furthermore, researchers did not control if the participants were more risk-seeking or risk-averse before the study.

Besides the number and the characteristics of participants, there is a major difference between the original study and the current study in terms of the breaking point sequences of

the balloon explosion. The original study generated a randomly selected collection of breakpoints, resulting in an average of 64 pumps in every 10 trials. For the current study, researchers did not control the breaking point sequence; as a result, it is not known if each participant has a fair breaking point across 30 trials. The uncontrolled breaking points lead to the probability of the participant's breaking point not being fairly distributed and cause some participants an early explosion in the first 10 trials, affecting their pumping behaviour. Thus, researchers could not provide evidence showing that all participants have an average of 64 breaking points. The original study used a semi-randomized structure for the breaking point, which makes the replication less similar. However, the randomization is cotrolled by taking out the breaking point in each trial. The current study may control the randomization but not the difficulty. Consequently, the participants may experience different difficulties. Although the nature of the explosion is randomized in the real world, it is better to control the breaking point for the original study's replication.

The original study also found that the limitation of the assessment of risk behaviours needed to be more comprehensive (Lejuez et al., 2002). Instead of using a self-reported single item, standardized measures can likely afford a more detailed result of risk behaviours. For example, studies that found BART is significantly correlated with risk behaviours are the youth risk behaviour surveillance system (Lejuez et al., 2007) and self-report psychopathy scale II factor II (Hunt et al., 2005). Although BART is correlated significantly with several risk-related constructs (Canning et al., 2022; Lejuez et al., 2003), several studies also found that some risk-related constructs are not significantly correlated with BART. Specifically, impulsivity (Lejuez et al., 2007; Hunt et al., 2005; Lawyer, 2013). In other words, the effective approach to measure risk-taking is to conjoint administration of self-report and behavioural assessment (Weiner, 2005).

Since there was a limitation in the breakpoint sequence and participants' characteristics, there should be an improvement in the next study. First, design a sequence that allows participants to have an average of 64 breaking points in every 10 trials. The sequence design presumably can prevent an early explosion that causes fewer pumps. Furthermore, more representative participants that are risk-averse and risk-taking are encouraged. For example, participants can be a targeted group relevant to risk-seeking individuals like firefighters and construction workers (Sanchez et al., 2021).

4.2. H2: There is no significant difference between CB and VR versions performance across 30 trials

As there is no significant result between CB and VR performance, this indicates no behaviour difference in participants' completing the tasks. Sitkin & Pablo's (1992) theory explains that an individual's risk-taking propensity is affected by historical patterns of success and failure. The irregular explosion pattern in CB and VR may result in participants trying different pumping behaviour. When the failure outcomes pattern is intermittent with the minor result, the decision maker tends to show experimentation in making the decision that may cause risks because of the glimpse of success (Sitkin & Pablo, 1992).

4.3. H3: The sense of presence in VR version is significantly higher than in CB version

The result shows that the participants are more immersed in VR version than the CB, indicating that the VR version is ecologically more valid than the CB. According to Slater (2009), when participants distinguish their presence in the virtual and real environment, they tend to forget that they are being measured. An immersive VR environment with high fidelity can cause the perception of a dangerous environment, where participants can see and hear the balloon inflating in a way that is close to reality, which can increase the perceived sense of risk, especially as they inflate the balloon and it gets bigger (Sanchez et al., 2021). Moreover, VR can become more immersive if it allows the participant to walk or perform a motion in the environment (Perusquía-Hernández et al., 2017). VR environment can enhance the ecological validity which evoked response (Parsey & Schmitteredgecombe, 2013). Thus, assessment with VR with a high sense of presence can result in less participant bias, such as social desirability bias and response bias in self-report.

4.4. H4: Participants' satisfaction using BART in the VR version is higher than in the CB version

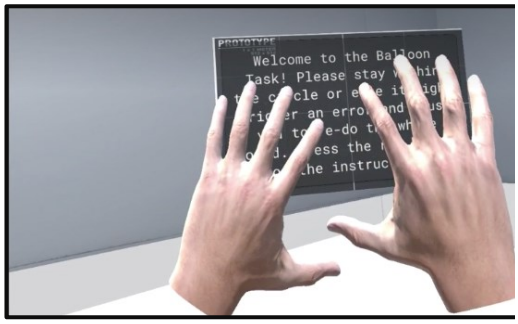
Even though there is no significant difference between CB and VR version satisfaction, the result shows that the VR version BART has lower satisfaction than the CB version. Choi et al. (2019) found several factors that could affect user satisfaction in using VR headsets, namely immersion, VR sickness, usability, wear ability, and menu navigation interface. Out of these five factors, current study measures immersion, VR sickness, and usability. The lower satisfaction in VR version could be because of an error found during the VR version study. This error caused an unrealistic virtual hand visually and caused reducing the immersive experience. When the game starts, the hands are normal, but as the participants use the hands

for pumping while gripping the lever, the hands are either getting wider or longer. Figure 6 shows the difference between the normal size hands when the game starts and the error hands after a few pumps. Choi et al. (2019) states that the low fidelity is the foundation for positive experience in VR simulation. Lower realism result shows that the VR simulation led to lower the immersion and cause lower simulating sensory stimulus that make the participant feel like they are in the real-world experience.

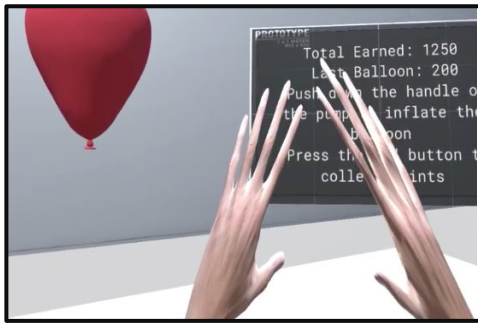
Figure 6

Comparisons between the Normal Hand Size when Unity Started to the Error Hand Size Because of the Bugs

Normal Hand Size



Error Hand Size



However, both results are above 68, indicating a highly satisfactory usability result (Bangor et al., 2008), and there is no significant difference with CB in the UMUX-Lite t-test result. Usability results show that the VR version is still acceptable to be used despite the bugs that bother the participants. Moreover, in terms of VR sickness, there was no significant increase across 30 trials and no participants feel extreme sickness.

In the future study, fixing the hand bugs presumably can increase the realism and lead to more positive experience in VR experience. Also, current study lacks of measuring the wearability and menu navigation or the VR display. Thus, the user experience can be more comprehensive with the measurement of wearability such as the comfort of headsets and the display evaluation.

To conclude, despite the space for improvement of the VR version, the prototype design is acceptable and does not trigger motion sickness. These results are overall encouraging as an assessment tool for risk-taking.

5. Conclusion

The current study was about developing a VR version and replicating the original study to test the validation of BART. The results show that the initial adaptation of the VR version is a promising tool for measuring risk-taking behaviour because there is no difference in participants' performances while completing the task in a CB or VR version and it has a satisfying usability. Moreover, participants' sense of presence is higher in the VR version, indicating that the VR version BART has higher ecological validity than the CB version. Unfortunately, researchers did not replicate in a satisfactory way the original study and its results for multiple reasons. First, the unequal distribution of the participants and the lack of possibility to track each participant the explosion event resulted in incomplete study replication. Second, design bugs in the prototype could have decreased the realism of the immersion as well as usability and acceptability. For better results, researchers should consider having more equally distributed participants (in terms of gender, risk-averse, and risk-seeking) and fix the bugs in the prototype to have higher satisfaction and usability. To conclude, this study contributes a finished prototype VR version of BART and research methods for future study.

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Appendix

Appendix 1

Participants' Demographics Explained the Gender, Education, Nationality, Experience in Using VR, and Visual Impairments

Characteristics	Number of participants	Percentage
Gender		
Female	35	73%
Male	13	27%
Education		
High school	35	73%
Bachelor's degree	10	21%
Master's degree	2	4%
Pre-Bachelor Foundation Year	1	2%
Nationality		
German	17	
Indonesian	10	
Indian	4	
Dutch	3	
Turkish	2	
American	1	
Bulgarian	1	
Colombian	1	
Egyptian	1	
Filipino	1	
German-American	1	
German-French	1	

German-Syrian	1	
Greek	1	
Irish	1	
Latvian	1	
Lithuanian	1	
VR Experience		
No	15	31%
Yes	33	69%
Visual Impairment		
No	21	44%
Astigmatism	2	4%
Short-sighted/myopia	15	31%
Far-sighted/hypermetropia	9	19%
Short-sighted/myopia, Astigmatism	1	2%

Appendix 2

Detail Information of the Difference Between Questionnaires Used in the Original Study and Current Study in Each Self-Reported Risk-Related Constructs and Risky Behaviours, Including the Name of the Scales and Dimensions that are measured

Construct	Factor	Original study Measurement	Dimension	Current Study Measurement	Dimension
Factor Loadings for the Risk-Related Constructs	First factor (impulsivity)	Barratt Impulsiveness (Barratt, 1985)	Motor impulsivity Cognitive impulsivity Future-planning impulsivity	Barrat Impulsiveness Scale- short form (BIS-15; Bhat et al., 2018)	Motor Non-planning Attention
		Eysenck Impulsivity subscale (Eysenck, et al., 1985)	Impulsivity	-	-
	Second factor (Arousal Seeking)	Eysenck Venturesomeness subscale (Eysenck, et al., 1985)	Venturesomeness	-	-
		Multidimensional Personality Questionnaire – Behavioral constraint superfactor (Tellegen, 1982)	Control Harm Avoidance Traditionalism	Multidimensional Personality Questionnaire (MPQ) – Behavioral constraint superfactor (Tellegen, 1982)	Control Harm Avoidance Traditionalism
		Sensation Seeking Scale (Zuckerman et al., 1978)	Thrill and adventure seeking Experience seeking Disinhibition Boredom susceptibility	Brief Sensation Seeking Scale (BSSS) (Hoyle et al., 2002)	Thrill and adventure seeking Experience seeking Disinhibition Boredom susceptibility
Factor Loadings for the Self-Reported Real-World Risk Behabiours	First factor (Delinquency Risk Behavior)	Alcohol Use Disorders Identification Test (AUDIT) (Sanders et al., 1993)	Quantity and frequency of drinking Drinking intensity Symptoms of dependence and tolerance Alcohol-related negative consequences over the past 12 months	Alcohol Use Disorders Identification Test (AUDIT) (Sanders et al., 1993)	Quantity and frequency of drinking Drinking intensity Symptoms of dependence and tolerance Alcohol-related negative consequences over the past 12 months
		Gambling Attitudes and Beliefs Scale (GABS; Breen & Zuckerman, 1994, 1999)	Cognitive biases Irrational beliefs Positively valued attitudes to gambling	Gambling Attitudes and Beliefs Survey (GABS-23, Bouju et al., 2014)	Strategies Chasing Attitudes Luck Emotions
		Number of stealing	Single item	Number of stealing	Single item
	Second factor (Substance Use and	Average number of daily cigarettes	Single item	Number of average number of daily cigarettes	Single item
	Sexual Risk Behaviours)	Number of polydrug/substance use	Marijuana Stimulants Cocaine Hallucinogens Opiates Sedatives Other	Number of polydrug/substance use	Cocaine Heroin Marijuana Amphetamines Inhalants Tranquilizers Hallucinogens Ecstasy Opiate analgesics Synthetic drugs Anabolic androgenic steroids Sedatives
		Number of different partners with whom sexual intercourse occurred without the use of a condom in the past year	Single item	Number of different partners with whom sexual intercourse occurred without the use of a condom in the past year	Single item

Appendix 3

Comparison of Participants' Average and Standard Deviation in Current Study and Original Study

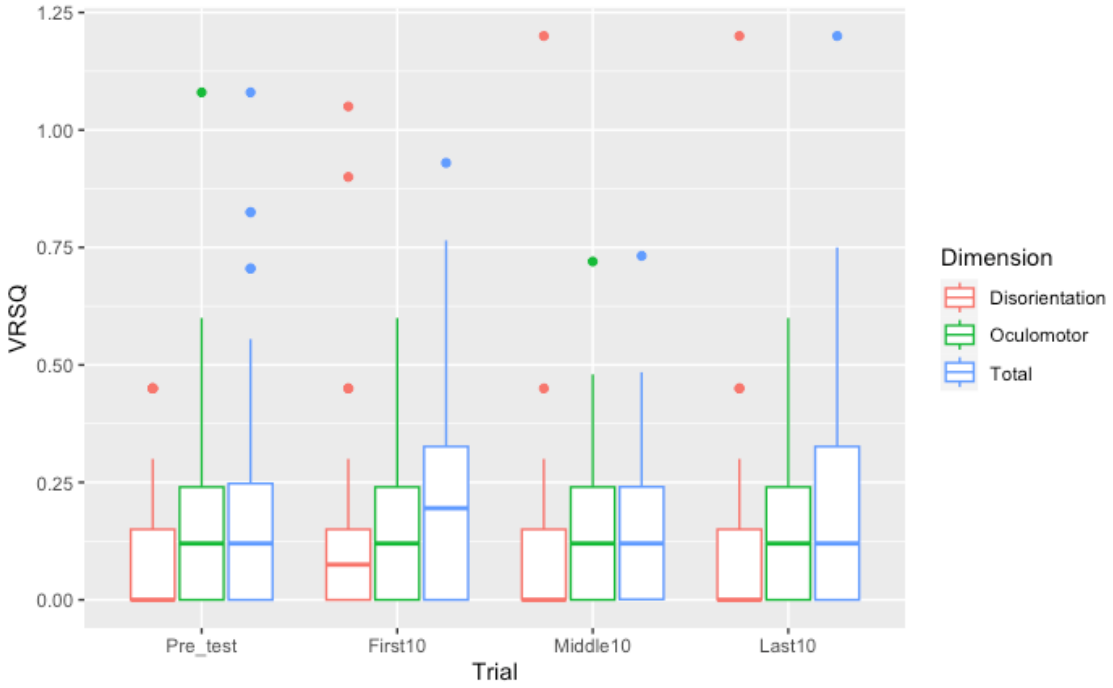
	Original Study		Current Study	
Variable	M	SD	M	SD
Age	20.8	2.1	21.6	3.38
EV	11.2	3.6	9.38	2.38
AUDIT	7.9	5.7	6.6	4.6
Drug	2.1	2.1	1.61	5.6
Cig	4.6	7.5	.19	.7
Sex	.9	1.4	.56	.82
Steal	.9	2.1	.25	.67

Notes. Abbreviation: EV: Eysenck Venturesomeness subscale; AUDIT: Alcohol Use Disorders Identification Test; Drug: number of drug classes tried over the past 12 months; Cigarettes: average number of daily cigarettes; Sex: number of sexual intercourses without

using a condom for the past 12 months, Steal: the number of stealing for the past 12 months; GABS: Gambling Attitudes and Beliefs Scale.

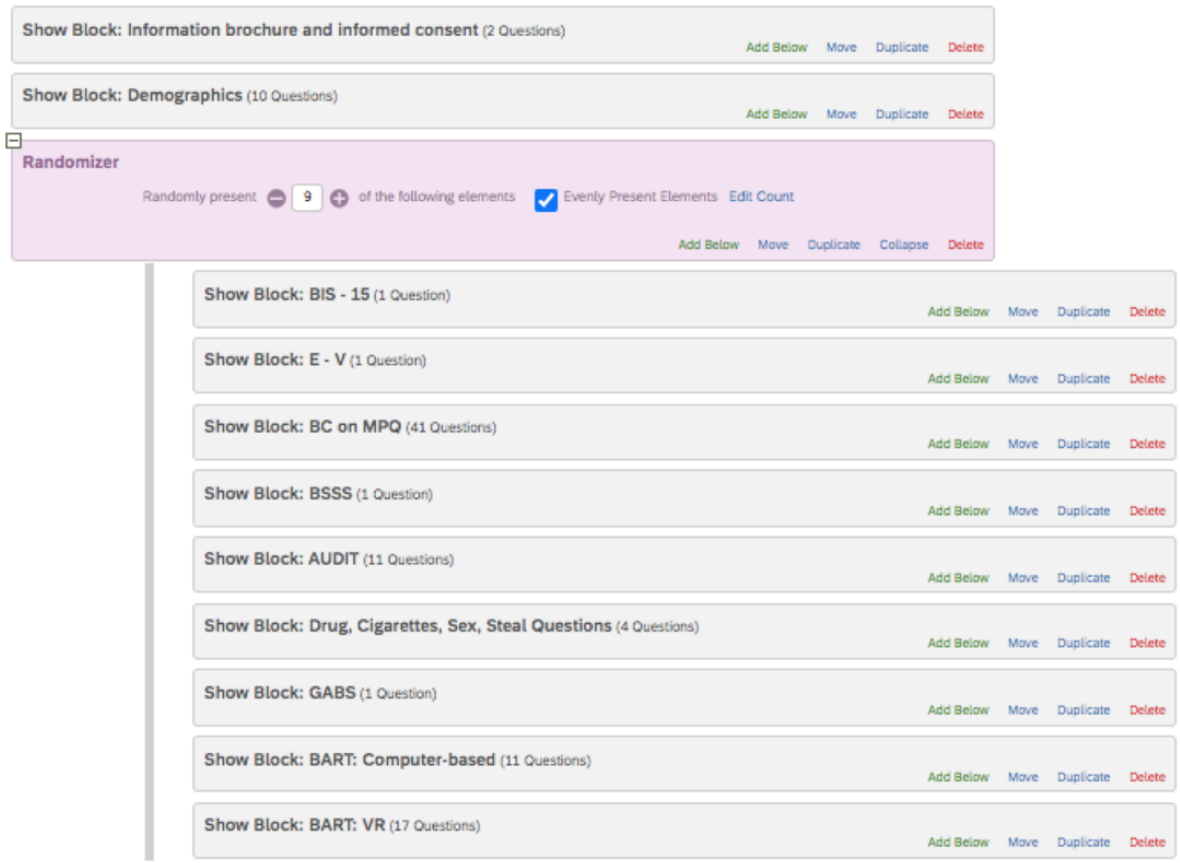
Appendix 4

Participants Virtual Reality Sickness Experience in Before VR Version BART and Each Trial, with Boxplot in Dimension Disorientation, Oculomotor, and Total Score of VRSQ



Appendix 5

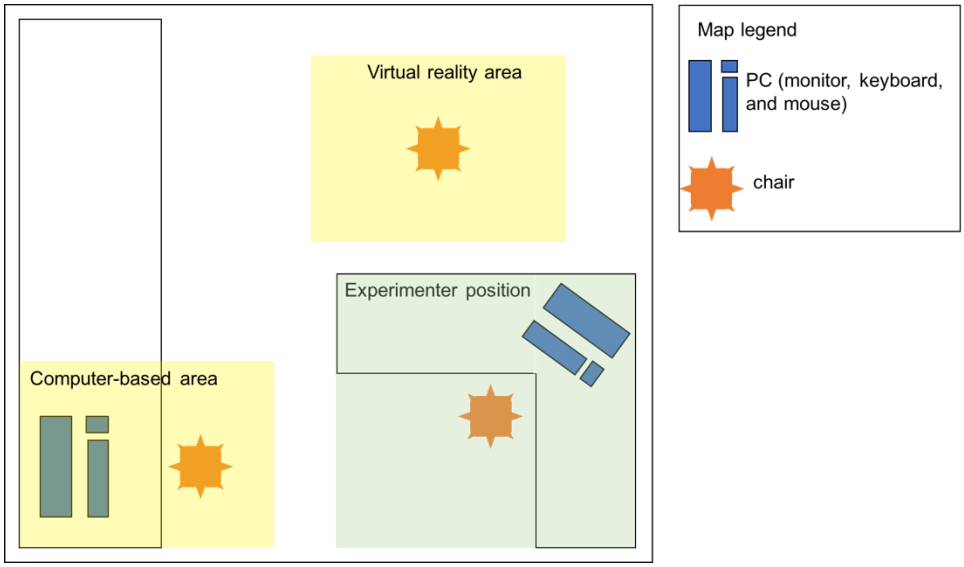
Randomisation Function in Qualtrics Indicated with Purple Box. The Randomisation Include Questionnaires BIS, EV, BC, BSSS, AUDIT, Substance Use and Sex Behaviour, GABS, CB Version BART, And VR Version BART



Notes. Questionnaires of IPQ and UMUX-Lite are in the CB and VR block, with VRSQ in addition to VR version block.

Appendix 6

Experiment Room Layout for Each CB Area, VR Area, and Experimenter Position



Notes. Yellow box indicates for participants and green box indicates for researcher. There were two PCs used. The first PC is equipped with an opensesame application to operate the computer-based BART and Qualtrics that contain information about the study, informed consent, and questionnaires. Another PC is equipped with Unity with the project of BART installed.

Appendix 7

Instructions for CB Version in Opensesame and VR version in Unity

CB instructions in Opensesame

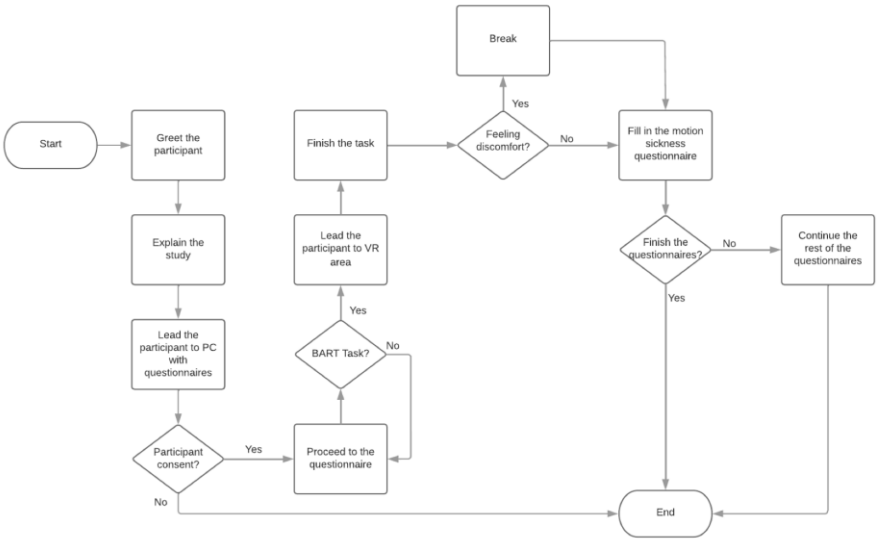
Throughout the task, you will be presented with 30 balloons, one at a time. For each balloon you can pump it with the button to increase the size of the balloon. You will accumulate 50 points in a temporary bank for each pump. At any point, you can stop pumping up the balloon and click on the "Collect" button. Clicking this button will start you on the next balloon and will transfer the accumulated points from your temporary bank to your permanent bank labeled "Total Earned." It is your choice to determine how much to pump up the balloon, but be aware that at some point the balloon will explode. The explosion point varies across balloons, ranging from the first pump to enough pumps to make the balloon fill the entire computer screen. If the balloon explodes before you click the "Collect" button, then you move on to the next balloon and all points in your temporary bank are lost. Exploded balloons do not affect the points accumulated in your permanent bank.

VR instructions used in Unity

Throughout the task, you will be presented with 30 balloons, one at a time. For each balloon you can pump it with your hand to increase the size of the balloon. You will accumulate 50 points in a temporary bank for each pump. At any point, you can stop pumping up the balloon and click on the red button. Clicking this button will start you on the next balloon and will transfer the accumulated points from your temporary bank to your permanent bank labeled "Total Earned." It is your choice to determine how much to pump up the balloon, but be aware that at some point the balloon will explode. The explosion point varies across balloons, ranging from the first pump to enough pumps to make the balloon fill the entire computer screen. If the balloon explodes before you click the red button, then you move on to the next balloon and all points in your temporary bank are lost. Exploded balloons do not affect the points accumulated in your permanent bank.
Now you will start with the actual game… please stay within the circle or else it might trigger an error and cause you to re-do the whole round.

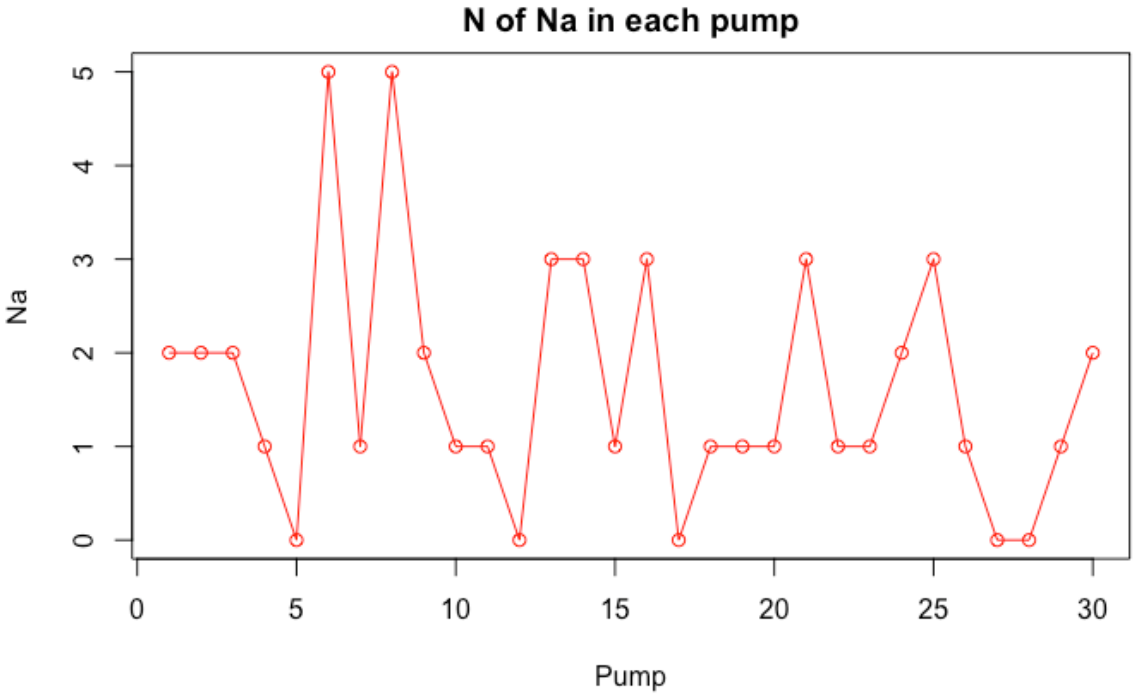
Appendix 8

Current Study's Experiment Flowchart for Researcher



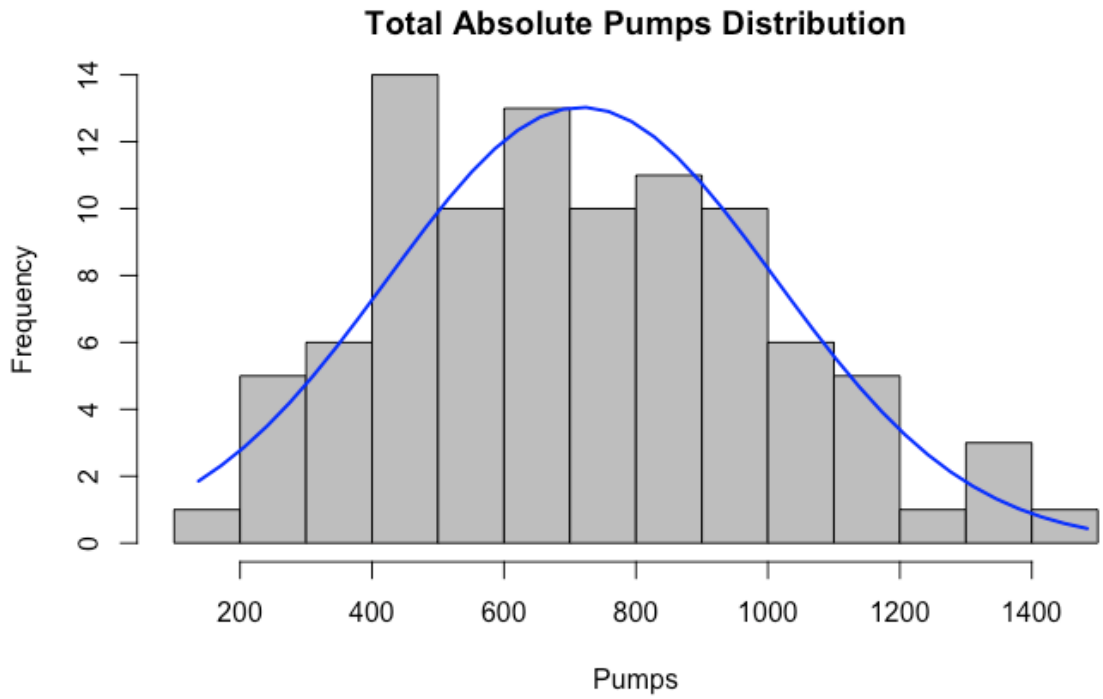
Appendix 9

Visualisation of Number of Missing Data in Each Trial



Appendix 10

Total Absolute Pumps Distribution



Appendix 11

Normality Shapiro Wilk Test Result in Each Questionnaires, Adjusted Pumps, and Absolute Pumps

aVariable	W	p-value
BIS	**.96**	**.200**
EV	**.97**	**.324**
BC	**.96**	**.135**
BSSS	**.96**	**.228**
AUDIT	.84	.000
Drug	.32	.000
Cigarettes	.29	.000
Sex	.70	.000
Steal	.00	.000
GABS	.94	.001
VR_adj_pump	**.98**	**.755**
VR_adj_pump_mean	**.98**	**.755**
CB_adj_pump	**.97**	**.361**
CB_adj_pump_mean	**.97**	**.361**
VR_abs_pump	**.98**	**.754**
VR_abs_pump_mean	**.98**	**.754**
CB_abs_pump	**.97**	**.393**
CB_abs_pump_mean	**.97**	**.393**

Note. Bolded text indicated significant (p > .05). Abbreviate: VR_adj_pump is total adjusted pumps in VR; VR_adj_pump_mean is average adjusted pumps in VR; CB_adj_pump is total adjusted pumps in CB; CB_adj_pump_mean is average adjusted pumps in CB; VR_abs_pump is total absolute pumps in

VR; VR_abs_pump_mean is average absolute pumps in VR; CB_abs_pump is total absolute pumps in CB; CB_abs_pump_mean mean is average absolute pumps in CB.

Appendix 12

Cohen's D Result Comparing the Effect Size between CB Version with the Original Study, VR Version with the Original Study, and CB Version with the VR Version of the Current Study

	Group 1				Group 2			Cohen's D
	M	SD	N		M	SD	N	
CB version	20.41	6.88	48	Original Study	27.75	9.85	86	0.866
VR version	17.52	7.05	48	Original Study	27.75	9.85	86	1.114
CB version	20.41	6.88	48	VR Version	17.52	7.05	48	0.304

Appendix 13

Link to the Technical Manual to Operate Unity for BART Project

For a complete manual on operating Unity click the link: bit.ly/vrbartmanual.

Appendix 14

Complete R Code Used for Answering H1, Includes Datasets, Shapiro-Wilk, Spearman-Rank Correlation, and MI

Load libraries

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyv
erse 1.3.2 ──
## ✔ ggplot2 3.4.0      ✔ purrr   0.3.5
## ✔ tibble  3.1.8      ✔ dplyr   1.0.10
## ✔ tidyr   1.2.1      ✔ stringr 1.5.0
## ✔ readr   2.1.2      ✔ forcats 0.5.2
## ── Conflicts ────────────────────────────────────────── tidyverse
_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
```

```
library(dplyr)
library(ggpubr)
library(rstatix)
```

```
##
## Attaching package: 'rstatix'
##
## The following object is masked from 'package:stats':
```

```
##
##     filter

library(Hmisc)

## Loading required package: lattice
## Loading required package: survival
## Loading required package: Formula
##
## Attaching package: 'Hmisc'
##
## The following objects are masked from 'package:dplyr':
##
##     src, summarize
##
## The following objects are masked from 'package:base':
##
##     format.pval, units

library(ISLR)
library(ggplot2)
library(GGally)

## Registered S3 method overwritten by 'GGally':
##   method from
##   +.gg   ggplot2

library(plyr)

## ------------------------------------------------------------------------------
## You have loaded plyr after dplyr - this is likely to cause problems.
## If you need functions from both plyr and dplyr, please load plyr first, then dplyr:
## library(plyr); library(dplyr)
## ------------------------------------------------------------------------------
##
## Attaching package: 'plyr'
##
## The following objects are masked from 'package:Hmisc':
##
##     is.discrete, summarize
##
## The following objects are masked from 'package:rstatix':
##
##     desc, mutate
##
## The following object is masked from 'package:ggpubr':
##
##     mutate
##
## The following objects are masked from 'package:dplyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
##
## The following object is masked from 'package:purrr':
```

```
##
##     compact

library(rstanarm)

## Loading required package: Rcpp
## This is rstanarm version 2.21.3
## - See https://mc-stan.org/rstanarm/articles/priors for changes to default priors!
## - Default priors may change, so it's safest to specify priors, even if equivalent to the defaults.
## - For execution on a local, multicore CPU with excess RAM we recommend calling
##   options(mc.cores = parallel::detectCores())

library(bayr)

## Registered S3 methods overwritten by 'bayr':
##   method          from
##   coef.stanreg    rstanarm
##   predict.stanreg rstanarm
##   print.tbl_obs   mascutils
##
## Attaching package: 'bayr'
##
## The following objects are masked from 'package:rstanarm':
##
##     fixef, ranef

library(brms)

## Registered S3 methods overwritten by 'brms':
##   method          from
##   coef.brmsfit    bayr
##   predict.brmsfit bayr
## Loading 'brms' package (version 2.18.0). Useful instructions
## can be found by typing help('brms'). A more detailed introduction
## to the package is available through vignette('brms_overview').
##
## Attaching package: 'brms'
##
## The following objects are masked from 'package:bayr':
##
##     fixef, ranef
##
## The following objects are masked from 'package:rstanarm':
##
##     dirichlet, exponential, get_y, lasso, ngrps
##
## The following object is masked from 'package:survival':
##
##     kidney
##
## The following object is masked from 'package:stats':
##
##     ar
```

Import Data

```
df <-
  read_csv("/Users/nesyalaviza/Desktop/Master/Thesis/DataCollection/questionnairedataset3.csv") %
>%
  print()

## Rows: 48 Columns: 220
## ── Column specification ────────────────────────────────────────────────────
──────────────────
## Delimiter: ","
## chr  (10): Gendercoded, Nationality, Nationalitycoded, Occupationcoded, Educ...
## dbl (210): ParticipantID, ParticipantID_2, BISTotal, EVTotal, BCTotal, BSSST...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

## # A tibble: 48 × 220
##    ParticipantID ParticipantID_2 BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
##            <dbl>           <dbl>    <dbl>   <dbl>   <dbl>     <dbl>      <dbl>
##  1             1               1       29       8      26        23          0
##  2             3               3       26      11      18        19          5
##  3             4               4       17      11      19        26          5
##  4             5               5       28      11      20        32          3
##  5             7               7       15      13      26        25          3
##  6             8               8       19      10      24        25          5
##  7             9               9       22       4      21        20          1
##  8            10              10       27       6      15        19          1
##  9            11              11       34      13      14        32         12
## 10            12           57229       42      13      19        38         11
## # … with 38 more rows, and 213 more variables: DrugTotal <dbl>,
## #   CigarettesTotal <dbl>, SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>,
## #   UMUXVRTotal <dbl>, UMUXCBTotal <dbl>, IPQVRG1 <dbl>, IPQVRINV <dbl>,
## #   IPQVRREAL1 <dbl>, IPQVRREAL <dbl>, IPQVRSP <dbl>, IPQVRTotal <dbl>,
## #   IPQCBG1 <dbl>, IPQCBINV <dbl>, IPQCBREAL1 <dbl>, IPQCBREAL <dbl>,
## #   IPQCBSP <dbl>, IPQCBTotal <dbl>, Age <dbl>, Gender <dbl>,
## #   Gendercoded <chr>, Nationality <chr>, Nationalitycoded <chr>, …
```

Replace 0 in log_count_inflate_exp_ into Na in bartdata

```
df <- df %>%
  mutate_at(c("VRlog_count_inflate_exp_1","VRlog_count_inflate_exp_2","VRlog_count_inflate_e
xp_3","VRlog_count_inflate_exp_4","VRlog_count_inflate_exp_5","VRlog_count_inflate_exp_6","
VRlog_count_inflate_exp_7","VRlog_count_inflate_exp_8","VRlog_count_inflate_exp_9","VRlog_c
ount_inflate_exp_10","VRlog_count_inflate_exp_11","VRlog_count_inflate_exp_12","VRlog_count
_inflate_exp_13","VRlog_count_inflate_exp_14","VRlog_count_inflate_exp_15","VRlog_count_infl
ate_exp_16","VRlog_count_inflate_exp_17","VRlog_count_inflate_exp_18","VRlog_count_inflate_e
xp_19","VRlog_count_inflate_exp_20","VRlog_count_inflate_exp_21","VRlog_count_inflate_exp_2
2","VRlog_count_inflate_exp_23","VRlog_count_inflate_exp_24","VRlog_count_inflate_exp_25","
VRlog_count_inflate_exp_26","VRlog_count_inflate_exp_27","VRlog_count_inflate_exp_28","VRl
og_count_inflate_exp_29","VRlog_count_inflate_exp_30"), ~na_if(.,0))
```

```
df
```

```
## # A tibble: 48 × 220
##    ParticipantID ParticipantID_2 BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
##            <dbl>           <dbl>    <dbl>   <dbl>   <dbl>    <dbl>      <dbl>
##  1             1               1       29       8      26       23          0
##  2             3               3       26      11      18       19          5
##  3             4               4       17      11      19       26          5
##  4             5               5       28      11      20       32          3
##  5             7               7       15      13      26       25          3
##  6             8               8       19      10      24       25          5
##  7             9               9       22       4      21       20          1
##  8            10              10       27       6      15       19          1
##  9            11              11       34      13      14       32         12
## 10            12           57229       42      13      19       38         11
## # … with 38 more rows, and 213 more variables: DrugTotal <dbl>,
## #   CigarettesTotal <dbl>, SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>,
## #   UMUXVRTotal <dbl>, UMUXCBTotal <dbl>, IPQVRG1 <dbl>, IPQVRINV <dbl>,
## #   IPQVRREAL1 <dbl>, IPQVRREAL <dbl>, IPQVRSP <dbl>, IPQVRTotal <dbl>,
## #   IPQCBG1 <dbl>, IPQCBINV <dbl>, IPQCBREAL1 <dbl>, IPQCBREAL <dbl>,
## #   IPQCBSP <dbl>, IPQCBTotal <dbl>, Age <dbl>, Gender <dbl>,
## #   Gendercoded <chr>, Nationality <chr>, Nationalitycoded <chr>, …
```

#replace NA with 0 adjusted pump columns

```
df[c("VRadjpump1", "VRadjpump2", "VRadjpump3", "VRadjpump4", "VRadjpump5", "VRadjpump6", "VRadjpump7", "VRadjpump8", "VRadjpump9", "VRadjpump10", "VRadjpump11", "VRadjpump12","VRadjpump13","VRadjpump14","VRadjpump15","VRadjpump16","VRadjpump17","VRadjpump18","VRadjpump19","VRadjpump20","VRadjpump21","VRadjpump22","VRadjpump23","VRadjpump24","VRadjpump25","VRadjpump26","VRadjpump27","VRadjpump28","VRadjpump29","VRadjpump30","CBadjpump1", "CBadjpump2", "CBadjpump3", "CBadjpump4", "CBadjpump5", "CBadjpump6", "CBadjpump7", "CBadjpump8", "CBadjpump9", "CBadjpump10", "CBadjpump11", "CBadjpump12","CBadjpump13","CBadjpump14","CBadjpump15","CBadjpump16","CBadjpump17","CBadjpump18","CBadjpump19","CBadjpump20","CBadjpump21","CBadjpump22","CBadjpump23","CBadjpump24","CBadjpump25","CBadjpump26","CBadjpump27","CBadjpump28","CBadjpump29","CBadjpump30")][is.na(df[c("VRadjpump1", "VRadjpump2", "VRadjpump3", "VRadjpump4", "VRadjpump5", "VRadjpump6", "VRadjpump7", "VRadjpump8", "VRadjpump9", "VRadjpump10", "VRadjpump11", "VRadjpump12","VRadjpump13","VRadjpump14","VRadjpump15","VRadjpump16","VRadjpump17","VRadjpump18","VRadjpump19","VRadjpump20","VRadjpump21","VRadjpump22","VRadjpump23","VRadjpump24","VRadjpump25","VRadjpump26","VRadjpump27","VRadjpump28","VRadjpump29","VRadjpump30","CBadjpump1", "CBadjpump2", "CBadjpump3", "CBadjpump4", "CBadjpump5", "CBadjpump6", "CBadjpump7", "CBadjpump8", "CBadjpump9", "CBadjpump10", "CBadjpump11", "CBadjpump12","CBadjpump13","CBadjpump14","CBadjpump15","CBadjpump16","CBadjpump17","CBadjpump18","CBadjpump19","CBadjpump20","CBadjpump21","CBadjpump22","CBadjpump23","CBadjpump24","CBadjpump25","CBadjpump26","CBadjpump27","CBadjpump28","CBadjpump29","CBadjpump30")])] <- 0

print(df)
```

```
## # A tibble: 48 × 220
##    ParticipantID ParticipantID_2 BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
##            <dbl>           <dbl>    <dbl>   <dbl>   <dbl>    <dbl>      <dbl>
##  1             1               1       29       8      26       23          0
##  2             3               3       26      11      18       19          5
##  3             4               4       17      11      19       26          5
```

```
## 4          5           5     28     11     20      32        3
## 5          7           7     15     13     26      25        3
## 6          8           8     19     10     24      25        5
## 7          9           9     22      4     21      20        1
## 8         10          10     27      6     15      19        1
## 9         11          11     34     13     14      32       12
## 10        12       57229     42     13     19      38       11
## # … with 38 more rows, and 213 more variables: DrugTotal <dbl>,
## #   CigarettesTotal <dbl>, SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>,
## #   UMUXVRTotal <dbl>, UMUXCBTotal <dbl>, IPQVRG1 <dbl>, IPQVRINV <dbl>,
## #   IPQVRREAL1 <dbl>, IPQVRREAL <dbl>, IPQVRSP <dbl>, IPQVRTotal <dbl>,
## #   IPQCBG1 <dbl>, IPQCBINV <dbl>, IPQCBREAL1 <dbl>, IPQCBREAL <dbl>,
## #   IPQCBSP <dbl>, IPQCBTotal <dbl>, Age <dbl>, Gender <dbl>,
## #   Gendercoded <chr>, Nationality <chr>, Nationalitycoded <chr>, …
```

#Separate questionnaire and make new column for BART values

```
#questionnaires
quest <-
  df %>%
  select(BISTotal, EVTotal, BCTotal, BSSSTotal, AUDITTotal, DrugTotal, CigarettesTotal, SexTotal
, StealTotal,GABSTotal)

#adjusted Total pump for VR
df$VR_adj_pump <- df %>%
  select(starts_with("VRadjpump")) %>% rowSums()
df$VR_adj_pump_mean <- df %>%
  select(starts_with("VRadjpump")) %>% rowMeans()

#adjusted Total & Average pump for VR
df$CB_adj_pump <- df %>%
  select(starts_with("CBadjpump")) %>% rowSums()
df$CB_adj_pump_mean <- df %>%
  select(starts_with("CBadjpump")) %>% rowMeans()

#grouping bart pumps
adj_pumps <-
  df %>%
  select(VR_adj_pump, VR_adj_pump_mean, CB_adj_pump, CB_adj_pump_mean)

print(df)
```

```
## # A tibble: 48 × 224
##    ParticipantID ParticipantID_2 BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
##            <dbl>           <dbl>    <dbl>   <dbl>   <dbl>     <dbl>      <dbl>
## 1          1           1     29      8     26      23        0
## 2          3           3     26     11     18      19        5
## 3          4           4     17     11     19      26        5
## 4          5           5     28     11     20      32        3
## 5          7           7     15     13     26      25        3
## 6          8           8     19     10     24      25        5
## 7          9           9     22      4     21      20        1
## 8         10          10     27      6     15      19        1
## 9         11          11     34     13     14      32       12
## 10        12       57229     42     13     19      38       11
```

```
## # … with 38 more rows, and 217 more variables: DrugTotal <dbl>,
## #   CigarettesTotal <dbl>, SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>,
## #   UMUXVRTotal <dbl>, UMUXCBTotal <dbl>, IPQVRG1 <dbl>, IPQVRINV <dbl>,
## #   IPQVRREAL1 <dbl>, IPQVRREAL <dbl>, IPQVRSP <dbl>, IPQVRTotal <dbl>,
## #   IPQCBG1 <dbl>, IPQCBINV <dbl>, IPQCBREAL1 <dbl>, IPQCBREAL <dbl>,
## #   IPQCBSP <dbl>, IPQCBTotal <dbl>, Age <dbl>, Gender <dbl>,
## #   Gendercoded <chr>, Nationality <chr>, Nationalitycoded <chr>, …
```

Replace the Gender into dummy variables

```
df = df %>%
  mutate(Gender = recode(Gender, "2" = "1", "1" = "0"))
print(df)
```

```
## # A tibble: 48 × 224
##    ParticipantID ParticipantID_2 BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
##            <dbl>           <dbl>    <dbl>   <dbl>   <dbl>     <dbl>      <dbl>
##  1             1               1       29       8      26        23          0
##  2             3               3       26      11      18        19          5
##  3             4               4       17      11      19        26          5
##  4             5               5       28      11      20        32          3
##  5             7               7       15      13      26        25          3
##  6             8               8       19      10      24        25          5
##  7             9               9       22       4      21        20          1
##  8            10              10       27       6      15        19          1
##  9            11              11       34      13      14        32         12
## 10            12           57229       42      13      19        38         11
## # … with 38 more rows, and 217 more variables: DrugTotal <dbl>,
## #   CigarettesTotal <dbl>, SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>,
## #   UMUXVRTotal <dbl>, UMUXCBTotal <dbl>, IPQVRG1 <dbl>, IPQVRINV <dbl>,
## #   IPQVRREAL1 <dbl>, IPQVRREAL <dbl>, IPQVRSP <dbl>, IPQVRTotal <dbl>,
## #   IPQCBG1 <dbl>, IPQCBINV <dbl>, IPQCBREAL1 <dbl>, IPQCBREAL <dbl>,
## #   IPQCBSP <dbl>, IPQCBTotal <dbl>, Age <dbl>, Gender <chr>,
## #   Gendercoded <chr>, Nationality <chr>, Nationalitycoded <chr>, …
```

Normality test for questionnaires

```
shapiro.test(quest$BISTotal)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  quest$BISTotal
## W = 0.94225, p-value = 0.01982
```

```
shapiro.test(quest$EVTotal)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  quest$EVTotal
## W = 0.97282, p-value = 0.3248
```

```
shapiro.test(quest$BCTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$BCTotal
## W = 0.96313, p-value = 0.1351

shapiro.test(quest$BSSSTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$BSSSTotal
## W = 0.96885, p-value = 0.2284

shapiro.test(quest$AUDITTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$AUDITTotal
## W = 0.84961, p-value = 2.124e-05

shapiro.test(quest$DrugTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$DrugTotal
## W = 0.32012, p-value = 1.403e-13

shapiro.test(quest$CigarettesTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$CigarettesTotal
## W = 0.29778, p-value = 8.394e-14

shapiro.test(quest$SexTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$SexTotal
## W = 0.7012, p-value = 1.394e-08

shapiro.test(quest$StealTotal)

##
##  Shapiro-Wilk normality test
##
## data:  quest$StealTotal
## W = 0.42343, p-value = 1.792e-12

shapiro.test(quest$GABSTotal)
```

```
##
##  Shapiro-Wilk normality test
##
## data:  quest$GABSTotal
## W = 0.94192, p-value = 0.01924
```

Normality test for adjusted pumps

```
library("ggpubr")
library("dplyr")
shapiro.test(adj_pumps$VR_adj_pump)

##
##  Shapiro-Wilk normality test
##
## data:  adj_pumps$VR_adj_pump
## W = 0.98414, p-value = 0.7555

shapiro.test(adj_pumps$VR_adj_pump_mean)

##
##  Shapiro-Wilk normality test
##
## data:  adj_pumps$VR_adj_pump_mean
## W = 0.98414, p-value = 0.7555

shapiro.test(adj_pumps$CB_adj_pump)

##
##  Shapiro-Wilk normality test
##
## data:  adj_pumps$CB_adj_pump
## W = 0.97407, p-value = 0.3616

shapiro.test(adj_pumps$CB_adj_pump_mean)

##
##  Shapiro-Wilk normality test
##
## data:  adj_pumps$CB_adj_pump_mean
## W = 0.97407, p-value = 0.3616
```

#New dataset with only columns needed for correlations in adjusted pump

```
df2 <-
  df %>%
  select(Age, Gender, BISTotal, EVTotal, BCTotal, BSSSTotal, AUDITTotal, DrugTotal, CigarettesT
otal, SexTotal, StealTotal,GABSTotal, VR_adj_pump, CB_adj_pump, VR_adj_pump_mean, CB_adj
_pump_mean)
print(df2)

## # A tibble: 48 × 16
##      Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal DrugTotal
##    <dbl> <chr>     <dbl>   <dbl>   <dbl>     <dbl>      <dbl>     <dbl>
##  1    28 1           29       8      26        23          0         0
```

```
##  2    19 1          26     11     18       19        5       0
##  3    25 0          17     11     19       26        5       0
##  4    25 0          28     11     20       32        3       0
##  5    25 0          15     13     26       25        3       0
##  6    23 1          19     10     24       25        5       1
##  7    25 0          22      4     21       20        1       0
##  8    27 1          27      6     15       19        1       1
##  9    26 0          34     13     14       32       12      35
## 10    20 1          42     13     19       38       11       0
## # … with 38 more rows, and 8 more variables: CigarettesTotal <dbl>,
## #   SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>, VR_adj_pump <dbl>,
## #   CB_adj_pump <dbl>, VR_adj_pump_mean <dbl>, CB_adj_pump_mean <dbl>
```

Questionnaire x adjusted pump correlations

```
rcorr(as.matrix(df2),type = "spearman")
```

```
##                 Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
## Age            1.00  -0.55    -0.04    0.16    0.07     -0.09      -0.25
## Gender        -0.55   1.00     0.24   -0.29   -0.16     -0.19      -0.02
## BISTotal      -0.04   0.24     1.00   -0.01   -0.28      0.21       0.33
## EVTotal        0.16  -0.29    -0.01    1.00    0.16      0.41       0.13
## BCTotal        0.07  -0.16    -0.28    0.16    1.00     -0.01      -0.32
## BSSSTotal     -0.09  -0.19     0.21    0.41   -0.01      1.00       0.44
## AUDITTotal    -0.25  -0.02     0.33    0.13   -0.32      0.44       1.00
## DrugTotal      0.08  -0.08     0.11    0.18   -0.11      0.32       0.24
## CigarettesTotal -0.14  0.18     0.10    0.03    0.00      0.31       0.13
## SexTotal       0.10  -0.01     0.09    0.08   -0.24      0.49       0.35
## StealTotal     0.01   0.15     0.26    0.18   -0.20      0.30       0.28
## GABSTotal     -0.05  -0.26    -0.04    0.10    0.33      0.04      -0.03
## VR_adj_pump    0.24  -0.25    -0.07    0.31    0.17      0.40       0.26
## CB_adj_pump   -0.15  -0.17    -0.10   -0.01    0.09      0.25       0.14
## VR_adj_pump_mean  0.24  -0.25    -0.07    0.31    0.17      0.40       0.26
## CB_adj_pump_mean -0.15  -0.17    -0.10   -0.01    0.09      0.25       0.14
##                 DrugTotal CigarettesTotal SexTotal StealTotal GABSTotal
## Age                  0.08          -0.14     0.10       0.01     -0.05
## Gender              -0.08           0.18    -0.01       0.15     -0.26
## BISTotal             0.11           0.10     0.09       0.26     -0.04
## EVTotal              0.18           0.03     0.08       0.18      0.10
## BCTotal             -0.11           0.00    -0.24      -0.20      0.33
## BSSSTotal            0.32           0.31     0.49       0.30      0.04
## AUDITTotal           0.24           0.13     0.35       0.28     -0.03
## DrugTotal            1.00           0.54     0.24       0.39     -0.20
## CigarettesTotal      0.54           1.00     0.22       0.48      0.01
## SexTotal             0.24           0.22     1.00       0.15     -0.15
## StealTotal           0.39           0.48     0.15       1.00     -0.20
## GABSTotal           -0.20           0.01    -0.15      -0.20      1.00
## VR_adj_pump          0.11          -0.01     0.33       0.13      0.14
## CB_adj_pump          0.04           0.06    -0.05      -0.04      0.23
## VR_adj_pump_mean     0.11          -0.01     0.33       0.13      0.14
## CB_adj_pump_mean     0.04           0.06    -0.05      -0.04      0.23
##                 VR_adj_pump CB_adj_pump VR_adj_pump_mean CB_adj_pump_mean
## Age                    0.24       -0.15            0.24           -0.15
```

```
## Gender              -0.25      -0.17          -0.25          -0.17
## BISTotal            -0.07      -0.10          -0.07          -0.10
## EVTotal              0.31      -0.01           0.31          -0.01
## BCTotal              0.17       0.09           0.17           0.09
## BSSSTotal            0.40       0.25           0.40           0.25
## AUDITTotal           0.26       0.14           0.26           0.14
## DrugTotal            0.11       0.04           0.11           0.04
## CigarettesTotal     -0.01       0.06          -0.01           0.06
## SexTotal             0.33      -0.05           0.33          -0.05
## StealTotal           0.13      -0.04           0.13          -0.04
## GABSTotal            0.14       0.23           0.14           0.23
## VR_adj_pump          1.00       0.44           1.00           0.44
## CB_adj_pump          0.44       1.00           0.44           1.00
## VR_adj_pump_mean     1.00       0.44           1.00           0.44
## CB_adj_pump_mean     0.44       1.00           0.44           1.00
##
## n= 48
##
##
## P
##                Age    Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
## Age                 0.0000 0.7649   0.2926  0.6281  0.5223    0.0861
## Gender         0.0000       0.1067   0.0429  0.2666  0.1921    0.9078
## BISTotal       0.7649 0.1067         0.9506  0.0523  0.1602    0.0232
## EVTotal        0.2926 0.0429 0.9506          0.2872  0.0041    0.3707
## BCTotal        0.6281 0.2666 0.0523   0.2872         0.9363    0.0247
## BSSSTotal      0.5223 0.1921 0.1602   0.0041  0.9363           0.0019
## AUDITTotal     0.0861 0.9078 0.0232   0.3707  0.0247  0.0019
## DrugTotal      0.5688 0.5885 0.4454   0.2088  0.4386  0.0250    0.1037
## CigarettesTotal  0.3484 0.2117 0.5199   0.8470  0.9733  0.0321    0.3700
## SexTotal       0.5205 0.9687 0.5425   0.5910  0.0994  0.0004    0.0155
## StealTotal     0.9579 0.3039 0.0800   0.2134  0.1700  0.0417    0.0522
## GABSTotal      0.7419 0.0792 0.7709   0.4981  0.0211  0.7827    0.8324
## VR_adj_pump    0.0961 0.0905 0.6501   0.0301  0.2540  0.0051    0.0744
## CB_adj_pump    0.3046 0.2551 0.4825   0.9444  0.5297  0.0897    0.3559
## VR_adj_pump_mean 0.0961 0.0905 0.6501   0.0301  0.2540  0.0051    0.0744
## CB_adj_pump_mean 0.3046 0.2551 0.4825   0.9444  0.5297  0.0897    0.3559
##                DrugTotal CigarettesTotal SexTotal StealTotal GABSTotal
## Age            0.5688    0.3484          0.5205   0.9579     0.7419
## Gender         0.5885    0.2117          0.9687   0.3039     0.0792
## BISTotal       0.4454    0.5199          0.5425   0.0800     0.7709
## EVTotal        0.2088    0.8470          0.5910   0.2134     0.4981
## BCTotal        0.4386    0.9733          0.0994   0.1700     0.0211
## BSSSTotal      0.0250    0.0321          0.0004   0.0417     0.7827
## AUDITTotal     0.1037    0.3700          0.0155   0.0522     0.8324
## DrugTotal                0.0000          0.0989   0.0055     0.1804
## CigarettesTotal  0.0000                  0.1273   0.0005     0.9643
## SexTotal       0.0989    0.1273                   0.3151     0.2973
## StealTotal     0.0055    0.0005          0.3151             0.1816
## GABSTotal      0.1804    0.9643          0.2973   0.1816
## VR_adj_pump    0.4421    0.9525          0.0215   0.3678     0.3435
## CB_adj_pump    0.7869    0.6983          0.7296   0.7626     0.1083
## VR_adj_pump_mean 0.4421    0.9525          0.0215   0.3678     0.3435
## CB_adj_pump_mean 0.7869    0.6983          0.7296   0.7626     0.1083
##                VR_adj_pump CB_adj_pump VR_adj_pump_mean CB_adj_pump_mean
```

```
## Age            0.0961     0.3046     0.0961          0.3046
## Gender         0.0905     0.2551     0.0905          0.2551
## BISTotal       0.6501     0.4825     0.6501          0.4825
## EVTotal        0.0301     0.9444     0.0301          0.9444
## BCTotal        0.2540     0.5297     0.2540          0.5297
## BSSSTotal      0.0051     0.0897     0.0051          0.0897
## AUDITTotal     0.0744     0.3559     0.0744          0.3559
## DrugTotal      0.4421     0.7869     0.4421          0.7869
## CigarettesTotal 0.9525    0.6983     0.9525          0.6983
## SexTotal       0.0215     0.7296     0.0215          0.7296
## StealTotal     0.3678     0.7626     0.3678          0.7626
## GABSTotal      0.3435     0.1083     0.3435          0.1083
## VR_adj_pump              0.0017     0.0000          0.0017
## CB_adj_pump    0.0017               0.0017          0.0000
## VR_adj_pump_mean 0.0000   0.0017                     0.0017
## CB_adj_pump_mean 0.0017   0.0000     0.0017
```

Absolute pump datasets

```
abs <-
  df %>%
  select("Age", "Gender", "BISTotal", "EVTotal", "BCTotal", "BSSSTotal", "AUDITTotal", "DrugTo
tal", "CigarettesTotal", "SexTotal", "StealTotal","GABSTotal","VRlog_count_inflate_exp_1","VRlog
_count_inflate_exp_2","VRlog_count_inflate_exp_3","VRlog_count_inflate_exp_4","VRlog_count_i
nflate_exp_5","VRlog_count_inflate_exp_6","VRlog_count_inflate_exp_7","VRlog_count_inflate_e
xp_8","VRlog_count_inflate_exp_9","VRlog_count_inflate_exp_10","VRlog_count_inflate_exp_11"
,"VRlog_count_inflate_exp_12","VRlog_count_inflate_exp_13","VRlog_count_inflate_exp_14","VR
log_count_inflate_exp_15","VRlog_count_inflate_exp_16","VRlog_count_inflate_exp_17","VRlog_
count_inflate_exp_18","VRlog_count_inflate_exp_19","VRlog_count_inflate_exp_20","VRlog_coun
t_inflate_exp_21","VRlog_count_inflate_exp_22","VRlog_count_inflate_exp_23","VRlog_count_inf
late_exp_24","VRlog_count_inflate_exp_25","VRlog_count_inflate_exp_26","VRlog_count_inflate_
exp_27","VRlog_count_inflate_exp_28","VRlog_count_inflate_exp_29","VRlog_count_inflate_exp_
30", "CBlog_count_inflate_exp_1","CBlog_count_inflate_exp_2","CBlog_count_inflate_exp_3","CB
log_count_inflate_exp_4","CBlog_count_inflate_exp_5","CBlog_count_inflate_exp_6","CBlog_coun
t_inflate_exp_7","CBlog_count_inflate_exp_8","CBlog_count_inflate_exp_9","CBlog_count_inflate
_exp_10","CBlog_count_inflate_exp_11","CBlog_count_inflate_exp_12","CBlog_count_inflate_exp
_13","CBlog_count_inflate_exp_14","CBlog_count_inflate_exp_15","CBlog_count_inflate_exp_16",
"CBlog_count_inflate_exp_17","CBlog_count_inflate_exp_18","CBlog_count_inflate_exp_19","CBl
og_count_inflate_exp_20","CBlog_count_inflate_exp_21","CBlog_count_inflate_exp_22","CBlog_c
ount_inflate_exp_23","CBlog_count_inflate_exp_24","CBlog_count_inflate_exp_25","CBlog_count_
inflate_exp_26","CBlog_count_inflate_exp_27","CBlog_count_inflate_exp_28","CBlog_count_inflat
e_exp_29","CBlog_count_inflate_exp_30", "CBlog_exploded_exp_1","CBlog_exploded_exp_2","C
Blog_exploded_exp_3","CBlog_exploded_exp_4","CBlog_exploded_exp_5","CBlog_exploded_exp_
6","CBlog_exploded_exp_7","CBlog_exploded_exp_8","CBlog_exploded_exp_9","CBlog_exploded
_exp_10","CBlog_exploded_exp_11","CBlog_exploded_exp_12","CBlog_exploded_exp_13","CBlog
_exploded_exp_14","CBlog_exploded_exp_15","CBlog_exploded_exp_16","CBlog_exploded_exp_1
7","CBlog_exploded_exp_18","CBlog_exploded_exp_19","CBlog_exploded_exp_20","CBlog_explo
ded_exp_21","CBlog_exploded_exp_22","CBlog_exploded_exp_23","CBlog_exploded_exp_24","C
Blog_exploded_exp_25","CBlog_exploded_exp_26","CBlog_exploded_exp_27","CBlog_exploded_e
xp_28","CBlog_exploded_exp_29","CBlog_exploded_exp_30","VRlog_exploded_exp_1","VRlog_e
xploded_exp_2","VRlog_exploded_exp_3","VRlog_exploded_exp_4","VRlog_exploded_exp_5","V
Rlog_exploded_exp_6","VRlog_exploded_exp_7","VRlog_exploded_exp_8","VRlog_exploded_exp
_9","VRlog_exploded_exp_10","VRlog_exploded_exp_11","VRlog_exploded_exp_12","VRlog_expl
```

```
oded_exp_13","VRlog_exploded_exp_14","VRlog_exploded_exp_15","VRlog_exploded_exp_16","
VRlog_exploded_exp_17","VRlog_exploded_exp_18","VRlog_exploded_exp_19","VRlog_exploded
_exp_20","VRlog_exploded_exp_21","VRlog_exploded_exp_22","VRlog_exploded_exp_23","VRlo
g_exploded_exp_24","VRlog_exploded_exp_25","VRlog_exploded_exp_26","VRlog_exploded_exp
_27","VRlog_exploded_exp_28","VRlog_exploded_exp_29","VRlog_exploded_exp_30",)

#absolute Total & average pump for VR
abs$VR_abs_pump <- abs %>%
  select(starts_with("VRlog_count_inflate_exp_")) %>% rowSums()
abs$VR_abs_exp <- abs %>%
  select(starts_with("VRlog_exploded_exp_")) %>% rowSums()
abs$VR_abs_pump_mean <- abs %>%
  select(starts_with("VRlog_count_inflate_exp_")) %>% rowMeans()

#absolute Total pump for CB
abs$CB_abs_pump <- abs %>%
  select(starts_with("CBlog_count_inflate_exp_")) %>% rowSums()
abs$CB_abs_exp <- abs %>%
  select(starts_with("CBlog_exploded_exp_")) %>% rowSums()
abs$CB_abs_pump_mean <- abs %>%
  select(starts_with("CBlog_count_inflate_exp_")) %>% rowMeans()
abs

## # A tibble: 48 × 138
##      Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal DrugTotal
##    <dbl> <chr>     <dbl>   <dbl>   <dbl>     <dbl>     <dbl>     <dbl>
##  1    28 1            29       8      26        23         0         0
##  2    19 1            26      11      18        19         5         0
##  3    25 0            17      11      19        26         5         0
##  4    25 0            28      11      20        32         3         0
##  5    25 0            15      13      26        25         3         0
##  6    23 1            19      10      24        25         5         1
##  7    25 0            22       4      21        20         1         0
##  8    27 1            27       6      15        19         1         1
##  9    26 0            34      13      14        32        12        35
## 10    20 1            42      13      19        38        11         0
## # … with 38 more rows, and 130 more variables: CigarettesTotal <dbl>,
## #   SexTotal <dbl>, StealTotal <dbl>, GABSTotal <dbl>,
## #   VRlog_count_inflate_exp_1 <dbl>, VRlog_count_inflate_exp_2 <dbl>,
## #   VRlog_count_inflate_exp_3 <dbl>, VRlog_count_inflate_exp_4 <dbl>,
## #   VRlog_count_inflate_exp_5 <dbl>, VRlog_count_inflate_exp_6 <dbl>,
## #   VRlog_count_inflate_exp_7 <dbl>, VRlog_count_inflate_exp_8 <dbl>,
## #   VRlog_count_inflate_exp_9 <dbl>, VRlog_count_inflate_exp_10 <dbl>, …
```

Compute MI with 5 times means for df dataset (NAs are in absolute pump columns)

```
library(mice)

##
## Attaching package: 'mice'
```

```
## The following object is masked from 'package:stats':
##
##     filter

## The following objects are masked from 'package:base':
##
##     cbind, rbind

absMI5 = mice(abs,m=5, defaultMethod = c("pmm"))

##
##  iter imp variable
##   1   1  VRlog_count_inflate_exp_1*  VRlog_count_inflate_exp_2*  VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4*  VRlog_count_inflate_exp_6*  VRlog_count_inflate_exp_8*  VRlog_c
ount_inflate_exp_9*  VRlog_count_inflate_exp_10*  VRlog_count_inflate_exp_11*  VRlog_count_i
nflate_exp_13*  VRlog_count_inflate_exp_14*  VRlog_count_inflate_exp_15*  VRlog_count_inflate
_exp_16*  VRlog_count_inflate_exp_18*  VRlog_count_inflate_exp_19*  VRlog_count_inflate_exp
_21*  VRlog_count_inflate_exp_22*  VRlog_count_inflate_exp_23*  VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25*  VRlog_count_inflate_exp_26*  VRlog_count_inflate_exp_29*  VRlo
g_count_inflate_exp_30*  VRlog_exploded_exp_30*  VR_abs_pump*  VR_abs_exp*
##   1   2  VRlog_count_inflate_exp_1*  VRlog_count_inflate_exp_2*  VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4*  VRlog_count_inflate_exp_6*  VRlog_count_inflate_exp_8*  VRlog_c
ount_inflate_exp_9*  VRlog_count_inflate_exp_10*  VRlog_count_inflate_exp_11*  VRlog_count_i
nflate_exp_13*  VRlog_count_inflate_exp_14*  VRlog_count_inflate_exp_15*  VRlog_count_inflate
_exp_16*  VRlog_count_inflate_exp_18*  VRlog_count_inflate_exp_19*  VRlog_count_inflate_exp
_21*  VRlog_count_inflate_exp_22*  VRlog_count_inflate_exp_23*  VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25*  VRlog_count_inflate_exp_26*  VRlog_count_inflate_exp_29*  VRlo
g_count_inflate_exp_30*  VRlog_exploded_exp_30*  VR_abs_pump*  VR_abs_exp*
##   1   3  VRlog_count_inflate_exp_1*  VRlog_count_inflate_exp_2*  VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4*  VRlog_count_inflate_exp_6*  VRlog_count_inflate_exp_8*  VRlog_c
ount_inflate_exp_9*  VRlog_count_inflate_exp_10*  VRlog_count_inflate_exp_11*  VRlog_count_i
nflate_exp_13*  VRlog_count_inflate_exp_14*  VRlog_count_inflate_exp_15*  VRlog_count_inflate
_exp_16*  VRlog_count_inflate_exp_18*  VRlog_count_inflate_exp_19*  VRlog_count_inflate_exp
_21*  VRlog_count_inflate_exp_22*  VRlog_count_inflate_exp_23*  VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25*  VRlog_count_inflate_exp_26*  VRlog_count_inflate_exp_29*  VRlo
g_count_inflate_exp_30*  VRlog_exploded_exp_30*  VR_abs_pump*  VR_abs_exp*
##   1   4  VRlog_count_inflate_exp_1*  VRlog_count_inflate_exp_2*  VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4*  VRlog_count_inflate_exp_6*  VRlog_count_inflate_exp_8*  VRlog_c
ount_inflate_exp_9*  VRlog_count_inflate_exp_10*  VRlog_count_inflate_exp_11*  VRlog_count_i
nflate_exp_13*  VRlog_count_inflate_exp_14*  VRlog_count_inflate_exp_15*  VRlog_count_inflate
_exp_16*  VRlog_count_inflate_exp_18*  VRlog_count_inflate_exp_19*  VRlog_count_inflate_exp
_21*  VRlog_count_inflate_exp_22*  VRlog_count_inflate_exp_23*  VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25*  VRlog_count_inflate_exp_26*  VRlog_count_inflate_exp_29*  VRlo
g_count_inflate_exp_30*  VRlog_exploded_exp_30*  VR_abs_pump*  VR_abs_exp*
##   1   5  VRlog_count_inflate_exp_1*  VRlog_count_inflate_exp_2*  VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4*  VRlog_count_inflate_exp_6*  VRlog_count_inflate_exp_8*  VRlog_c
ount_inflate_exp_9*  VRlog_count_inflate_exp_10*  VRlog_count_inflate_exp_11*  VRlog_count_i
nflate_exp_13*  VRlog_count_inflate_exp_14*  VRlog_count_inflate_exp_15*  VRlog_count_inflate
_exp_16*  VRlog_count_inflate_exp_18*  VRlog_count_inflate_exp_19*  VRlog_count_inflate_exp
_21*  VRlog_count_inflate_exp_22*  VRlog_count_inflate_exp_23*  VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25*  VRlog_count_inflate_exp_26*  VRlog_count_inflate_exp_29*  VRlo
g_count_inflate_exp_30*  VRlog_exploded_exp_30*  VR_abs_pump*  VR_abs_exp*
##   2   1  VRlog_count_inflate_exp_1*  VRlog_count_inflate_exp_2*  VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4*  VRlog_count_inflate_exp_6*  VRlog_count_inflate_exp_8*  VRlog_c
ount_inflate_exp_9*  VRlog_count_inflate_exp_10*  VRlog_count_inflate_exp_11*  VRlog_count_i
```

nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
2 2 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_count_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_inflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
2 3 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_count_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_inflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
2 4 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_count_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_inflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
2 5 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_count_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_inflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
3 1 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_count_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_inflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
3 2 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_count_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_inflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24* VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlog_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
3 3 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3* VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c

```
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  3  4 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  3  5 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  4  1 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  4  2 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  4  3 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  4  4 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  4  5 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
```

```
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  5  1 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  5  2 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  5  3 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  5  4 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*
##  5  5 VRlog_count_inflate_exp_1* VRlog_count_inflate_exp_2* VRlog_count_inflate_exp_3*
VRlog_count_inflate_exp_4* VRlog_count_inflate_exp_6* VRlog_count_inflate_exp_8* VRlog_c
ount_inflate_exp_9* VRlog_count_inflate_exp_10* VRlog_count_inflate_exp_11* VRlog_count_i
nflate_exp_13* VRlog_count_inflate_exp_14* VRlog_count_inflate_exp_15* VRlog_count_inflate
_exp_16* VRlog_count_inflate_exp_18* VRlog_count_inflate_exp_19* VRlog_count_inflate_exp
_21* VRlog_count_inflate_exp_22* VRlog_count_inflate_exp_23* VRlog_count_inflate_exp_24*
VRlog_count_inflate_exp_25* VRlog_count_inflate_exp_26* VRlog_count_inflate_exp_29* VRlo
g_count_inflate_exp_30* VRlog_exploded_exp_30* VR_abs_pump* VR_abs_exp*

## Warning: Number of logged events: 1433
```

Take One of complete dataset of absolute pump after MI

```
d1_abs = complete(absMI5,3)
d1_abs
```

```
##    Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal DrugTotal
## 1   28      1       29       8      26        23          0       0.0
## 2   19      1       26      11      18        19          5       0.0
## 3   25      0       17      11      19        26          5       0.0
## 4   25      0       28      11      20        32          3       0.0
## 5   25      0       15      13      26        25          3       0.0
## 6   23      1       19      10      24        25          5       1.0
## 7   25      0       22       4      21        20          1       0.0
## 8   27      1       27       6      15        19          1       1.0
## 9   26      0       34      13      14        32         12      35.0
## 10  20      1       42      13      19        38         11       0.0
## 11  20      1       18       9      20        32          3       0.0
## 12  18      1       22       7      18        18          5       0.0
## 13  19      1       30       8      15        32         18       0.0
## 14  29      0       19       5      16        18          6       0.0
## 15  19      1       22       9      24        23          1       0.0
## 16  22      1       30       5      23        18          7       0.0
## 17  19      1       29       9      19        36         21       0.0
## 18  20      1       20       8      19        26          9       0.0
## 19  24      0       28      12      21        37          8       7.0
## 20  20      0       17       6      24        25          2       0.0
## 21  26      0       30      13      24        19          5       0.0
## 22  26      1       21       9      24        18          5       0.0
## 23  22      0       21      14      19        31         14       0.2
## 24  20      1       38      10      19        22          5       1.0
## 25  32      0       20      12      28        29          5       0.0
## 26  20      1       21       8      18        16          5       0.0
## 27  19      1       27      11      22        28          5       0.0
## 28  20      1       19      11      21        21          1       0.0
## 29  19      1       36       9      14        24         10       1.0
## 30  18      1       25       9      19        29          7       0.0
## 31  19      0       15      10      29        30          9       9.0
## 32  22      1       36       8      18        27          6       2.0
## 33  21      1       26      12      18        34          7      15.0
## 34  19      1       24      10      23        30          6       2.0
## 35  18      1       22       9      22        33          7       2.0
## 36  19      1       42       7      18        24          6       0.0
## 37  19      1       22       9      20        22         11       0.0
## 38  19      1       24       9      20        26          5       0.0
## 39  24      0       29      10      14        33         21       0.0
## 40  19      1       21       7      20        19          9       0.0
## 41  18      1       13      10      19        20          5       0.0
## 42  23      1       21       8      18        24          4       1.0
## 43  19      1       21      12      18        25          2       0.0
## 44  21      1       25       6      17        27          5       0.0
## 45  18      1       43       6      20        28          6       0.0
## 46  21      1       24      11      16        23          8       0.0
## 47  19      1       29      11      24        27          7       0.0
## 48  24      1       30      11      22        25          5       0.0
```

```
##    CigarettesTotal SexTotal StealTotal GABSTotal VRlog_count_inflate_exp_1
## 1               0        0         0        7.0                        46
## 2               0        0         0        6.2                        11
## 3               0        0         0        8.4                        23
## 4               0        0         0        5.2                        16
## 5               0        0         0        9.0                        50
## 6               0        0         1        3.2                        20
## 7               0        0         0        6.6                        30
## 8               0        1         0        4.6                        17
## 9               0        1         1        5.6                        22
## 10              0        2         3        4.8                        21
## 11              0        1         0        1.4                        10
## 12              0        0         0        5.6                         6
## 13              0        1         0        6.2                        24
## 14              0        0         0        4.8                         4
## 15              0        0         0        7.0                        14
## 16              0        0         0        7.2                        18
## 17              0        2         0        8.6                        17
## 18              0        2         0        1.2                        23
## 19              0        0         0        4.4                        56
## 20              0        1         0        8.2                        21
## 21              0        0         0        7.6                        10
## 22              0        0         0        6.6                         4
## 23              0        2         0        7.4                        35
## 24              0        1         0        2.4                         4
## 25              0        1         0        6.0                        29
## 26              0        0         0        4.6                        12
## 27              0        0         0        7.8                         9
## 28              0        0         0        6.4                        25
## 29              0        0         0        5.4                         5
## 30              0        0         0        6.8                        18
## 31              0        0         0        6.2                        22
## 32              2        0         1        4.4                         6
## 33              1        3         1        7.8                        21
## 34              2        1         0        6.6                        30
## 35              4        1         3        4.8                         8
## 36              0        0         1        6.0                         6
## 37              0        0         0        6.0                         9
## 38              0        0         0        5.4                        28
## 39              0        3         0        5.6                        26
## 40              0        1         0        2.6                         5
## 41              0        0         0        6.6                         7
## 42              0        1         0        4.4                         1
## 43              0        0         0        1.4                        11
## 44              0        1         0        5.4                         4
## 45              0        0         0        7.0                         8
## 46              0        0         1        4.6                        21
## 47              0        0         0        6.2                         3
## 48              0        1         0        1.0                        20
##    VRlog_count_inflate_exp_2 VRlog_count_inflate_exp_3
## 1                         54                        30
## 2                         16                        12
## 3                          9                        17
## 4                          7                        16
## 5                         51                        52
```

```
## 6                   16                   19
## 7                   15                   20
## 8                   15                   23
## 9                   43                   21
## 10                  29                   32
## 11                  12                   13
## 12                   5                    8
## 13                  25                   16
## 14                   6                    7
## 15                  18                   14
## 16                  19                   18
## 17                  34                   46
## 18                  38                    1
## 19                  54                   12
## 20                  34                   12
## 21                  10                   10
## 22                   5                    5
## 23                   1                   39
## 24                   7                    7
## 25                  43                   33
## 26                   3                    9
## 27                  13                   15
## 28                  30                   30
## 29                   5                    6
## 30                  35                   33
## 31                   8                   15
## 32                   2                    6
## 33                  26                   31
## 34                   5                   24
## 35                  13                   17
## 36                   6                    8
## 37                  11                   19
## 38                  16                   16
## 39                  15                   18
## 40                   5                    4
## 41                   9                   10
## 42                  23                   20
## 43                  14                    4
## 44                  18                   21
## 45                  15                    6
## 46                  19                   29
## 47                  11                   19
## 48                   5                   18
##    VRlog_count_inflate_exp_4 VRlog_count_inflate_exp_5
## 1                   18                    4
## 2                   15                    7
## 3                   35                   41
## 4                    1                   14
## 5                   50                    8
## 6                    7                    7
## 7                    5                   18
## 8                   16                   19
## 9                   15                   40
## 10                  44                   54
## 11                  11                   14
```

```
## 12                  9                  6
## 13                 22                 21
## 14                  8                  8
## 15                 15                 17
## 16                 22                  1
## 17                 53                 49
## 18                 37                 34
## 19                 18                 20
## 20                  3                 38
## 21                 11                 15
## 22                  6                  6
## 23                 59                 44
## 24                  8                  8
## 25                 45                 52
## 26                  4                 13
## 27                 22                 11
## 28                 14                 21
## 29                  4                  4
## 30                 30                 20
## 31                 10                 18
## 32                  7                 11
## 33                 17                 14
## 34                 24                 26
## 35                 20                 28
## 36                 10                  8
## 37                 32                 21
## 38                 10                 20
## 39                 17                 18
## 40                  5                  5
## 41                 10                 11
## 42                 25                 25
## 43                  9                  7
## 44                 19                 17
## 45                 10                 10
## 46                 33                 37
## 47                 19                 16
## 48                 19                 23
##    VRlog_count_inflate_exp_6 VRlog_count_inflate_exp_7
## 1                          6                 33
## 2                         10                 12
## 3                         41                 46
## 4                         17                 15
## 5                         53                 54
## 6                          4                 15
## 7                         22                  3
## 8                         17                 24
## 9                         37                 23
## 10                        53                 44
## 11                        10                 13
## 12                         7                  8
## 13                        25                 19
## 14                         9                 11
## 15                        20                  9
## 16                        18                 22
## 17                        27                 33
```

```
## 18                  53                  37
## 19                   6                  18
## 20                  39                  38
## 21                  18                  18
## 22                   4                   6
## 23                  53                  31
## 24                  10                  13
## 25                  68                  41
## 26                  18                  13
## 27                  16                  19
## 28                  30                  25
## 29                  12                   6
## 30                  25                  35
## 31                  20                  20
## 32                  51                  12
## 33                  12                  14
## 34                  23                   8
## 35                  34                  18
## 36                   7                   1
## 37                  53                  15
## 38                  22                  19
## 39                  26                  33
## 40                   6                   5
## 41                  11                  10
## 42                  25                  30
## 43                  13                   8
## 44                  32                   5
## 45                   8                  15
## 46                  51                  28
## 47                  17                  21
## 48                  26                  27
##    VRlog_count_inflate_exp_8 VRlog_count_inflate_exp_9
## 1                         36                        42
## 2                         13                        20
## 3                         18                        37
## 4                         59                        36
## 5                         59                        55
## 6                         22                        23
## 7                         44                         4
## 8                         25                        23
## 9                          5                        24
## 10                        44                        28
## 11                        16                        13
## 12                         7                         6
## 13                        26                        23
## 14                        14                        16
## 15                        20                        25
## 16                        14                        18
## 17                        23                        27
## 18                        38                        20
## 19                        36                        36
## 20                        44                        36
## 21                        24                        21
## 22                         6                         7
## 23                        32                        30
```

```
## 24                  8                  13
## 25                 47                  26
## 26                  6                   9
## 27                 23                  21
## 28                 20                  29
## 29                  7                   6
## 30                 28                  24
## 31                 20                  34
## 32                 12                  12
## 33                 14                   6
## 34                 59                   5
## 35                 24                  19
## 36                 10                  12
## 37                 20                  34
## 38                 59                  19
## 39                 35                  43
## 40                  5                   6
## 41                  8                   8
## 42                 14                  54
## 43                  6                   7
## 44                 23                  24
## 45                 15                  14
## 46                 16                  61
## 47                 21                  26
## 48                 23                  25
##    VRlog_count_inflate_exp_10 VRlog_count_inflate_exp_11
## 1                  40                  24
## 2                   8                  15
## 3                  52                   7
## 4                  18                  17
## 5                  11                  55
## 6                   4                   9
## 7                   4                  20
## 8                  20                  18
## 9                  27                  47
## 10                 50                  33
## 11                 15                  13
## 12                  3                   6
## 13                 29                  18
## 14                 20                  14
## 15                 11                  12
## 16                 18                  18
## 17                 20                  26
## 18                 31                  53
## 19                 48                  41
## 20                 44                  38
## 21                 17                   6
## 22                  6                   2
## 23                 33                  36
## 24                 13                  13
## 25                 27                   8
## 26                 13                  14
## 27                 23                  26
## 28                 30                  23
## 29                  6                   6
```

```
## 30                      28                      40
## 31                      19                      18
## 32                      15                      15
## 33                      13                      11
## 34                      13                      21
## 35                      23                      20
## 36                      13                       7
## 37                      40                      39
## 38                      26                      30
## 39                      30                      33
## 40                       4                       4
## 41                       8                       8
## 42                      21                      25
## 43                       5                       6
## 44                      23                      25
## 45                      17                      14
## 46                      65                      16
## 47                      28                      26
## 48                      20                      25
##    VRlog_count_inflate_exp_12 VRlog_count_inflate_exp_13
## 1                       29                      32
## 2                       15                      20
## 3                       31                      55
## 4                       17                      13
## 5                       21                       2
## 6                       60                      38
## 7                       25                      15
## 8                       19                      26
## 9                       38                      35
## 10                      21                      55
## 11                      15                      15
## 12                       7                       8
## 13                      25                      20
## 14                      10                      12
## 15                      12                      14
## 16                      19                      21
## 17                      32                      31
## 18                      28                      20
## 19                      47                      43
## 20                       1                      36
## 21                      20                      15
## 22                       7                       7
## 23                      40                      40
## 24                      10                      12
## 25                      21                      20
## 26                      19                      18
## 27                      44                      49
## 28                      30                      30
## 29                       7                       9
## 30                       9                      13
## 31                      22                      31
## 32                      15                      16
## 33                      11                      13
## 34                      21                      21
## 35                      32                      42
```

```
## 36                   6                   6
## 37                  25                  46
## 38                  39                  30
## 39                  56                  11
## 40                   7                   6
## 41                   9                   9
## 42                  14                  25
## 43                   6                   8
## 44                  30                  33
## 45                  20                   3
## 46                  25                  21
## 47                  29                   9
## 48                  21                  20
##    VRlog_count_inflate_exp_14 VRlog_count_inflate_exp_15
## 1                   39                  44
## 2                   16                  18
## 3                   64                  36
## 4                    6                  12
## 5                   40                  13
## 6                   36                  46
## 7                   19                  19
## 8                   23                  24
## 9                   34                  22
## 10                  65                  21
## 11                  15                  13
## 12                   9                  10
## 13                  21                  28
## 14                  14                  18
## 15                  65                  18
## 16                  17                   7
## 17                  15                  23
## 18                  30                  52
## 19                  40                  31
## 20                  36                  39
## 21                   2                  15
## 22                   8                   8
## 23                  26                  44
## 24                  12                  11
## 25                  48                  26
## 26                  26                  23
## 27                   7                   6
## 28                  30                  20
## 29                   6                   8
## 30                   7                  16
## 31                  25                  20
## 32                  21                   4
## 33                  14                  13
## 34                  21                  25
## 35                  40                  29
## 36                  42                   4
## 37                  34                  11
## 38                  26                  36
## 39                  14                  28
## 40                   5                   4
## 41                  10                  10
```

```
## 42                   25                    2
## 43                    8                    8
## 44                   42                   32
## 45                    3                   10
## 46                    1                   37
## 47                    2                   20
## 48                   24                   16
##    VRlog_count_inflate_exp_16 VRlog_count_inflate_exp_17
## 1                    5                   45
## 2                   18                   18
## 3                   11                   39
## 4                   12                   11
## 5                   30                   40
## 6                   14                   20
## 7                   20                   19
## 8                   24                   26
## 9                   37                   33
## 10                  43                   30
## 11                  17                   16
## 12                   8                    8
## 13                  22                   25
## 14                  18                   22
## 15                  12                   10
## 16                  13                    7
## 17                  32                   32
## 18                  28                   29
## 19                  19                   26
## 20                  38                   40
## 21                   7                   15
## 22                   9                    9
## 23                  33                   15
## 24                  14                   14
## 25                   7                   22
## 26                  24                   17
## 27                  14                   20
## 28                  28                   20
## 29                   5                    6
## 30                   8                    6
## 31                  23                   27
## 32                   5                   15
## 33                  16                   17
## 34                  17                   18
## 35                  23                    3
## 36                   4                    4
## 37                  64                   36
## 38                  29                   22
## 39                  35                   37
## 40                   5                    4
## 41                  11                   11
## 42                  17                   25
## 43                   9                    9
## 44                  42                   17
## 45                   2                   15
## 46                   6                   37
## 47                  26                   28
```

```
## 48                    15                     8
##    VRlog_count_inflate_exp_18 VRlog_count_inflate_exp_19
## 1                      42                    42
## 2                      20                     5
## 3                       6                    39
## 4                      11                    11
## 5                      17                    30
## 6                      38                    43
## 7                      23                     7
## 8                      27                    27
## 9                      32                    31
## 10                     55                    53
## 11                     15                    18
## 12                     12                    53
## 13                     22                    26
## 14                     21                    24
## 15                     10                     7
## 16                     13                    13
## 17                     38                    31
## 18                     21                     4
## 19                     42                    33
## 20                     35                    41
## 21                     10                    12
## 22                     10                    11
## 23                     36                    50
## 24                     15                    14
## 25                     51                    48
## 26                      7                    13
## 27                     20                    25
## 28                     30                    20
## 29                      7                     9
## 30                     10                    16
## 31                     18                    40
## 32                     29                    31
## 33                     17                    18
## 34                     20                    24
## 35                     15                    17
## 36                      4                     4
## 37                     45                    39
## 38                     28                    18
## 39                     41                    41
## 40                      3                     3
## 41                     10                    11
## 42                     18                    20
## 43                     12                    14
## 44                      9                    18
## 45                     19                    18
## 46                     40                    34
## 47                     27                    30
## 48                     24                    30
##    VRlog_count_inflate_exp_20 VRlog_count_inflate_exp_21
## 1                       5                    41
## 2                      20                    18
## 3                      30                    19
## 4                       8                    11
```

```
## 5                  40                  20
## 6                  45                   6
## 7                  15                   7
## 8                  29                  17
## 9                  34                  35
## 10                 46                  38
## 11                 16                  19
## 12                 13                  10
## 13                 18                  20
## 14                 26                   2
## 15                 20                  16
## 16                 16                  20
## 17                 33                  33
## 18                  9                  11
## 19                 40                  38
## 20                 42                  38
## 21                 13                  38
## 22                 11                  12
## 23                 56                   3
## 24                 16                  14
## 25                 12                  69
## 26                 13                  15
## 27                 23                  12
## 28                 30                  18
## 29                 11                   9
## 30                 12                   9
## 31                 25                  26
## 32                 20                  29
## 33                  7                  16
## 34                 22                  24
## 35                 26                  24
## 36                  4                   4
## 37                 36                  29
## 38                 15                  18
## 39                 43                  12
## 40                  4                   3
## 41                 11                  12
## 42                 40                  16
## 43                  4                  10
## 44                 20                  25
## 45                 22                  16
## 46                 57                  62
## 47                 36                  25
## 48                 31                  25
##    VRlog_count_inflate_exp_22 VRlog_count_inflate_exp_23
## 1                  20                   9
## 2                  20                  20
## 3                   3                   5
## 4                   9                   8
## 5                  25                  30
## 6                  50                  62
## 7                  15                  20
## 8                  24                  27
## 9                  28                  36
## 10                 59                  26
```

```
## 11                      17                      14
## 12                      14                      18
## 13                       3                      22
## 14                      10                      14
## 15                      20                      21
## 16                      19                      20
## 17                      14                      24
## 18                      24                      23
## 19                      50                      46
## 20                      39                      38
## 21                      10                      16
## 22                      12                      13
## 23                      36                      36
## 24                      15                      18
## 25                      40                      61
## 26                      18                      17
## 27                      25                      29
## 28                      31                      25
## 29                      10                      12
## 30                      13                      15
## 31                      41                      26
## 32                      33                      27
## 33                      17                      12
## 34                      24                      26
## 35                       8                      18
## 36                       4                       5
## 37                       1                      46
## 38                      19                      31
## 39                       1                      46
## 40                       3                       5
## 41                      12                      11
## 42                      24                      10
## 43                      13                      11
## 44                      30                      22
## 45                      25                      18
## 46                      48                      48
## 47                      25                      27
## 48                      27                      29
##    VRlog_count_inflate_exp_24 VRlog_count_inflate_exp_25
## 1                       6                      30
## 2                      21                      20
## 3                      36                      40
## 4                      11                       6
## 5                      40                      41
## 6                      44                      49
## 7                       4                       2
## 8                      15                      22
## 9                      17                      20
## 10                     46                      60
## 11                     15                      17
## 12                     16                      10
## 13                     27                      20
## 14                     18                      22
## 15                      2                      25
## 16                     21                      22
```

```
## 17                  25                  5
## 18                  34                 40
## 19                  40                 29
## 20                  42                 38
## 21                  20                 14
## 22                  13                 13
## 23                  94                 81
## 24                  16                 18
## 25                  35                 38
## 26                  20                 22
## 27                  38                 42
## 28                  25                 23
## 29                  11                 16
## 30                  21                 24
## 31                  33                  3
## 32                   4                 33
## 33                  15                 16
## 34                  30                 31
## 35                  34                 26
## 36                   4                  7
## 37                  44                 54
## 38                   8                 52
## 39                  13                 33
## 40                   6                  2
## 41                  13                 13
## 42                  16                  2
## 43                  14                 81
## 44                  30                 15
## 45                  22                 17
## 46                  43                 52
## 47                  20                 22
## 48                  21                 10
##    VRlog_count_inflate_exp_26 VRlog_count_inflate_exp_27
## 1                   36                 34
## 2                   20                 22
## 3                   35                 36
## 4                   12                 10
## 5                   25                 29
## 6                   52                 21
## 7                   17                 15
## 8                   24                 22
## 9                   43                 47
## 10                  61                 61
## 11                   3                 10
## 12                   8                 10
## 13                  28                 23
## 14                  24                 30
## 15                  29                 20
## 16                  26                 32
## 17                   7                  8
## 18                  38                 43
## 19                  46                  3
## 20                  39                 39
## 21                  15                 15
## 22                   5                  3
```

```
## 23                      10                      15
## 24                      20                      18
## 25                      52                      10
## 26                      23                      13
## 27                       7                      14
## 28                      25                       4
## 29                      18                      10
## 30                       3                      19
## 31                      30                      13
## 32                      30                      35
## 33                      30                      16
## 34                      36                      41
## 35                      30                      18
## 36                       6                       6
## 37                      22                      27
## 38                      29                      27
## 39                      15                      29
## 40                       3                       4
## 41                      12                      12
## 42                      10                      16
## 43                      13                      15
## 44                      26                      42
## 45                      19                      22
## 46                      51                      54
## 47                      28                      34
## 48                      22                      25
##    VRlog_count_inflate_exp_28 VRlog_count_inflate_exp_29
## 1                          42                       7
## 2                          22                      24
## 3                          15                      15
## 4                           7                      12
## 5                          34                      40
## 6                          52                      51
## 7                          21                      23
## 8                          21                      24
## 9                          55                      52
## 10                         64                      76
## 11                         12                      14
## 12                         12                      14
## 13                         26                      20
## 14                         35                       1
## 15                         27                      29
## 16                         43                      46
## 17                         28                      32
## 18                         26                      43
## 19                         10                      36
## 20                         35                      45
## 21                         21                      14
## 22                          4                       5
## 23                         45                      51
## 24                         19                      26
## 25                         24                      12
## 26                         17                      28
## 27                          9                      23
## 28                         30                      30
```

```
## 29                    4                    4
## 30                   31                   30
## 31                   31                   27
## 32                   40                   30
## 33                   17                   18
## 34                   43                   39
## 35                   13                   12
## 36                    1                    3
## 37                   33                   17
## 38                   34                   12
## 39                    2                   25
## 40                    4                    6
## 41                   13                   13
## 42                   24                    4
## 43                   16                   11
## 44                   20                   22
## 45                   26                   19
## 46                   60                   58
## 47                   26                   44
## 48                   20                    2
##    VRlog_count_inflate_exp_30 CBlog_count_inflate_exp_1
## 1                          44                        19
## 2                          16                        55
## 3                          23                         8
## 4                           9                        22
## 5                          41                        48
## 6                          41                        88
## 7                          54                        18
## 8                          26                         5
## 9                          54                        75
## 10                         83                         3
## 11                         13                        10
## 12                         16                        10
## 13                         25                        21
## 14                         34                        22
## 15                         29                        39
## 16                         50                        12
## 17                         25                        40
## 18                         45                        16
## 19                         33                        31
## 20                         46                        36
## 21                         19                        10
## 22                          5                        10
## 23                         67                        44
## 24                          9                        21
## 25                         21                         4
## 26                         20                        29
## 27                         20                        44
## 28                         23                         5
## 29                          7                         2
## 30                         21                        27
## 31                         25                        58
## 32                         45                        21
## 33                         19                         5
## 34                         40                         6
```

```
## 35                    67                    13
## 36                     3                    15
## 37                    41                    29
## 38                    25                    23
## 39                    21                    11
## 40                     6                     7
## 41                    13                    16
## 42                    11                    16
## 43                     7                    34
## 44                    22                    66
## 45                    23                    28
## 46                    41                     7
## 47                    50                    17
## 48                    23                    11
##    CBlog_count_inflate_exp_2 CBlog_count_inflate_exp_3
## 1                     22                    12
## 2                     55                    29
## 3                     12                    14
## 4                      5                     9
## 5                     48                    30
## 6                     31                    63
## 7                     18                    15
## 8                      9                    12
## 9                     50                    26
## 10                    30                    31
## 11                    10                    15
## 12                     3                    14
## 13                    14                    24
## 14                    36                    42
## 15                    26                    31
## 16                    20                    13
## 17                    53                    57
## 18                    15                    16
## 19                    32                    38
## 20                    42                    49
## 21                    12                    10
## 22                    12                    13
## 23                    52                    61
## 24                    21                    61
## 25                    10                    10
## 26                    31                    34
## 27                    47                   102
## 28                    10                    10
## 29                    16                    17
## 30                    27                    30
## 31                     7                    43
## 32                    30                    40
## 33                     6                     6
## 34                    29                    33
## 35                    11                    12
## 36                    16                    20
## 37                    34                    10
## 38                    21                    42
## 39                    17                     8
## 40                     8                     9
```

```
## 41                      18                      16
## 42                       8                      10
## 43                      26                      13
## 44                      22                      30
## 45                      25                      31
## 46                       4                       7
## 47                      41                      30
## 48                      15                      14
##    CBlog_count_inflate_exp_4 CBlog_count_inflate_exp_5
## 1                       17                      21
## 2                       15                      20
## 3                       17                       7
## 4                       20                      20
## 5                       45                      13
## 6                       92                      20
## 7                       23                      25
## 8                       12                      11
## 9                       22                      20
## 10                      47                      64
## 11                      14                      16
## 12                      15                      20
## 13                      16                      23
## 14                      52                      60
## 15                      37                      38
## 16                      18                      21
## 17                      68                      75
## 18                      18                      42
## 19                      41                      67
## 20                      43                      40
## 21                      11                      10
## 22                      13                      14
## 23                      70                      65
## 24                      15                      31
## 25                      12                      12
## 26                      35                      41
## 27                      49                      39
## 28                      12                      17
## 29                      21                      19
## 30                      34                      40
## 31                      11                      32
## 32                      45                      40
## 33                       5                       5
## 34                      36                       9
## 35                      24                      19
## 36                      21                      10
## 37                      34                       4
## 38                       4                      43
## 39                      14                      27
## 40                       9                      10
## 41                      12                      17
## 42                      13                      16
## 43                      23                      19
## 44                      47                      56
## 45                      47                      32
## 46                       8                      12
```

```
## 47                    22                    5
## 48                    15                   15
##    CBlog_count_inflate_exp_6 CBlog_count_inflate_exp_7
## 1                         24                        35
## 2                          2                        10
## 3                          7                        11
## 4                         21                        21
## 5                         45                        48
## 6                         72                        41
## 7                         23                        22
## 8                         13                        11
## 9                         23                        62
## 10                        69                        62
## 11                        15                        15
## 12                        24                        25
## 13                        16                        21
## 14                        17                        62
## 15                        18                        28
## 16                        26                        17
## 17                        81                        94
## 18                        23                        49
## 19                        48                        28
## 20                        34                        38
## 21                        11                        10
## 22                        13                        11
## 23                        71                        38
## 24                        30                         1
## 25                        15                        16
## 26                        44                         0
## 27                        13                        11
## 28                         9                        12
## 29                        22                         4
## 30                        49                        55
## 31                        33                        16
## 32                        49                        40
## 33                         6                         6
## 34                        35                        36
## 35                        25                        32
## 36                        15                         8
## 37                        30                         7
## 38                        12                        44
## 39                        26                        42
## 40                         9                        11
## 41                        14                        17
## 42                        16                        17
## 43                        13                        11
## 44                        56                        42
## 45                        37                        38
## 46                        21                        31
## 47                        11                        13
## 48                        15                        16
##    CBlog_count_inflate_exp_8 CBlog_count_inflate_exp_9
## 1                         12                        17
## 2                         15                        25
## 3                         11                        13
```

```
## 4                 22                 22
## 5                  5                 48
## 6                 58                 51
## 7                 24                 16
## 8                 19                 17
## 9                 62                 20
## 10                57                 22
## 11                15                 20
## 12                18                 29
## 13                25                 17
## 14                12                 28
## 15                17                 25
## 16                26                 27
## 17                97                 75
## 18                11                 20
## 19                35                 28
## 20                40                 42
## 21                12                 12
## 22                 7                  7
## 23                39                 38
## 24                27                 29
## 25                 4                 10
## 26                40                 45
## 27                 9                 18
## 28                13                 23
## 29                 5                 14
## 30                52                 41
## 31                46                  4
## 32                35                 25
## 33                 7                  8
## 34                37                 40
## 35                37                 36
## 36                 6                 10
## 37                16                 22
## 38                57                 68
## 39                57                 60
## 40                12                 12
## 41                13                 12
## 42                17                 19
## 43                18                 16
## 44                27                 27
## 45                45                 42
## 46                13                 22
## 47                 4                 16
## 48                15                 16
##    CBlog_count_inflate_exp_10 CBlog_count_inflate_exp_11
## 1                  13                  9
## 2                  30                 40
## 3                  13                 18
## 4                  21                 22
## 5                  31                 45
## 6                  90                 71
## 7                  24                 16
## 8                  19                 19
## 9                  12                 65
```

```
## 10                  42                  51
## 11                   4                  19
## 12                  25                  25
## 13                  25                  17
## 14                  24                  34
## 15                  31                  20
## 16                  30                  30
## 17                  44                   4
## 18                   7                  64
## 19                  17                  19
## 20                  38                  35
## 21                  10                  12
## 22                   8                  10
## 23                  55                  52
## 24                  18                  27
## 25                  15                  12
## 26                  50                  46
## 27                  25                  34
## 28                  18                  20
## 29                  17                  16
## 30                   1                  19
## 31                  45                  46
## 32                  20                  12
## 33                   9                   9
## 34                  38                  36
## 35                  10                  20
## 36                  12                   8
## 37                  24                  45
## 38                  32                  33
## 39                  29                   5
## 40                  14                  16
## 41                  13                  14
## 42                  18                  17
## 43                  12                  20
## 44                  36                  33
## 45                  47                  53
## 46                  24                  33
## 47                  24                  30
## 48                  15                   2
##    CBlog_count_inflate_exp_12 CBlog_count_inflate_exp_13
## 1                   15                  10
## 2                   35                  40
## 3                   20                  24
## 4                   21                  23
## 5                   48                  49
## 6                   81                  67
## 7                   15                  19
## 8                   23                  12
## 9                   70                  15
## 10                  37                  34
## 11                  14                  17
## 12                  22                  15
## 13                  21                  21
## 14                  40                  52
## 15                  30                  18
```

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## 16                  29                  30
## 17                  33                  20
## 18                   5                  11
## 19                  20                  29
## 20                  34                  33
## 21                  10                  10
## 22                   9                   8
## 23                  57                  14
## 24                  29                  31
## 25                  20                  20
## 26                  58                  48
## 27                  15                  21
## 28                  25                  30
## 29                  17                  16
## 30                  30                  42
## 31                   5                  40
## 32                  10                   0
## 33                   8                  10
## 34                  36                  35
## 35                  20                  30
## 36                  12                  10
## 37                  17                   9
## 38                  26                  25
## 39                  16                  25
## 40                  14                  14
## 41                  16                  16
## 42                  16                  19
## 43                  19                  24
## 44                  29                  24
## 45                  40                  51
## 46                  56                  28
## 47                  26                  33
## 48                  13                  14
##    CBlog_count_inflate_exp_14 CBlog_count_inflate_exp_15
## 1                   15                  18
## 2                   40                  40
## 3                   25                  27
## 4                    7                  21
## 5                   50                  55
## 6                   25                  34
## 7                   25                  30
## 8                   16                  15
## 9                    8                  58
## 10                  37                  30
## 11                  17                  17
## 12                   6                  10
## 13                  25                  29
## 14                  24                  10
## 15                  38                  31
## 16                  32                  39
## 17                  17                  19
## 18                  10                  11
## 19                  36                  35
## 20                  33                  41
## 21                  10                  12
```

```
## 22                 11                 13
## 23                 60                  2
## 24                 29                 35
## 25                 12                 10
## 26                 13                 16
## 27                 26                 35
## 28                 25                 40
## 29                 13                 22
## 30                 35                 29
## 31                  3                 49
## 32                  8                 11
## 33                 10                 10
## 34                  7                 43
## 35                 22                 17
## 36                  8                 10
## 37                 40                 40
## 38                 39                 50
## 39                 14                 20
## 40                 18                 19
## 41                 16                 16
## 42                 20                 19
## 43                 20                 21
## 44                 32                 13
## 45                 55                 61
## 46                  1                 36
## 47                 11                 20
## 48                 15                 15
##    CBlog_count_inflate_exp_16 CBlog_count_inflate_exp_17
## 1                   9                  8
## 2                  13                 10
## 3                  17                 26
## 4                  10                 20
## 5                  60                 51
## 6                  15                 44
## 7                  25                 25
## 8                  14                 13
## 9                  65                 32
## 10                 53                 37
## 11                 12                 20
## 12                 25                 30
## 13                 13                 24
## 14                 50                 64
## 15                 37                 38
## 16                 35                 10
## 17                 33                 43
## 18                  9                  8
## 19                 41                  3
## 20                  5                 30
## 21                 14                 11
## 22                 10                  4
## 23                 51                 47
## 24                 30                 26
## 25                 15                  6
## 26                  6                 23
## 27                 41                 44
```

```
## 28                  14                  48
## 29                  22                  17
## 30                  41                  44
## 31                  25                  31
## 32                  25                  22
## 33                  11                  12
## 34                  45                  48
## 35                  19                  31
## 36                  10                  20
## 37                  31                  60
## 38                  15                  36
## 39                  20                  20
## 40                  19                  18
## 41                   7                  12
## 42                   0                  20
## 43                  23                  24
## 44                  26                  22
## 45                  59                   5
## 46                  37                  41
## 47                  20                  30
## 48                  18                  16
##    CBlog_count_inflate_exp_18 CBlog_count_inflate_exp_19
## 1                  14                  10
## 2                  27                  22
## 3                  27                  33
## 4                  19                  22
## 5                  17                  48
## 6                  49                  60
## 7                  30                  21
## 8                  15                  19
## 9                  84                   1
## 10                  4                  20
## 11                 19                  18
## 12                 30                  42
## 13                 23                  27
## 14                 54                   5
## 15                 22                  27
## 16                 28                  36
## 17                 62                  67
## 18                 12                  26
## 19                 25                  26
## 20                 37                  40
## 21                 10                  12
## 22                  9                   9
## 23                 64                  39
## 24                 20                  21
## 25                 10                   5
## 26                  5                   5
## 27                 29                  31
## 28                 34                  30
## 29                  6                  19
## 30                 27                  29
## 31                 32                  17
## 32                 34                   2
## 33                 13                  15
```

```
## 34                      47                      42
## 35                      24                       9
## 36                      10                      20
## 37                      76                       7
## 38                      49                       8
## 39                      20                      25
## 40                      18                      14
## 41                      14                       9
## 42                      20                      20
## 43                      20                       6
## 44                      29                      40
## 45                      51                      48
## 46                      45                      14
## 47                      15                      39
## 48                      18                      20
##    CBlog_count_inflate_exp_20 CBlog_count_inflate_exp_21
## 1                       13                       7
## 2                       30                      30
## 3                       26                      44
## 4                       23                      24
## 5                       48                      48
## 6                       43                      70
## 7                       37                      32
## 8                       20                      16
## 9                       45                      13
## 10                       0                       6
## 11                      20                      18
## 12                      20                       5
## 13                      18                      26
## 14                      40                      70
## 15                      31                      36
## 16                      21                      31
## 17                      45                      39
## 18                      46                      32
## 19                      20                      23
## 20                      26                      26
## 21                      12                       9
## 22                      11                       9
## 23                      59                      17
## 24                      13                      27
## 25                      10                      25
## 26                       3                      39
## 27                      11                      16
## 28                      35                      39
## 29                       7                       9
## 30                      37                      20
## 31                      30                      15
## 32                      44                      54
## 33                      16                      18
## 34                      17                      29
## 35                      12                      28
## 36                      25                       5
## 37                      17                      63
## 38                      67                      49
## 39                      32                      24
```

```
## 40                      7                      10
## 41                     11                      13
## 42                     20                      20
## 43                     17                      20
## 44                     21                       7
## 45                     40                      40
## 46                     40                      31
## 47                     38                      28
## 48                     20                      20
##    CBlog_count_inflate_exp_22 CBlog_count_inflate_exp_23
## 1                       8                      14
## 2                      35                      30
## 3                      52                      63
## 4                      28                      10
## 5                      50                      19
## 6                      49                      18
## 7                      18                       8
## 8                      15                      19
## 9                      47                      62
## 10                     12                      23
## 11                     24                      26
## 12                      5                      10
## 13                     29                      23
## 14                     26                      17
## 15                     25                      31
## 16                     35                      35
## 17                     48                      59
## 18                     30                      28
## 19                     19                      26
## 20                     33                      32
## 21                     10                      11
## 22                      1                      11
## 23                      3                      40
## 24                     27                      27
## 25                     35                      38
## 26                     19                      26
## 27                     33                      27
## 28                     35                      20
## 29                     13                       4
## 30                      5                      15
## 31                     37                      14
## 32                     32                      42
## 33                     17                      15
## 34                     36                      39
## 35                     17                      22
## 36                     10                      20
## 37                     46                       9
## 38                     81                      59
## 39                     26                      21
## 40                     11                      14
## 41                     13                      16
## 42                     20                      20
## 43                     19                      23
## 44                     14                      20
## 45                     49                      48
```

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## 46                    42                    47
## 47                    29                    21
## 48                    22                    25
##    CBlog_count_inflate_exp_24 CBlog_count_inflate_exp_25
## 1                     19                    19
## 2                     33                    39
## 3                     58                    76
## 4                     14                    22
## 5                     15                    48
## 6                     41                    21
## 7                     15                    25
## 8                     21                    20
## 9                     11                    58
## 10                    11                    15
## 11                    27                    31
## 12                    15                    15
## 13                     2                    27
## 14                    14                    33
## 15                    28                    27
## 16                    17                    20
## 17                    17                    56
## 18                    11                    21
## 19                    32                    27
## 20                    33                    34
## 21                    12                     8
## 22                     7                    10
## 23                    36                    54
## 24                    13                     6
## 25                    15                    20
## 26                    27                    39
## 27                    15                    11
## 28                    20                    19
## 29                    10                    14
## 30                    34                    24
## 31                    43                    13
## 32                    37                    35
## 33                     8                    12
## 34                    26                    36
## 35                    16                    26
## 36                    20                    30
## 37                    29                    71
## 38                    84                    24
## 39                    27                    27
## 40                     8                    10
## 41                    12                    14
## 42                    20                    20
## 43                     1                     6
## 44                    19                    26
## 45                     4                    51
## 46                    46                    53
## 47                    23                    15
## 48                    30                    37
##    CBlog_count_inflate_exp_26 CBlog_count_inflate_exp_27
## 1                     19                    18
## 2                      6                    25
```

```
## 3                  83                  37
## 4                  25                  26
## 5                   3                  48
## 6                  51                  30
## 7                  33                  21
## 8                  21                  17
## 9                  77                  58
## 10                 25                  27
## 11                 36                  22
## 12                  8                  12
## 13                 30                  23
## 14                  2                  40
## 15                  4                  30
## 16                 24                  24
## 17                 40                  38
## 18                 24                  51
## 19                  3                  24
## 20                 34                  33
## 21                 10                  11
## 22                 11                   2
## 23                 62                  33
## 24                 24                   7
## 25                 24                  20
## 26                 38                  39
## 27                 12                  10
## 28                 29                  27
## 29                 15                  13
## 30                 42                  25
## 31                 38                  17
## 32                 41                  30
## 33                 14                  15
## 34                 37                  39
## 35                 34                  19
## 36                 30                  34
## 37                 16                  47
## 38                 34                  22
## 39                 19                  26
## 40                  8                   8
## 41                 15                  17
## 42                 20                  11
## 43                 20                   4
## 44                 25                  29
## 45                 48                  39
## 46                 25                  18
## 47                  2                  25
## 48                 39                  43
##    CBlog_count_inflate_exp_28 CBlog_count_inflate_exp_29
## 1                  11                   6
## 2                  26                  33
## 3                  67                  67
## 4                  24                  24
## 5                   1                   2
## 6                  20                  49
## 7                  31                  14
## 8                  18                  20
```

```
## 9                    19                    44
## 10                   17                    28
## 11                   23                    25
## 12                   16                    20
## 13                   28                    18
## 14                   56                    64
## 15                   34                    39
## 16                   20                    20
## 17                   16                     7
## 18                   21                    75
## 19                   26                    23
## 20                   34                    34
## 21                    9                    10
## 22                    7                     8
## 23                   62                     5
## 24                   25                    25
## 25                   21                    22
## 26                   27                    26
## 27                   15                    21
## 28                   30                    30
## 29                   10                    11
## 30                   50                    30
## 31                   29                    42
## 32                   20                    27
## 33                   16                    15
## 34                   43                    42
## 35                   44                    27
## 36                    6                    22
## 37                   83                    29
## 38                    4                    60
## 39                   30                    38
## 40                    2                     1
## 41                   17                    18
## 42                   16                     8
## 43                    3                     8
## 44                    6                    19
## 45                   41                     8
## 46                   26                     8
## 47                   15                    20
## 48                   46                     6
##    CBlog_count_inflate_exp_30 CBlog_exploded_exp_1 CBlog_exploded_exp_2
## 1                           2                    0                    0
## 2                          29                    0                    0
## 3                          76                    0                    0
## 4                          23                    0                    0
## 5                          11                    0                    0
## 6                          40                    0                    1
## 7                          15                    0                    0
## 8                          17                    1                    0
## 9                          24                    0                    1
## 10                         20                    1                    0
## 11                         27                    0                    0
## 12                          1                    0                    0
## 13                         30                    0                    1
## 14                         56                    0                    0
```

```
## 15                23                1                0
## 16                32                1                1
## 17                39                0                0
## 18                18                0                0
## 19                32                0                0
## 20                46                0                0
## 21                10                0                0
## 22                 9                0                0
## 23                48                0                0
## 24                26                0                0
## 25                19                1                0
## 26                32                0                0
## 27                23                0                0
## 28                35                0                0
## 29                18                1                0
## 30                16                0                0
## 31                26                0                1
## 32                25                0                0
## 33                18                0                0
## 34                48                1                0
## 35                26                0                1
## 36                 1                0                0
## 37                48                0                0
## 38                15                1                0
## 39                44                1                1
## 40                 6                0                0
## 41                14                0                0
## 42                20                0                1
## 43                23                0                1
## 44                25                0                1
## 45                 2                1                0
## 46                14                1                0
## 47                20                1                0
## 48                33                0                0
##    CBlog_exploded_exp_3 CBlog_exploded_exp_4 CBlog_exploded_exp_5
## 1                     1                    0                    0
## 2                     1                    0                    0
## 3                     0                    0                    1
## 4                     0                    0                    0
## 5                     1                    0                    1
## 6                     1                    0                    1
## 7                     0                    0                    0
## 8                     0                    0                    0
## 9                     1                    1                    1
## 10                    0                    0                    0
## 11                    0                    1                    0
## 12                    0                    0                    0
## 13                    0                    1                    1
## 14                    0                    0                    0
## 15                    0                    0                    0
## 16                    0                    0                    0
## 17                    0                    0                    0
## 18                    0                    0                    0
## 19                    0                    0                    0
## 20                    1                    0                    1
```

```
## 21                0                0                0
## 22                0                0                0
## 23                0                0                1
## 24                1                1                0
## 25                0                0                0
## 26                0                0                0
## 27                0                1                0
## 28                0                0                0
## 29                0                0                0
## 30                0                0                0
## 31                0                1                1
## 32                0                0                0
## 33                1                0                0
## 34                0                0                1
## 35                0                0                0
## 36                0                1                0
## 37                1                0                1
## 38                0                1                0
## 39                0                0                0
## 40                0                0                0
## 41                1                0                0
## 42                0                0                0
## 43                0                0                0
## 44                0                0                0
## 45                0                1                0
## 46                0                0                0
## 47                1                1                1
## 48                0                0                0
##    CBlog_exploded_exp_6 CBlog_exploded_exp_7 CBlog_exploded_exp_8
## 1                 0                0                0
## 2                 1                0                0
## 3                 0                0                0
## 4                 0                0                0
## 5                 0                0                1
## 6                 1                1                1
## 7                 0                0                0
## 8                 0                0                0
## 9                 1                0                0
## 10                0                1                0
## 11                0                0                0
## 12                0                0                0
## 13                0                0                0
## 14                1                0                1
## 15                1                0                1
## 16                0                1                0
## 17                0                0                0
## 18                0                0                0
## 19                1                0                1
## 20                0                0                0
## 21                0                0                0
## 22                0                1                0
## 23                0                1                0
## 24                0                1                0
## 25                0                1                1
## 26                0                0                0
```

```
## 27                1                1                0
## 28                1                0                0
## 29                0                0                0
## 30                0                0                1
## 31                0                0                0
## 32                1                0                0
## 33                0                0                0
## 34                0                0                0
## 35                0                0                0
## 36                0                0                0
## 37                0                1                0
## 38                0                0                0
## 39                0                0                0
## 40                0                0                0
## 41                0                0                1
## 42                0                0                0
## 43                1                0                0
## 44                1                0                1
## 45                0                0                0
## 46                0                1                0
## 47                0                1                1
## 48                0                1                0
##    CBlog_exploded_exp_9 CBlog_exploded_exp_10 CBlog_exploded_exp_11
## 1                 0                 0                 0
## 2                 0                 0                 0
## 3                 0                 0                 0
## 4                 0                 0                 0
## 5                 0                 1                 0
## 6                 0                 1                 0
## 7                 0                 1                 0
## 8                 0                 0                 0
## 9                 1                 1                 0
## 10                1                 0                 0
## 11                0                 1                 0
## 12                0                 0                 0
## 13                0                 0                 1
## 14                1                 0                 0
## 15                0                 1                 0
## 16                0                 0                 0
## 17                1                 1                 1
## 18                1                 1                 1
## 19                0                 1                 0
## 20                1                 0                 0
## 21                0                 0                 0
## 22                0                 0                 0
## 23                0                 1                 0
## 24                0                 1                 0
## 25                0                 0                 0
## 26                0                 0                 0
## 27                0                 0                 1
## 28                0                 0                 0
## 29                0                 0                 0
## 30                1                 1                 0
## 31                1                 0                 0
## 32                1                 0                 1
```

```
## 33                    0                    0                    0
## 34                    0                    0                    0
## 35                    1                    0                    0
## 36                    0                    0                    0
## 37                    0                    0                    0
## 38                    0                    1                    0
## 39                    1                    0                    1
## 40                    0                    0                    0
## 41                    0                    0                    0
## 42                    0                    0                    0
## 43                    0                    0                    0
## 44                    0                    0                    0
## 45                    0                    0                    0
## 46                    0                    0                    0
## 47                    0                    0                    0
## 48                    0                    1                    1
##    CBlog_exploded_exp_12 CBlog_exploded_exp_13 CBlog_exploded_exp_14
## 1                     0                    1                    0
## 2                     0                    0                    0
## 3                     0                    0                    0
## 4                     0                    0                    1
## 5                     0                    0                    0
## 6                     0                    0                    1
## 7                     0                    0                    0
## 8                     1                    0                    0
## 9                     0                    1                    1
## 10                    1                    0                    1
## 11                    0                    0                    0
## 12                    0                    0                    1
## 13                    0                    1                    0
## 14                    0                    0                    0
## 15                    0                    1                    0
## 16                    0                    0                    0
## 17                    0                    1                    0
## 18                    1                    0                    1
## 19                    0                    0                    0
## 20                    0                    0                    0
## 21                    0                    0                    0
## 22                    0                    0                    0
## 23                    0                    0                    0
## 24                    0                    0                    0
## 25                    0                    0                    1
## 26                    1                    0                    1
## 27                    0                    0                    0
## 28                    0                    0                    0
## 29                    0                    0                    0
## 30                    0                    0                    1
## 31                    0                    0                    1
## 32                    0                    0                    1
## 33                    0                    0                    0
## 34                    0                    0                    1
## 35                    0                    0                    0
## 36                    0                    0                    0
## 37                    1                    0                    0
## 38                    1                    0                    0
```

```
## 39                  1                  0                  1
## 40                  1                  0                  0
## 41                  0                  0                  0
## 42                  0                  0                  0
## 43                  0                  0                  0
## 44                  1                  0                  0
## 45                  0                  0                  0
## 46                  1                  0                  1
## 47                  0                  0                  1
## 48                  0                  0                  0
##    CBlog_exploded_exp_15 CBlog_exploded_exp_16 CBlog_exploded_exp_17
## 1                      0                     1                     0
## 2                      0                     1                     0
## 3                      0                     1                     0
## 4                      0                     1                     0
## 5                      0                     0                     1
## 6                      1                     1                     0
## 7                      0                     0                     0
## 8                      1                     0                     0
## 9                      1                     0                     1
## 10                     0                     0                     1
## 11                     0                     1                     0
## 12                     0                     0                     0
## 13                     0                     0                     0
## 14                     1                     0                     0
## 15                     0                     0                     0
## 16                     0                     1                     1
## 17                     0                     0                     0
## 18                     0                     1                     0
## 19                     0                     0                     1
## 20                     0                     1                     1
## 21                     0                     0                     1
## 22                     0                     0                     1
## 23                     1                     0                     1
## 24                     0                     0                     1
## 25                     0                     1                     1
## 26                     1                     0                     0
## 27                     0                     0                     1
## 28                     0                     1                     1
## 29                     0                     0                     0
## 30                     0                     0                     1
## 31                     1                     0                     0
## 32                     0                     0                     0
## 33                     0                     0                     0
## 34                     0                     0                     0
## 35                     0                     0                     0
## 36                     0                     0                     0
## 37                     0                     0                     0
## 38                     0                     0                     0
## 39                     0                     0                     0
## 40                     0                     1                     0
## 41                     0                     1                     0
## 42                     0                     0                     0
## 43                     0                     0                     0
## 44                     1                     0                     0
```

```
## 45                    0                    0                    1
## 46                    0                    0                    0
## 47                    0                    0                    0
## 48                    0                    0                    0
##    CBlog_exploded_exp_18 CBlog_exploded_exp_19 CBlog_exploded_exp_20
## 1                     0                    0                    0
## 2                     1                    0                    0
## 3                     0                    0                    0
## 4                     0                    0                    0
## 5                     1                    0                    0
## 6                     0                    0                    1
## 7                     0                    0                    0
## 8                     0                    0                    0
## 9                     1                    1                    1
## 10                    1                    1                    0
## 11                    0                    0                    0
## 12                    0                    0                    1
## 13                    0                    0                    0
## 14                    1                    1                    0
## 15                    0                    0                    0
## 16                    0                    0                    1
## 17                    0                    0                    1
## 18                    0                    0                    0
## 19                    0                    1                    1
## 20                    0                    0                    1
## 21                    0                    0                    0
## 22                    0                    0                    0
## 23                    0                    0                    0
## 24                    0                    0                    1
## 25                    0                    1                    0
## 26                    1                    1                    0
## 27                    0                    0                    1
## 28                    0                    0                    0
## 29                    0                    0                    0
## 30                    0                    0                    1
## 31                    1                    1                    0
## 32                    0                    1                    0
## 33                    0                    0                    0
## 34                    0                    1                    1
## 35                    0                    1                    0
## 36                    0                    0                    0
## 37                    0                    1                    0
## 38                    0                    1                    0
## 39                    0                    0                    0
## 40                    1                    0                    1
## 41                    1                    0                    0
## 42                    0                    0                    0
## 43                    1                    0                    0
## 44                    0                    0                    1
## 45                    1                    1                    0
## 46                    0                    1                    0
## 47                    0                    0                    1
## 48                    0                    0                    0
##    CBlog_exploded_exp_21 CBlog_exploded_exp_22 CBlog_exploded_exp_23
## 1                     0                    0                    0
```

```
## 2                0                0                0
## 3                0                0                0
## 4                0                0                1
## 5                0                0                1
## 6                0                0                0
## 7                0                1                1
## 8                0                0                0
## 9                1                1                0
## 10               1                0                0
## 11               0                0                0
## 12               1                0                0
## 13               0                0                0
## 14               0                1                1
## 15               0                1                0
## 16               0                0                0
## 17               0                0                0
## 18               1                0                1
## 19               0                1                0
## 20               1                0                0
## 21               0                0                0
## 22               0                1                0
## 23               1                1                1
## 24               0                0                0
## 25               0                0                1
## 26               1                0                0
## 27               0                0                1
## 28               0                1                0
## 29               0                1                0
## 30               0                1                0
## 31               1                0                0
## 32               1                0                0
## 33               0                1                0
## 34               0                0                0
## 35               0                0                0
## 36               0                0                0
## 37               0                0                1
## 38               0                0                0
## 39               0                0                1
## 40               0                0                0
## 41               0                0                0
## 42               0                0                0
## 43               0                0                0
## 44               1                0                1
## 45               0                0                0
## 46               0                0                1
## 47               0                0                0
## 48               0                0                0
##    CBlog_exploded_exp_24 CBlog_exploded_exp_25 CBlog_exploded_exp_26
## 1                 0                0                0
## 2                 0                1                1
## 3                 0                0                1
## 4                 1                0                0
## 5                 1                0                1
## 6                 1                0                0
## 7                 0                0                0
```

```
## 8                  0                  0                  0
## 9                  1                  0                  0
## 10                 1                  0                  0
## 11                 0                  0                  1
## 12                 0                  1                  0
## 13                 1                  0                  0
## 14                 1                  0                  1
## 15                 1                  0                  1
## 16                 1                  0                  0
## 17                 1                  1                  0
## 18                 1                  0                  0
## 19                 0                  0                  1
## 20                 0                  0                  0
## 21                 0                  0                  0
## 22                 0                  0                  0
## 23                 0                  0                  0
## 24                 1                  1                  0
## 25                 0                  0                  1
## 26                 0                  0                  0
## 27                 1                  0                  1
## 28                 1                  0                  0
## 29                 0                  0                  0
## 30                 0                  0                  0
## 31                 0                  0                  0
## 32                 0                  0                  0
## 33                 1                  0                  0
## 34                 1                  0                  0
## 35                 0                  0                  0
## 36                 0                  0                  0
## 37                 0                  1                  0
## 38                 0                  1                  0
## 39                 0                  0                  1
## 40                 1                  0                  0
## 41                 0                  0                  0
## 42                 0                  0                  0
## 43                 1                  0                  0
## 44                 0                  0                  0
## 45                 1                  0                  1
## 46                 0                  1                  1
## 47                 1                  0                  0
## 48                 0                  0                  0
##    CBlog_exploded_exp_27 CBlog_exploded_exp_28 CBlog_exploded_exp_29
## 1                  0                  0                  0
## 2                  0                  0                  0
## 3                  1                  0                  1
## 4                  0                  0                  0
## 5                  0                  1                  1
## 6                  1                  0                  0
## 7                  0                  0                  1
## 8                  0                  0                  0
## 9                  1                  1                  1
## 10                 1                  0                  0
## 11                 0                  0                  0
## 12                 0                  0                  0
## 13                 0                  1                  0
```

```
## 14                0                0                1
## 15                0                0                0
## 16                1                0                0
## 17                0                1                1
## 18                0                0                1
## 19                0                1                0
## 20                0                0                0
## 21                0                0                0
## 22                0                0                0
## 23                1                0                1
## 24                1                1                0
## 25                0                0                0
## 26                1                0                0
## 27                0                0                0
## 28                0                0                0
## 29                0                0                0
## 30                0                0                0
## 31                0                1                0
## 32                1                0                1
## 33                0                0                0
## 34                0                0                0
## 35                0                0                0
## 36                0                0                1
## 37                0                0                0
## 38                1                1                0
## 39                0                0                0
## 40                0                0                0
## 41                0                0                0
## 42                0                0                1
## 43                1                0                0
## 44                0                1                0
## 45                0                1                1
## 46                0                1                1
## 47                0                0                0
## 48                0                0                1
##    CBlog_exploded_exp_30 VRlog_exploded_exp_1 VRlog_exploded_exp_2
## 1                  1                0                0
## 2                  0                0                1
## 3                  0                0                1
## 4                  1                1                0
## 5                  1                0                0
## 6                  0                0                0
## 7                  0                0                0
## 8                  0                0                0
## 9                  1                0                0
## 10                 1                0                0
## 11                 0                0                0
## 12                 1                1                0
## 13                 0                0                1
## 14                 1                0                0
## 15                 0                0                0
## 16                 0                0                0
## 17                 0                0                0
## 18                 1                0                0
## 19                 0                0                0
```

```
## 20                0                1                0
## 21                0                0                0
## 22                0                0                0
## 23                0                0                1
## 24                0                1                0
## 25                1                0                0
## 26                0                0                1
## 27                0                0                0
## 28                0                0                0
## 29                0                0                0
## 30                1                0                0
## 31                0                1                1
## 32                0                0                1
## 33                0                0                1
## 34                0                0                1
## 35                0                0                0
## 36                1                0                0
## 37                0                1                0
## 38                0                0                0
## 39                0                1                0
## 40                0                0                0
## 41                0                0                0
## 42                0                1                1
## 43                0                0                0
## 44                0                0                0
## 45                1                0                0
## 46                0                0                0
## 47                0                1                0
## 48                0                0                1
##    VRlog_exploded_exp_3 VRlog_exploded_exp_4 VRlog_exploded_exp_5
## 1                 0                1                1
## 2                 0                0                1
## 3                 0                0                0
## 4                 0                0                0
## 5                 0                0                1
## 6                 0                1                1
## 7                 0                0                0
## 8                 0                0                0
## 9                 1                0                0
## 10                0                0                0
## 11                0                0                0
## 12                0                1                0
## 13                0                0                0
## 14                0                0                0
## 15                0                0                0
## 16                0                0                1
## 17                0                0                1
## 18                1                0                0
## 19                1                1                0
## 20                0                0                1
## 21                0                0                0
## 22                0                0                0
## 23                0                0                1
## 24                0                0                0
## 25                0                0                0
```

```
## 26                    0                    1                    0
## 27                    0                    0                    0
## 28                    0                    1                    0
## 29                    0                    0                    0
## 30                    0                    1                    0
## 31                    1                    0                    0
## 32                    0                    0                    0
## 33                    0                    0                    0
## 34                    0                    0                    0
## 35                    0                    0                    0
## 36                    0                    0                    0
## 37                    0                    0                    1
## 38                    0                    1                    0
## 39                    0                    0                    0
## 40                    0                    0                    0
## 41                    0                    0                    0
## 42                    0                    0                    0
## 43                    1                    0                    0
## 44                    0                    0                    0
## 45                    1                    0                    0
## 46                    0                    1                    0
## 47                    0                    0                    1
## 48                    0                    0                    0
##    VRlog_exploded_exp_6 VRlog_exploded_exp_7 VRlog_exploded_exp_8
## 1                     0                    0                    0
## 2                     1                    0                    0
## 3                     0                    0                    1
## 4                     0                    0                    0
## 5                     0                    0                    0
## 6                     0                    0                    0
## 7                     0                    1                    0
## 8                     0                    0                    0
## 9                     0                    1                    1
## 10                    1                    0                    0
## 11                    0                    0                    0
## 12                    0                    0                    0
## 13                    0                    0                    0
## 14                    0                    0                    0
## 15                    0                    1                    0
## 16                    0                    0                    1
## 17                    0                    0                    1
## 18                    0                    1                    0
## 19                    1                    0                    0
## 20                    0                    0                    0
## 21                    0                    0                    0
## 22                    0                    0                    0
## 23                    0                    0                    1
## 24                    0                    0                    1
## 25                    0                    1                    0
## 26                    0                    0                    1
## 27                    0                    0                    0
## 28                    0                    0                    0
## 29                    0                    0                    0
## 30                    0                    0                    1
## 31                    0                    0                    0
```

```
## 32                  0                   0                   0
## 33                  0                   0                   0
## 34                  0                   1                   0
## 35                  1                   0                   0
## 36                  0                   1                   0
## 37                  0                   0                   0
## 38                  0                   0                   0
## 39                  0                   0                   0
## 40                  0                   0                   0
## 41                  0                   0                   0
## 42                  0                   0                   1
## 43                  0                   0                   0
## 44                  0                   1                   0
## 45                  1                   0                   0
## 46                  0                   1                   1
## 47                  0                   0                   0
## 48                  0                   0                   0
##    VRlog_exploded_exp_9 VRlog_exploded_exp_10 VRlog_exploded_exp_11
## 1                   0                   0                   0
## 2                   0                   1                   0
## 3                   1                   0                   1
## 4                   0                   0                   0
## 5                   0                   1                   1
## 6                   0                   1                   0
## 7                   1                   0                   0
## 8                   0                   0                   0
## 9                   0                   1                   1
## 10                  1                   0                   0
## 11                  0                   0                   0
## 12                  0                   1                   0
## 13                  0                   1                   0
## 14                  0                   0                   1
## 15                  0                   1                   1
## 16                  1                   0                   0
## 17                  1                   0                   0
## 18                  0                   0                   0
## 19                  0                   0                   0
## 20                  0                   0                   0
## 21                  0                   0                   0
## 22                  0                   0                   0
## 23                  0                   0                   0
## 24                  0                   0                   0
## 25                  1                   0                   1
## 26                  0                   0                   0
## 27                  0                   0                   0
## 28                  0                   0                   1
## 29                  0                   0                   0
## 30                  0                   0                   0
## 31                  0                   0                   1
## 32                  0                   0                   0
## 33                  1                   0                   0
## 34                  1                   1                   0
## 35                  0                   0                   0
## 36                  0                   0                   1
## 37                  0                   0                   0
```

```
## 38                  0                  0                  0
## 39                  0                  0                  0
## 40                  0                  0                  0
## 41                  0                  0                  0
## 42                  0                  1                  0
## 43                  1                  0                  0
## 44                  0                  0                  0
## 45                  1                  0                  0
## 46                  0                  0                  1
## 47                  0                  0                  0
## 48                  0                  0                  1
##    VRlog_exploded_exp_12 VRlog_exploded_exp_13 VRlog_exploded_exp_14
## 1                   0                  0                  0
## 2                   0                  0                  0
## 3                   0                  0                  0
## 4                   1                  0                  1
## 5                   1                  1                  0
## 6                   1                  0                  0
## 7                   0                  0                  0
## 8                   0                  0                  0
## 9                   0                  1                  1
## 10                  1                  0                  0
## 11                  0                  0                  0
## 12                  0                  0                  0
## 13                  1                  1                  0
## 14                  0                  0                  0
## 15                  0                  0                  0
## 16                  0                  0                  1
## 17                  0                  0                  1
## 18                  0                  1                  1
## 19                  0                  0                  1
## 20                  0                  0                  0
## 21                  0                  0                  1
## 22                  0                  0                  0
## 23                  0                  0                  1
## 24                  0                  0                  0
## 25                  0                  0                  1
## 26                  0                  0                  0
## 27                  0                  1                  1
## 28                  0                  0                  0
## 29                  0                  0                  0
## 30                  1                  0                  1
## 31                  0                  0                  0
## 32                  0                  0                  0
## 33                  0                  0                  0
## 34                  0                  0                  0
## 35                  0                  0                  0
## 36                  0                  1                  0
## 37                  0                  0                  1
## 38                  0                  1                  0
## 39                  0                  1                  1
## 40                  0                  0                  0
## 41                  0                  0                  0
## 42                  1                  0                  0
## 43                  0                  0                  0
```

```
## 44                  0                  0                  0
## 45                  0                  1                  1
## 46                  1                  0                  1
## 47                  0                  1                  1
## 48                  0                  0                  0
##    VRlog_exploded_exp_15 VRlog_exploded_exp_16 VRlog_exploded_exp_17
## 1                   0                  0                  0
## 2                   0                  0                  0
## 3                   1                  1                  0
## 4                   0                  0                  0
## 5                   1                  0                  0
## 6                   0                  1                  1
## 7                   0                  0                  0
## 8                   0                  0                  0
## 9                   0                  0                  0
## 10                  1                  1                  0
## 11                  0                  0                  0
## 12                  0                  0                  0
## 13                  0                  0                  1
## 14                  0                  0                  1
## 15                  0                  0                  1
## 16                  1                  0                  1
## 17                  0                  0                  0
## 18                  1                  0                  1
## 19                  0                  1                  0
## 20                  0                  0                  0
## 21                  0                  1                  0
## 22                  0                  0                  0
## 23                  0                  1                  1
## 24                  0                  0                  0
## 25                  0                  1                  0
## 26                  0                  1                  0
## 27                  0                  0                  0
## 28                  1                  1                  0
## 29                  0                  0                  0
## 30                  0                  1                  0
## 31                  0                  0                  0
## 32                  1                  0                  0
## 33                  0                  0                  0
## 34                  0                  1                  0
## 35                  0                  1                  1
## 36                  0                  0                  0
## 37                  1                  0                  0
## 38                  0                  0                  1
## 39                  0                  0                  0
## 40                  0                  1                  0
## 41                  0                  0                  0
## 42                  1                  1                  0
## 43                  0                  0                  0
## 44                  0                  1                  1
## 45                  0                  1                  0
## 46                  0                  1                  0
## 47                  0                  0                  0
## 48                  1                  0                  1
##    VRlog_exploded_exp_18 VRlog_exploded_exp_19 VRlog_exploded_exp_20
```

```
## 1                0                1                1
## 2                0                1                0
## 3                1                1                1
## 4                0                0                1
## 5                1                0                0
## 6                0                0                0
## 7                0                1                0
## 8                0                0                0
## 9                1                0                0
## 10               0                1                0
## 11               0                0                0
## 12               0                0                0
## 13               0                1                0
## 14               0                0                0
## 15               0                1                0
## 16               0                0                0
## 17               0                0                0
## 18               0                1                1
## 19               0                0                0
## 20               0                0                1
## 21               0                0                0
## 22               0                0                0
## 23               0                0                0
## 24               0                0                0
## 25               0                0                1
## 26               1                1                0
## 27               0                0                0
## 28               0                0                0
## 29               0                0                0
## 30               0                1                0
## 31               1                0                0
## 32               0                0                1
## 33               0                0                1
## 34               0                0                0
## 35               0                0                0
## 36               0                0                1
## 37               0                0                1
## 38               0                0                0
## 39               0                0                0
## 40               0                0                0
## 41               0                0                0
## 42               1                0                1
## 43               0                0                1
## 44               1                0                0
## 45               0                0                0
## 46               1                0                0
## 47               0                0                1
## 48               0                0                0
##    VRlog_exploded_exp_21 VRlog_exploded_exp_22 VRlog_exploded_exp_23
## 1                0                1                1
## 2                0                0                0
## 3                0                1                0
## 4                0                1                0
## 5                1                0                0
## 6                1                0                1
```

```
## 7                 1                 0                 0
## 8                 1                 0                 0
## 9                 0                 1                 0
## 10                0                 0                 1
## 11                0                 0                 0
## 12                0                 0                 0
## 13                0                 1                 0
## 14                1                 0                 0
## 15                0                 0                 0
## 16                0                 0                 0
## 17                0                 1                 0
## 18                0                 0                 0
## 19                0                 0                 0
## 20                0                 0                 0
## 21                0                 0                 0
## 22                0                 0                 0
## 23                1                 1                 0
## 24                0                 0                 0
## 25                1                 0                 0
## 26                0                 0                 0
## 27                0                 0                 0
## 28                0                 0                 0
## 29                0                 0                 0
## 30                0                 0                 0
## 31                0                 0                 0
## 32                0                 0                 0
## 33                0                 0                 1
## 34                0                 0                 0
## 35                0                 1                 0
## 36                0                 0                 0
## 37                0                 1                 0
## 38                0                 0                 0
## 39                0                 1                 0
## 40                0                 0                 0
## 41                0                 0                 0
## 42                0                 0                 0
## 43                0                 0                 0
## 44                0                 0                 0
## 45                0                 0                 0
## 46                0                 1                 0
## 47                0                 0                 0
## 48                0                 0                 0
##    VRlog_exploded_exp_24 VRlog_exploded_exp_25 VRlog_exploded_exp_26
## 1                 0                 0                 0
## 2                 0                 0                 0
## 3                 0                 0                 1
## 4                 0                 1                 0
## 5                 0                 0                 1
## 6                 0                 0                 0
## 7                 0                 1                 0
## 8                 1                 0                 0
## 9                 1                 1                 0
## 10                1                 0                 1
## 11                0                 0                 1
## 12                0                 1                 0
```

```
## 13                 0                 0                 0
## 14                 0                 0                 0
## 15                 1                 0                 0
## 16                 0                 0                 0
## 17                 0                 1                 1
## 18                 0                 0                 0
## 19                 1                 0                 0
## 20                 0                 0                 0
## 21                 0                 0                 0
## 22                 0                 0                 1
## 23                 0                 1                 1
## 24                 0                 0                 0
## 25                 1                 0                 0
## 26                 0                 0                 0
## 27                 0                 0                 1
## 28                 0                 1                 0
## 29                 0                 0                 0
## 30                 0                 0                 0
## 31                 0                 1                 0
## 32                 1                 0                 0
## 33                 0                 0                 0
## 34                 0                 0                 0
## 35                 0                 0                 1
## 36                 0                 0                 1
## 37                 0                 0                 1
## 38                 1                 0                 0
## 39                 1                 0                 1
## 40                 0                 1                 0
## 41                 0                 0                 0
## 42                 1                 0                 0
## 43                 0                 0                 0
## 44                 0                 0                 0
## 45                 1                 0                 0
## 46                 0                 0                 0
## 47                 1                 0                 0
## 48                 1                 1                 0
##    VRlog_exploded_exp_27 VRlog_exploded_exp_28 VRlog_exploded_exp_29
## 1                  0                 0                 1
## 2                  0                 0                 1
## 3                  0                 1                 1
## 4                  0                 1                 0
## 5                  0                 0                 0
## 6                  1                 0                 0
## 7                  0                 0                 0
## 8                  0                 0                 0
## 9                  0                 0                 0
## 10                 0                 0                 0
## 11                 0                 0                 0
## 12                 0                 0                 0
## 13                 0                 0                 0
## 14                 0                 0                 1
## 15                 0                 0                 0
## 16                 0                 0                 0
## 17                 0                 0                 0
## 18                 0                 1                 0
```

```
## 19                1                1                0
## 20                0                1                0
## 21                0                0                0
## 22                0                0                0
## 23                1                0                0
## 24                0                0                0
## 25                1                1                1
## 26                1                0                0
## 27                1                0                0
## 28                1                0                0
## 29                1                1                0
## 30                0                0                0
## 31                1                0                1
## 32                0                0                0
## 33                0                0                0
## 34                0                0                0
## 35                0                1                0
## 36                0                1                0
## 37                0                1                0
## 38                0                0                1
## 39                0                1                1
## 40                0                0                0
## 41                0                0                0
## 42                0                0                1
## 43                0                0                1
## 44                0                1                0
## 45                0                0                0
## 46                0                0                0
## 47                0                0                0
## 48                0                0                1
##    VRlog_exploded_exp_30 VR_abs_pump VR_abs_exp VR_abs_pump_mean CB_abs_pump
## 1                  0       316        7             NA        436
## 2                  1       492        7      16.400000        839
## 3                  1       137       14             NA        979
## 4                  0       913        7             NA        591
## 5                  0      1056        9      35.200000       1077
## 6                  1      1395       10             NA       1484
## 7                  1       913        2             NA        663
## 8                  0       664        2      22.133333        478
## 9                  0       987       11      32.900000       1228
## 10                 0      1395        9      46.500000        914
## 11                 1       414        2      13.800000        566
## 12                 0      1395        4             NA        515
## 13                 0       669        7      22.300000        656
## 14                 0       472        4      15.733333       1106
## 15                 0       987        6             NA        859
## 16                 0       611        6      20.366667        758
## 17                 0       823        7      27.433333       1386
## 18                 0       913        9      30.433333        730
## 19                 0       913        8             NA        854
## 20                 0      1395        4             NA       1055
## 21                 0       414        2             NA        321
## 22                 0       222        1       7.400000        277
## 23                 0       987       11             NA       1338
## 24                 1       395        3      13.166667        722
```

```
## 25              0       414       11          NA       467
## 26              1       625        8          NA       884
## 27              0       625        4   20.833333       827
## 28              0       749        6   24.966667       714
## 29              0       987        2          NA       409
## 30              1       599        7   19.966667       950
## 31              0       690        8   23.000000       847
## 32              0       987        4          NA       856
## 33              0       987        4          NA       325
## 34              0       987        5          NA      1030
## 35              0       987        6          NA       682
## 36              0       913        6          NA       444
## 37              0       913        8          NA       993
## 38              1      1395        6          NA      1126
## 39              0      1056        8          NA       770
## 40              0       137        2    4.566667       336
## 41              0       316        0   10.533333       428
## 42              0       414       11          NA       496
## 43              0       137        4          NA       506
## 44              0       987        5          NA       868
## 45              1       451        8   15.033333      1165
## 46              1      1151       10   38.366667       790
## 47              0       715        6   23.833333       643
## 48              0       624        7   20.800000       599
##    CB_abs_exp CB_abs_pump_mean
## 1           4       14.533333
## 2           6       27.966667
## 3           5       32.633333
## 4           5       19.700000
## 5          12       35.900000
## 6          13       49.466667
## 7           4       22.100000
## 8           3       15.933333
## 9          21       40.933333
## 10         12       30.466667
## 11          4       18.866667
## 12          5       17.166667
## 13          7       21.866667
## 14         12       36.866667
## 15          8       28.633333
## 16          8       25.266667
## 17          9       46.200000
## 18         11       24.333333
## 19          9       28.466667
## 20          7       35.166667
## 21          1       10.700000
## 22          3        9.233333
## 23         10       44.600000
## 24         10       24.066667
## 25         10       15.566667
## 26          7       29.466667
## 27          9       27.566667
## 28          5       23.800000
## 29          2       13.633333
## 30          8       31.666667
```

```
## 31        10       28.233333
## 32         8       28.533333
## 33         3       10.833333
## 34         6       34.333333
## 35         3       22.733333
## 36         3       14.800000
## 37         7       33.100000
## 38         8       37.533333
## 39         8       25.666667
## 40         5       11.200000
## 41         4       14.266667
## 42         2       16.533333
## 43         5       16.866667
## 44         9       28.933333
## 45        10       38.833333
## 46        10       26.333333
## 47         9       21.433333
## 48         4       19.966667
```

```
#absolute Total & average pump for VR
d1_abs$VR_abs_pump <- d1_abs %>%
  select(starts_with("VRlog_count_inflate_exp_")) %>% rowSums()
d1_abs$VR_abs_exp <- d1_abs %>%
  select(starts_with("VRlog_exploded_exp_")) %>% rowSums()
d1_abs$VR_abs_pump_mean <- d1_abs %>%
  select(starts_with("VRlog_count_inflate_exp_")) %>% rowMeans()

#absolute Total pump for CB
d1_abs$CB_abs_pump <- d1_abs %>%
  select(starts_with("CBlog_count_inflate_exp_")) %>% rowSums()
d1_abs$CB_abs_exp <- d1_abs %>%
  select(starts_with("CBlog_exploded_exp_")) %>% rowSums()
d1_abs$CB_abs_pump_mean <- d1_abs %>%
  select(starts_with("CBlog_count_inflate_exp_")) %>% rowMeans()
d1_abs
```

```
##    Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal DrugTotal
## 1   28      1       29       8      26        23          0       0.0
## 2   19      1       26      11      18        19          5       0.0
## 3   25      0       17      11      19        26          5       0.0
## 4   25      0       28      11      20        32          3       0.0
## 5   25      0       15      13      26        25          3       0.0
## 6   23      1       19      10      24        25          5       1.0
## 7   25      0       22       4      21        20          1       0.0
## 8   27      1       27       6      15        19          1       1.0
## 9   26      0       34      13      14        32         12      35.0
## 10  20      1       42      13      19        38         11       0.0
## 11  20      1       18       9      20        32          3       0.0
## 12  18      1       22       7      18        18          5       0.0
## 13  19      1       30       8      15        32         18       0.0
## 14  29      0       19       5      16        18          6       0.0
## 15  19      1       22       9      24        23          1       0.0
## 16  22      1       30       5      23        18          7       0.0
## 17  19      1       29       9      19        36         21       0.0
## 18  20      1       20       8      19        26          9       0.0
```

```
## 19  24     0     28     12     21     37      8     7.0
## 20  20     0     17      6     24     25      2     0.0
## 21  26     0     30     13     24     19      5     0.0
## 22  26     1     21      9     24     18      5     0.0
## 23  22     0     21     14     19     31     14     0.2
## 24  20     1     38     10     19     22      5     1.0
## 25  32     0     20     12     28     29      5     0.0
## 26  20     1     21      8     18     16      5     0.0
## 27  19     1     27     11     22     28      5     0.0
## 28  20     1     19     11     21     21      1     0.0
## 29  19     1     36      9     14     24     10     1.0
## 30  18     1     25      9     19     29      7     0.0
## 31  19     0     15     10     29     30      9     9.0
## 32  22     1     36      8     18     27      6     2.0
## 33  21     1     26     12     18     34      7    15.0
## 34  19     1     24     10     23     30      6     2.0
## 35  18     1     22      9     22     33      7     2.0
## 36  19     1     42      7     18     24      6     0.0
## 37  19     1     22      9     20     22     11     0.0
## 38  19     1     24      9     20     26      5     0.0
## 39  24     0     29     10     14     33     21     0.0
## 40  19     1     21      7     20     19      9     0.0
## 41  18     1     13     10     19     20      5     0.0
## 42  23     1     21      8     18     24      4     1.0
## 43  19     1     21     12     18     25      2     0.0
## 44  21     1     25      6     17     27      5     0.0
## 45  18     1     43      6     20     28      6     0.0
## 46  21     1     24     11     16     23      8     0.0
## 47  19     1     29     11     24     27      7     0.0
## 48  24     1     30     11     22     25      5     0.0
##    CigarettesTotal SexTotal StealTotal GABSTotal VRlog_count_inflate_exp_1
## 1               0       0         0        7.0                        46
## 2               0       0         0        6.2                        11
## 3               0       0         0        8.4                        23
## 4               0       0         0        5.2                        16
## 5               0       0         0        9.0                        50
## 6               0       0         1        3.2                        20
## 7               0       0         0        6.6                        30
## 8               0       1         0        4.6                        17
## 9               0       1         1        5.6                        22
## 10              0       2         3        4.8                        21
## 11              0       1         0        1.4                        10
## 12              0       0         0        5.6                         6
## 13              0       1         0        6.2                        24
## 14              0       0         0        4.8                         4
## 15              0       0         0        7.0                        14
## 16              0       0         0        7.2                        18
## 17              0       2         0        8.6                        17
## 18              0       2         0        1.2                        23
## 19              0       0         0        4.4                        56
## 20              0       1         0        8.2                        21
## 21              0       0         0        7.6                        10
## 22              0       0         0        6.6                         4
## 23              0       2         0        7.4                        35
## 24              0       1         0        2.4                         4
```

```
## 25          0       1       0     6.0                  29
## 26          0       0       0     4.6                  12
## 27          0       0       0     7.8                   9
## 28          0       0       0     6.4                  25
## 29          0       0       0     5.4                   5
## 30          0       0       0     6.8                  18
## 31          0       0       0     6.2                  22
## 32          2       0       1     4.4                   6
## 33          1       3       1     7.8                  21
## 34          2       1       0     6.6                  30
## 35          4       1       3     4.8                   8
## 36          0       0       1     6.0                   6
## 37          0       0       0     6.0                   9
## 38          0       0       0     5.4                  28
## 39          0       3       0     5.6                  26
## 40          0       1       0     2.6                   5
## 41          0       0       0     6.6                   7
## 42          0       1       0     4.4                   1
## 43          0       0       0     1.4                  11
## 44          0       1       0     5.4                   4
## 45          0       0       0     7.0                   8
## 46          0       0       1     4.6                  21
## 47          0       0       0     6.2                   3
## 48          0       1       0     1.0                  20
##    VRlog_count_inflate_exp_2 VRlog_count_inflate_exp_3
## 1                         54                        30
## 2                         16                        12
## 3                          9                        17
## 4                          7                        16
## 5                         51                        52
## 6                         16                        19
## 7                         15                        20
## 8                         15                        23
## 9                         43                        21
## 10                        29                        32
## 11                        12                        13
## 12                         5                         8
## 13                        25                        16
## 14                         6                         7
## 15                        18                        14
## 16                        19                        18
## 17                        34                        46
## 18                        38                         1
## 19                        54                        12
## 20                        34                        12
## 21                        10                        10
## 22                         5                         5
## 23                         1                        39
## 24                         7                         7
## 25                        43                        33
## 26                         3                         9
## 27                        13                        15
## 28                        30                        30
## 29                         5                         6
## 30                        35                        33
```

```
## 31                      8                      15
## 32                      2                       6
## 33                     26                      31
## 34                      5                      24
## 35                     13                      17
## 36                      6                       8
## 37                     11                      19
## 38                     16                      16
## 39                     15                      18
## 40                      5                       4
## 41                      9                      10
## 42                     23                      20
## 43                     14                       4
## 44                     18                      21
## 45                     15                       6
## 46                     19                      29
## 47                     11                      19
## 48                      5                      18
##    VRlog_count_inflate_exp_4 VRlog_count_inflate_exp_5
## 1                         18                       4
## 2                         15                       7
## 3                         35                      41
## 4                          1                      14
## 5                         50                       8
## 6                          7                       7
## 7                          5                      18
## 8                         16                      19
## 9                         15                      40
## 10                        44                      54
## 11                        11                      14
## 12                         9                       6
## 13                        22                      21
## 14                         8                       8
## 15                        15                      17
## 16                        22                       1
## 17                        53                      49
## 18                        37                      34
## 19                        18                      20
## 20                         3                      38
## 21                        11                      15
## 22                         6                       6
## 23                        59                      44
## 24                         8                       8
## 25                        45                      52
## 26                         4                      13
## 27                        22                      11
## 28                        14                      21
## 29                         4                       4
## 30                        30                      20
## 31                        10                      18
## 32                         7                      11
## 33                        17                      14
## 34                        24                      26
## 35                        20                      28
## 36                        10                       8
```

```
## 37                      32                      21
## 38                      10                      20
## 39                      17                      18
## 40                       5                       5
## 41                      10                      11
## 42                      25                      25
## 43                       9                       7
## 44                      19                      17
## 45                      10                      10
## 46                      33                      37
## 47                      19                      16
## 48                      19                      23
##    VRlog_count_inflate_exp_6 VRlog_count_inflate_exp_7
## 1                          6                      33
## 2                         10                      12
## 3                         41                      46
## 4                         17                      15
## 5                         53                      54
## 6                          4                      15
## 7                         22                       3
## 8                         17                      24
## 9                         37                      23
## 10                        53                      44
## 11                        10                      13
## 12                         7                       8
## 13                        25                      19
## 14                         9                      11
## 15                        20                       9
## 16                        18                      22
## 17                        27                      33
## 18                        53                      37
## 19                         6                      18
## 20                        39                      38
## 21                        18                      18
## 22                         4                       6
## 23                        53                      31
## 24                        10                      13
## 25                        68                      41
## 26                        18                      13
## 27                        16                      19
## 28                        30                      25
## 29                        12                       6
## 30                        25                      35
## 31                        20                      20
## 32                        51                      12
## 33                        12                      14
## 34                        23                       8
## 35                        34                      18
## 36                         7                       1
## 37                        53                      15
## 38                        22                      19
## 39                        26                      33
## 40                         6                       5
## 41                        11                      10
## 42                        25                      30
```

```
## 43                 13                  8
## 44                 32                  5
## 45                  8                 15
## 46                 51                 28
## 47                 17                 21
## 48                 26                 27
##    VRlog_count_inflate_exp_8 VRlog_count_inflate_exp_9
## 1                         36                        42
## 2                         13                        20
## 3                         18                        37
## 4                         59                        36
## 5                         59                        55
## 6                         22                        23
## 7                         44                         4
## 8                         25                        23
## 9                          5                        24
## 10                        44                        28
## 11                        16                        13
## 12                         7                         6
## 13                        26                        23
## 14                        14                        16
## 15                        20                        25
## 16                        14                        18
## 17                        23                        27
## 18                        38                        20
## 19                        36                        36
## 20                        44                        36
## 21                        24                        21
## 22                         6                         7
## 23                        32                        30
## 24                         8                        13
## 25                        47                        26
## 26                         6                         9
## 27                        23                        21
## 28                        20                        29
## 29                         7                         6
## 30                        28                        24
## 31                        20                        34
## 32                        12                        12
## 33                        14                         6
## 34                        59                         5
## 35                        24                        19
## 36                        10                        12
## 37                        20                        34
## 38                        59                        19
## 39                        35                        43
## 40                         5                         6
## 41                         8                         8
## 42                        14                        54
## 43                         6                         7
## 44                        23                        24
## 45                        15                        14
## 46                        16                        61
## 47                        21                        26
## 48                        23                        25
```

```
##    VRlog_count_inflate_exp_10 VRlog_count_inflate_exp_11
## 1                          40                         24
## 2                           8                         15
## 3                          52                          7
## 4                          18                         17
## 5                          11                         55
## 6                           4                          9
## 7                           4                         20
## 8                          20                         18
## 9                          27                         47
## 10                         50                         33
## 11                         15                         13
## 12                          3                          6
## 13                         29                         18
## 14                         20                         14
## 15                         11                         12
## 16                         18                         18
## 17                         20                         26
## 18                         31                         53
## 19                         48                         41
## 20                         44                         38
## 21                         17                          6
## 22                          6                          2
## 23                         33                         36
## 24                         13                         13
## 25                         27                          8
## 26                         13                         14
## 27                         23                         26
## 28                         30                         23
## 29                          6                          6
## 30                         28                         40
## 31                         19                         18
## 32                         15                         15
## 33                         13                         11
## 34                         13                         21
## 35                         23                         20
## 36                         13                          7
## 37                         40                         39
## 38                         26                         30
## 39                         30                         33
## 40                          4                          4
## 41                          8                          8
## 42                         21                         25
## 43                          5                          6
## 44                         23                         25
## 45                         17                         14
## 46                         65                         16
## 47                         28                         26
## 48                         20                         25
##    VRlog_count_inflate_exp_12 VRlog_count_inflate_exp_13
## 1                          29                         32
## 2                          15                         20
## 3                          31                         55
## 4                          17                         13
## 5                          21                          2
```

```
## 6                  60                  38
## 7                  25                  15
## 8                  19                  26
## 9                  38                  35
## 10                 21                  55
## 11                 15                  15
## 12                  7                   8
## 13                 25                  20
## 14                 10                  12
## 15                 12                  14
## 16                 19                  21
## 17                 32                  31
## 18                 28                  20
## 19                 47                  43
## 20                  1                  36
## 21                 20                  15
## 22                  7                   7
## 23                 40                  40
## 24                 10                  12
## 25                 21                  20
## 26                 19                  18
## 27                 44                  49
## 28                 30                  30
## 29                  7                   9
## 30                  9                  13
## 31                 22                  31
## 32                 15                  16
## 33                 11                  13
## 34                 21                  21
## 35                 32                  42
## 36                  6                   6
## 37                 25                  46
## 38                 39                  30
## 39                 56                  11
## 40                  7                   6
## 41                  9                   9
## 42                 14                  25
## 43                  6                   8
## 44                 30                  33
## 45                 20                   3
## 46                 25                  21
## 47                 29                   9
## 48                 21                  20
##    VRlog_count_inflate_exp_14 VRlog_count_inflate_exp_15
## 1                  39                  44
## 2                  16                  18
## 3                  64                  36
## 4                   6                  12
## 5                  40                  13
## 6                  36                  46
## 7                  19                  19
## 8                  23                  24
## 9                  34                  22
## 10                 65                  21
## 11                 15                  13
```

```
## 12                  9                  10
## 13                 21                  28
## 14                 14                  18
## 15                 65                  18
## 16                 17                   7
## 17                 15                  23
## 18                 30                  52
## 19                 40                  31
## 20                 36                  39
## 21                  2                  15
## 22                  8                   8
## 23                 26                  44
## 24                 12                  11
## 25                 48                  26
## 26                 26                  23
## 27                  7                   6
## 28                 30                  20
## 29                  6                   8
## 30                  7                  16
## 31                 25                  20
## 32                 21                   4
## 33                 14                  13
## 34                 21                  25
## 35                 40                  29
## 36                 42                   4
## 37                 34                  11
## 38                 26                  36
## 39                 14                  28
## 40                  5                   4
## 41                 10                  10
## 42                 25                   2
## 43                  8                   8
## 44                 42                  32
## 45                  3                  10
## 46                  1                  37
## 47                  2                  20
## 48                 24                  16
##    VRlog_count_inflate_exp_16 VRlog_count_inflate_exp_17
## 1                   5                  45
## 2                  18                  18
## 3                  11                  39
## 4                  12                  11
## 5                  30                  40
## 6                  14                  20
## 7                  20                  19
## 8                  24                  26
## 9                  37                  33
## 10                 43                  30
## 11                 17                  16
## 12                  8                   8
## 13                 22                  25
## 14                 18                  22
## 15                 12                  10
## 16                 13                   7
## 17                 32                  32
```

```
## 18                    28                    29
## 19                    19                    26
## 20                    38                    40
## 21                     7                    15
## 22                     9                     9
## 23                    33                    15
## 24                    14                    14
## 25                     7                    22
## 26                    24                    17
## 27                    14                    20
## 28                    28                    20
## 29                     5                     6
## 30                     8                     6
## 31                    23                    27
## 32                     5                    15
## 33                    16                    17
## 34                    17                    18
## 35                    23                     3
## 36                     4                     4
## 37                    64                    36
## 38                    29                    22
## 39                    35                    37
## 40                     5                     4
## 41                    11                    11
## 42                    17                    25
## 43                     9                     9
## 44                    42                    17
## 45                     2                    15
## 46                     6                    37
## 47                    26                    28
## 48                    15                     8
##    VRlog_count_inflate_exp_18 VRlog_count_inflate_exp_19
## 1                          42                         42
## 2                          20                          5
## 3                           6                         39
## 4                          11                         11
## 5                          17                         30
## 6                          38                         43
## 7                          23                          7
## 8                          27                         27
## 9                          32                         31
## 10                         55                         53
## 11                         15                         18
## 12                         12                         53
## 13                         22                         26
## 14                         21                         24
## 15                         10                          7
## 16                         13                         13
## 17                         38                         31
## 18                         21                          4
## 19                         42                         33
## 20                         35                         41
## 21                         10                         12
## 22                         10                         11
## 23                         36                         50
```

```
## 24                  15                  14
## 25                  51                  48
## 26                   7                  13
## 27                  20                  25
## 28                  30                  20
## 29                   7                   9
## 30                  10                  16
## 31                  18                  40
## 32                  29                  31
## 33                  17                  18
## 34                  20                  24
## 35                  15                  17
## 36                   4                   4
## 37                  45                  39
## 38                  28                  18
## 39                  41                  41
## 40                   3                   3
## 41                  10                  11
## 42                  18                  20
## 43                  12                  14
## 44                   9                  18
## 45                  19                  18
## 46                  40                  34
## 47                  27                  30
## 48                  24                  30
##    VRlog_count_inflate_exp_20 VRlog_count_inflate_exp_21
## 1                   5                  41
## 2                  20                  18
## 3                  30                  19
## 4                   8                  11
## 5                  40                  20
## 6                  45                   6
## 7                  15                   7
## 8                  29                  17
## 9                  34                  35
## 10                 46                  38
## 11                 16                  19
## 12                 13                  10
## 13                 18                  20
## 14                 26                   2
## 15                 20                  16
## 16                 16                  20
## 17                 33                  33
## 18                  9                  11
## 19                 40                  38
## 20                 42                  38
## 21                 13                  38
## 22                 11                  12
## 23                 56                   3
## 24                 16                  14
## 25                 12                  69
## 26                 13                  15
## 27                 23                  12
## 28                 30                  18
## 29                 11                   9
```

```
## 30                  12                  9
## 31                  25                 26
## 32                  20                 29
## 33                   7                 16
## 34                  22                 24
## 35                  26                 24
## 36                   4                  4
## 37                  36                 29
## 38                  15                 18
## 39                  43                 12
## 40                   4                  3
## 41                  11                 12
## 42                  40                 16
## 43                   4                 10
## 44                  20                 25
## 45                  22                 16
## 46                  57                 62
## 47                  36                 25
## 48                  31                 25
##    VRlog_count_inflate_exp_22 VRlog_count_inflate_exp_23
## 1                   20                  9
## 2                   20                 20
## 3                    3                  5
## 4                    9                  8
## 5                   25                 30
## 6                   50                 62
## 7                   15                 20
## 8                   24                 27
## 9                   28                 36
## 10                  59                 26
## 11                  17                 14
## 12                  14                 18
## 13                   3                 22
## 14                  10                 14
## 15                  20                 21
## 16                  19                 20
## 17                  14                 24
## 18                  24                 23
## 19                  50                 46
## 20                  39                 38
## 21                  10                 16
## 22                  12                 13
## 23                  36                 36
## 24                  15                 18
## 25                  40                 61
## 26                  18                 17
## 27                  25                 29
## 28                  31                 25
## 29                  10                 12
## 30                  13                 15
## 31                  41                 26
## 32                  33                 27
## 33                  17                 12
## 34                  24                 26
## 35                   8                 18
```

```
## 36                      4                      5
## 37                      1                     46
## 38                     19                     31
## 39                      1                     46
## 40                      3                      5
## 41                     12                     11
## 42                     24                     10
## 43                     13                     11
## 44                     30                     22
## 45                     25                     18
## 46                     48                     48
## 47                     25                     27
## 48                     27                     29
##    VRlog_count_inflate_exp_24 VRlog_count_inflate_exp_25
## 1                       6                     30
## 2                      21                     20
## 3                      36                     40
## 4                      11                      6
## 5                      40                     41
## 6                      44                     49
## 7                       4                      2
## 8                      15                     22
## 9                      17                     20
## 10                     46                     60
## 11                     15                     17
## 12                     16                     10
## 13                     27                     20
## 14                     18                     22
## 15                      2                     25
## 16                     21                     22
## 17                     25                      5
## 18                     34                     40
## 19                     40                     29
## 20                     42                     38
## 21                     20                     14
## 22                     13                     13
## 23                     94                     81
## 24                     16                     18
## 25                     35                     38
## 26                     20                     22
## 27                     38                     42
## 28                     25                     23
## 29                     11                     16
## 30                     21                     24
## 31                     33                      3
## 32                      4                     33
## 33                     15                     16
## 34                     30                     31
## 35                     34                     26
## 36                      4                      7
## 37                     44                     54
## 38                      8                     52
## 39                     13                     33
## 40                      6                      2
## 41                     13                     13
```

```
## 42                    16                    2
## 43                    14                   81
## 44                    30                   15
## 45                    22                   17
## 46                    43                   52
## 47                    20                   22
## 48                    21                   10
##    VRlog_count_inflate_exp_26 VRlog_count_inflate_exp_27
## 1                          36                         34
## 2                          20                         22
## 3                          35                         36
## 4                          12                         10
## 5                          25                         29
## 6                          52                         21
## 7                          17                         15
## 8                          24                         22
## 9                          43                         47
## 10                         61                         61
## 11                          3                         10
## 12                          8                         10
## 13                         28                         23
## 14                         24                         30
## 15                         29                         20
## 16                         26                         32
## 17                          7                          8
## 18                         38                         43
## 19                         46                          3
## 20                         39                         39
## 21                         15                         15
## 22                          5                          3
## 23                         10                         15
## 24                         20                         18
## 25                         52                         10
## 26                         23                         13
## 27                          7                         14
## 28                         25                          4
## 29                         18                         10
## 30                          3                         19
## 31                         30                         13
## 32                         30                         35
## 33                         30                         16
## 34                         36                         41
## 35                         30                         18
## 36                          6                          6
## 37                         22                         27
## 38                         29                         27
## 39                         15                         29
## 40                          3                          4
## 41                         12                         12
## 42                         10                         16
## 43                         13                         15
## 44                         26                         42
## 45                         19                         22
## 46                         51                         54
## 47                         28                         34
```

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## 48                    22                    25
##    VRlog_count_inflate_exp_28 VRlog_count_inflate_exp_29
## 1                     42                     7
## 2                     22                    24
## 3                     15                    15
## 4                      7                    12
## 5                     34                    40
## 6                     52                    51
## 7                     21                    23
## 8                     21                    24
## 9                     55                    52
## 10                    64                    76
## 11                    12                    14
## 12                    12                    14
## 13                    26                    20
## 14                    35                     1
## 15                    27                    29
## 16                    43                    46
## 17                    28                    32
## 18                    26                    43
## 19                    10                    36
## 20                    35                    45
## 21                    21                    14
## 22                     4                     5
## 23                    45                    51
## 24                    19                    26
## 25                    24                    12
## 26                    17                    28
## 27                     9                    23
## 28                    30                    30
## 29                     4                     4
## 30                    31                    30
## 31                    31                    27
## 32                    40                    30
## 33                    17                    18
## 34                    43                    39
## 35                    13                    12
## 36                     1                     3
## 37                    33                    17
## 38                    34                    12
## 39                     2                    25
## 40                     4                     6
## 41                    13                    13
## 42                    24                     4
## 43                    16                    11
## 44                    20                    22
## 45                    26                    19
## 46                    60                    58
## 47                    26                    44
## 48                    20                     2
##    VRlog_count_inflate_exp_30 CBlog_count_inflate_exp_1
## 1                     44                    19
## 2                     16                    55
## 3                     23                     8
## 4                      9                    22
```

```
## 5                  41                  48
## 6                  41                  88
## 7                  54                  18
## 8                  26                   5
## 9                  54                  75
## 10                 83                   3
## 11                 13                  10
## 12                 16                  10
## 13                 25                  21
## 14                 34                  22
## 15                 29                  39
## 16                 50                  12
## 17                 25                  40
## 18                 45                  16
## 19                 33                  31
## 20                 46                  36
## 21                 19                  10
## 22                  5                  10
## 23                 67                  44
## 24                  9                  21
## 25                 21                   4
## 26                 20                  29
## 27                 20                  44
## 28                 23                   5
## 29                  7                   2
## 30                 21                  27
## 31                 25                  58
## 32                 45                  21
## 33                 19                   5
## 34                 40                   6
## 35                 67                  13
## 36                  3                  15
## 37                 41                  29
## 38                 25                  23
## 39                 21                  11
## 40                  6                   7
## 41                 13                  16
## 42                 11                  16
## 43                  7                  34
## 44                 22                  66
## 45                 23                  28
## 46                 41                   7
## 47                 50                  17
## 48                 23                  11
##    CBlog_count_inflate_exp_2 CBlog_count_inflate_exp_3
## 1                  22                  12
## 2                  55                  29
## 3                  12                  14
## 4                   5                   9
## 5                  48                  30
## 6                  31                  63
## 7                  18                  15
## 8                   9                  12
## 9                  50                  26
## 10                 30                  31
```

```
## 11                  10                  15
## 12                   3                  14
## 13                  14                  24
## 14                  36                  42
## 15                  26                  31
## 16                  20                  13
## 17                  53                  57
## 18                  15                  16
## 19                  32                  38
## 20                  42                  49
## 21                  12                  10
## 22                  12                  13
## 23                  52                  61
## 24                  21                  61
## 25                  10                  10
## 26                  31                  34
## 27                  47                 102
## 28                  10                  10
## 29                  16                  17
## 30                  27                  30
## 31                   7                  43
## 32                  30                  40
## 33                   6                   6
## 34                  29                  33
## 35                  11                  12
## 36                  16                  20
## 37                  34                  10
## 38                  21                  42
## 39                  17                   8
## 40                   8                   9
## 41                  18                  16
## 42                   8                  10
## 43                  26                  13
## 44                  22                  30
## 45                  25                  31
## 46                   4                   7
## 47                  41                  30
## 48                  15                  14
##    CBlog_count_inflate_exp_4 CBlog_count_inflate_exp_5
## 1                  17                  21
## 2                  15                  20
## 3                  17                   7
## 4                  20                  20
## 5                  45                  13
## 6                  92                  20
## 7                  23                  25
## 8                  12                  11
## 9                  22                  20
## 10                 47                  64
## 11                 14                  16
## 12                 15                  20
## 13                 16                  23
## 14                 52                  60
## 15                 37                  38
## 16                 18                  21
```

```
## 17                  68                  75
## 18                  18                  42
## 19                  41                  67
## 20                  43                  40
## 21                  11                  10
## 22                  13                  14
## 23                  70                  65
## 24                  15                  31
## 25                  12                  12
## 26                  35                  41
## 27                  49                  39
## 28                  12                  17
## 29                  21                  19
## 30                  34                  40
## 31                  11                  32
## 32                  45                  40
## 33                   5                   5
## 34                  36                   9
## 35                  24                  19
## 36                  21                  10
## 37                  34                   4
## 38                   4                  43
## 39                  14                  27
## 40                   9                  10
## 41                  12                  17
## 42                  13                  16
## 43                  23                  19
## 44                  47                  56
## 45                  47                  32
## 46                   8                  12
## 47                  22                   5
## 48                  15                  15
##    CBlog_count_inflate_exp_6 CBlog_count_inflate_exp_7
## 1                  24                  35
## 2                   2                  10
## 3                   7                  11
## 4                  21                  21
## 5                  45                  48
## 6                  72                  41
## 7                  23                  22
## 8                  13                  11
## 9                  23                  62
## 10                 69                  62
## 11                 15                  15
## 12                 24                  25
## 13                 16                  21
## 14                 17                  62
## 15                 18                  28
## 16                 26                  17
## 17                 81                  94
## 18                 23                  49
## 19                 48                  28
## 20                 34                  38
## 21                 11                  10
## 22                 13                  11
```

```
## 23                 71                 38
## 24                 30                  1
## 25                 15                 16
## 26                 44                  0
## 27                 13                 11
## 28                  9                 12
## 29                 22                  4
## 30                 49                 55
## 31                 33                 16
## 32                 49                 40
## 33                  6                  6
## 34                 35                 36
## 35                 25                 32
## 36                 15                  8
## 37                 30                  7
## 38                 12                 44
## 39                 26                 42
## 40                  9                 11
## 41                 14                 17
## 42                 16                 17
## 43                 13                 11
## 44                 56                 42
## 45                 37                 38
## 46                 21                 31
## 47                 11                 13
## 48                 15                 16
##    CBlog_count_inflate_exp_8 CBlog_count_inflate_exp_9
## 1                 12                 17
## 2                 15                 25
## 3                 11                 13
## 4                 22                 22
## 5                  5                 48
## 6                 58                 51
## 7                 24                 16
## 8                 19                 17
## 9                 62                 20
## 10                57                 22
## 11                15                 20
## 12                18                 29
## 13                25                 17
## 14                12                 28
## 15                17                 25
## 16                26                 27
## 17                97                 75
## 18                11                 20
## 19                35                 28
## 20                40                 42
## 21                12                 12
## 22                 7                  7
## 23                39                 38
## 24                27                 29
## 25                 4                 10
## 26                40                 45
## 27                 9                 18
## 28                13                 23
```

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## 29                      5                      14
## 30                     52                      41
## 31                     46                       4
## 32                     35                      25
## 33                      7                       8
## 34                     37                      40
## 35                     37                      36
## 36                      6                      10
## 37                     16                      22
## 38                     57                      68
## 39                     57                      60
## 40                     12                      12
## 41                     13                      12
## 42                     17                      19
## 43                     18                      16
## 44                     27                      27
## 45                     45                      42
## 46                     13                      22
## 47                      4                      16
## 48                     15                      16
##    CBlog_count_inflate_exp_10 CBlog_count_inflate_exp_11
## 1                      13                       9
## 2                      30                      40
## 3                      13                      18
## 4                      21                      22
## 5                      31                      45
## 6                      90                      71
## 7                      24                      16
## 8                      19                      19
## 9                      12                      65
## 10                     42                      51
## 11                      4                      19
## 12                     25                      25
## 13                     25                      17
## 14                     24                      34
## 15                     31                      20
## 16                     30                      30
## 17                     44                       4
## 18                      7                      64
## 19                     17                      19
## 20                     38                      35
## 21                     10                      12
## 22                      8                      10
## 23                     55                      52
## 24                     18                      27
## 25                     15                      12
## 26                     50                      46
## 27                     25                      34
## 28                     18                      20
## 29                     17                      16
## 30                      1                      19
## 31                     45                      46
## 32                     20                      12
## 33                      9                       9
## 34                     38                      36
```

```
## 35                      10                      20
## 36                      12                       8
## 37                      24                      45
## 38                      32                      33
## 39                      29                       5
## 40                      14                      16
## 41                      13                      14
## 42                      18                      17
## 43                      12                      20
## 44                      36                      33
## 45                      47                      53
## 46                      24                      33
## 47                      24                      30
## 48                      15                       2
##    CBlog_count_inflate_exp_12 CBlog_count_inflate_exp_13
## 1                       15                      10
## 2                       35                      40
## 3                       20                      24
## 4                       21                      23
## 5                       48                      49
## 6                       81                      67
## 7                       15                      19
## 8                       23                      12
## 9                       70                      15
## 10                      37                      34
## 11                      14                      17
## 12                      22                      15
## 13                      21                      21
## 14                      40                      52
## 15                      30                      18
## 16                      29                      30
## 17                      33                      20
## 18                       5                      11
## 19                      20                      29
## 20                      34                      33
## 21                      10                      10
## 22                       9                       8
## 23                      57                      14
## 24                      29                      31
## 25                      20                      20
## 26                      58                      48
## 27                      15                      21
## 28                      25                      30
## 29                      17                      16
## 30                      30                      42
## 31                       5                      40
## 32                      10                       0
## 33                       8                      10
## 34                      36                      35
## 35                      20                      30
## 36                      12                      10
## 37                      17                       9
## 38                      26                      25
## 39                      16                      25
## 40                      14                      14
```

```
## 41                    16                    16
## 42                    16                    19
## 43                    19                    24
## 44                    29                    24
## 45                    40                    51
## 46                    56                    28
## 47                    26                    33
## 48                    13                    14
##    CBlog_count_inflate_exp_14 CBlog_count_inflate_exp_15
## 1                          15                         18
## 2                          40                         40
## 3                          25                         27
## 4                           7                         21
## 5                          50                         55
## 6                          25                         34
## 7                          25                         30
## 8                          16                         15
## 9                           8                         58
## 10                         37                         30
## 11                         17                         17
## 12                          6                         10
## 13                         25                         29
## 14                         24                         10
## 15                         38                         31
## 16                         32                         39
## 17                         17                         19
## 18                         10                         11
## 19                         36                         35
## 20                         33                         41
## 21                         10                         12
## 22                         11                         13
## 23                         60                          2
## 24                         29                         35
## 25                         12                         10
## 26                         13                         16
## 27                         26                         35
## 28                         25                         40
## 29                         13                         22
## 30                         35                         29
## 31                          3                         49
## 32                          8                         11
## 33                         10                         10
## 34                          7                         43
## 35                         22                         17
## 36                          8                         10
## 37                         40                         40
## 38                         39                         50
## 39                         14                         20
## 40                         18                         19
## 41                         16                         16
## 42                         20                         19
## 43                         20                         21
## 44                         32                         13
## 45                         55                         61
## 46                          1                         36
```

```
## 47                    11                    20
## 48                    15                    15
##    CBlog_count_inflate_exp_16 CBlog_count_inflate_exp_17
## 1                      9                     8
## 2                     13                    10
## 3                     17                    26
## 4                     10                    20
## 5                     60                    51
## 6                     15                    44
## 7                     25                    25
## 8                     14                    13
## 9                     65                    32
## 10                    53                    37
## 11                    12                    20
## 12                    25                    30
## 13                    13                    24
## 14                    50                    64
## 15                    37                    38
## 16                    35                    10
## 17                    33                    43
## 18                     9                     8
## 19                    41                     3
## 20                     5                    30
## 21                    14                    11
## 22                    10                     4
## 23                    51                    47
## 24                    30                    26
## 25                    15                     6
## 26                     6                    23
## 27                    41                    44
## 28                    14                    48
## 29                    22                    17
## 30                    41                    44
## 31                    25                    31
## 32                    25                    22
## 33                    11                    12
## 34                    45                    48
## 35                    19                    31
## 36                    10                    20
## 37                    31                    60
## 38                    15                    36
## 39                    20                    20
## 40                    19                    18
## 41                     7                    12
## 42                     0                    20
## 43                    23                    24
## 44                    26                    22
## 45                    59                     5
## 46                    37                    41
## 47                    20                    30
## 48                    18                    16
##    CBlog_count_inflate_exp_18 CBlog_count_inflate_exp_19
## 1                     14                    10
## 2                     27                    22
## 3                     27                    33
```

```
## 4                 19                 22
## 5                 17                 48
## 6                 49                 60
## 7                 30                 21
## 8                 15                 19
## 9                 84                  1
## 10                 4                 20
## 11                19                 18
## 12                30                 42
## 13                23                 27
## 14                54                  5
## 15                22                 27
## 16                28                 36
## 17                62                 67
## 18                12                 26
## 19                25                 26
## 20                37                 40
## 21                10                 12
## 22                 9                  9
## 23                64                 39
## 24                20                 21
## 25                10                  5
## 26                 5                  5
## 27                29                 31
## 28                34                 30
## 29                 6                 19
## 30                27                 29
## 31                32                 17
## 32                34                  2
## 33                13                 15
## 34                47                 42
## 35                24                  9
## 36                10                 20
## 37                76                  7
## 38                49                  8
## 39                20                 25
## 40                18                 14
## 41                14                  9
## 42                20                 20
## 43                20                  6
## 44                29                 40
## 45                51                 48
## 46                45                 14
## 47                15                 39
## 48                18                 20
##    CBlog_count_inflate_exp_20 CBlog_count_inflate_exp_21
## 1                  13                  7
## 2                  30                 30
## 3                  26                 44
## 4                  23                 24
## 5                  48                 48
## 6                  43                 70
## 7                  37                 32
## 8                  20                 16
## 9                  45                 13
```

```
## 10                  0                  6
## 11                 20                 18
## 12                 20                  5
## 13                 18                 26
## 14                 40                 70
## 15                 31                 36
## 16                 21                 31
## 17                 45                 39
## 18                 46                 32
## 19                 20                 23
## 20                 26                 26
## 21                 12                  9
## 22                 11                  9
## 23                 59                 17
## 24                 13                 27
## 25                 10                 25
## 26                  3                 39
## 27                 11                 16
## 28                 35                 39
## 29                  7                  9
## 30                 37                 20
## 31                 30                 15
## 32                 44                 54
## 33                 16                 18
## 34                 17                 29
## 35                 12                 28
## 36                 25                  5
## 37                 17                 63
## 38                 67                 49
## 39                 32                 24
## 40                  7                 10
## 41                 11                 13
## 42                 20                 20
## 43                 17                 20
## 44                 21                  7
## 45                 40                 40
## 46                 40                 31
## 47                 38                 28
## 48                 20                 20
##    CBlog_count_inflate_exp_22 CBlog_count_inflate_exp_23
## 1                   8                 14
## 2                  35                 30
## 3                  52                 63
## 4                  28                 10
## 5                  50                 19
## 6                  49                 18
## 7                  18                  8
## 8                  15                 19
## 9                  47                 62
## 10                 12                 23
## 11                 24                 26
## 12                  5                 10
## 13                 29                 23
## 14                 26                 17
## 15                 25                 31
```

```
## 16                35                35
## 17                48                59
## 18                30                28
## 19                19                26
## 20                33                32
## 21                10                11
## 22                 1                11
## 23                 3                40
## 24                27                27
## 25                35                38
## 26                19                26
## 27                33                27
## 28                35                20
## 29                13                 4
## 30                 5                15
## 31                37                14
## 32                32                42
## 33                17                15
## 34                36                39
## 35                17                22
## 36                10                20
## 37                46                 9
## 38                81                59
## 39                26                21
## 40                11                14
## 41                13                16
## 42                20                20
## 43                19                23
## 44                14                20
## 45                49                48
## 46                42                47
## 47                29                21
## 48                22                25
##    CBlog_count_inflate_exp_24 CBlog_count_inflate_exp_25
## 1                  19                19
## 2                  33                39
## 3                  58                76
## 4                  14                22
## 5                  15                48
## 6                  41                21
## 7                  15                25
## 8                  21                20
## 9                  11                58
## 10                 11                15
## 11                 27                31
## 12                 15                15
## 13                  2                27
## 14                 14                33
## 15                 28                27
## 16                 17                20
## 17                 17                56
## 18                 11                21
## 19                 32                27
## 20                 33                34
## 21                 12                 8
```

```
## 22                  7                  10
## 23                 36                  54
## 24                 13                   6
## 25                 15                  20
## 26                 27                  39
## 27                 15                  11
## 28                 20                  19
## 29                 10                  14
## 30                 34                  24
## 31                 43                  13
## 32                 37                  35
## 33                  8                  12
## 34                 26                  36
## 35                 16                  26
## 36                 20                  30
## 37                 29                  71
## 38                 84                  24
## 39                 27                  27
## 40                  8                  10
## 41                 12                  14
## 42                 20                  20
## 43                  1                   6
## 44                 19                  26
## 45                  4                  51
## 46                 46                  53
## 47                 23                  15
## 48                 30                  37
##    CBlog_count_inflate_exp_26 CBlog_count_inflate_exp_27
## 1                  19                  18
## 2                   6                  25
## 3                  83                  37
## 4                  25                  26
## 5                   3                  48
## 6                  51                  30
## 7                  33                  21
## 8                  21                  17
## 9                  77                  58
## 10                 25                  27
## 11                 36                  22
## 12                  8                  12
## 13                 30                  23
## 14                  2                  40
## 15                  4                  30
## 16                 24                  24
## 17                 40                  38
## 18                 24                  51
## 19                  3                  24
## 20                 34                  33
## 21                 10                  11
## 22                 11                   2
## 23                 62                  33
## 24                 24                   7
## 25                 24                  20
## 26                 38                  39
## 27                 12                  10
```

```
## 28                    29                    27
## 29                    15                    13
## 30                    42                    25
## 31                    38                    17
## 32                    41                    30
## 33                    14                    15
## 34                    37                    39
## 35                    34                    19
## 36                    30                    34
## 37                    16                    47
## 38                    34                    22
## 39                    19                    26
## 40                     8                     8
## 41                    15                    17
## 42                    20                    11
## 43                    20                     4
## 44                    25                    29
## 45                    48                    39
## 46                    25                    18
## 47                     2                    25
## 48                    39                    43
##    CBlog_count_inflate_exp_28 CBlog_count_inflate_exp_29
## 1                          11                     6
## 2                          26                    33
## 3                          67                    67
## 4                          24                    24
## 5                           1                     2
## 6                          20                    49
## 7                          31                    14
## 8                          18                    20
## 9                          19                    44
## 10                         17                    28
## 11                         23                    25
## 12                         16                    20
## 13                         28                    18
## 14                         56                    64
## 15                         34                    39
## 16                         20                    20
## 17                         16                     7
## 18                         21                    75
## 19                         26                    23
## 20                         34                    34
## 21                          9                    10
## 22                          7                     8
## 23                         62                     5
## 24                         25                    25
## 25                         21                    22
## 26                         27                    26
## 27                         15                    21
## 28                         30                    30
## 29                         10                    11
## 30                         50                    30
## 31                         29                    42
## 32                         20                    27
## 33                         16                    15
```

```
## 34                  43                   42
## 35                  44                   27
## 36                   6                   22
## 37                  83                   29
## 38                   4                   60
## 39                  30                   38
## 40                   2                    1
## 41                  17                   18
## 42                  16                    8
## 43                   3                    8
## 44                   6                   19
## 45                  41                    8
## 46                  26                    8
## 47                  15                   20
## 48                  46                    6
##    CBlog_count_inflate_exp_30 CBlog_exploded_exp_1 CBlog_exploded_exp_2
## 1                           2                    0                    0
## 2                          29                    0                    0
## 3                          76                    0                    0
## 4                          23                    0                    0
## 5                          11                    0                    0
## 6                          40                    0                    1
## 7                          15                    0                    0
## 8                          17                    1                    0
## 9                          24                    0                    1
## 10                         20                    1                    0
## 11                         27                    0                    0
## 12                          1                    0                    0
## 13                         30                    0                    1
## 14                         56                    0                    0
## 15                         23                    1                    0
## 16                         32                    1                    1
## 17                         39                    0                    0
## 18                         18                    0                    0
## 19                         32                    0                    0
## 20                         46                    0                    0
## 21                         10                    0                    0
## 22                          9                    0                    0
## 23                         48                    0                    0
## 24                         26                    0                    0
## 25                         19                    1                    0
## 26                         32                    0                    0
## 27                         23                    0                    0
## 28                         35                    0                    0
## 29                         18                    1                    0
## 30                         16                    0                    0
## 31                         26                    0                    1
## 32                         25                    0                    0
## 33                         18                    0                    0
## 34                         48                    1                    0
## 35                         26                    0                    1
## 36                          1                    0                    0
## 37                         48                    0                    0
## 38                         15                    1                    0
## 39                         44                    1                    1
```

```
## 40                  6                 0                 0
## 41                 14                 0                 0
## 42                 20                 0                 1
## 43                 23                 0                 1
## 44                 25                 0                 1
## 45                  2                 1                 0
## 46                 14                 1                 0
## 47                 20                 1                 0
## 48                 33                 0                 0
##    CBlog_exploded_exp_3 CBlog_exploded_exp_4 CBlog_exploded_exp_5
## 1                     1                    0                    0
## 2                     1                    0                    0
## 3                     0                    0                    1
## 4                     0                    0                    0
## 5                     1                    0                    1
## 6                     1                    0                    1
## 7                     0                    0                    0
## 8                     0                    0                    0
## 9                     1                    1                    1
## 10                    0                    0                    0
## 11                    0                    1                    0
## 12                    0                    0                    0
## 13                    0                    1                    1
## 14                    0                    0                    0
## 15                    0                    0                    0
## 16                    0                    0                    0
## 17                    0                    0                    0
## 18                    0                    0                    0
## 19                    0                    0                    0
## 20                    1                    0                    1
## 21                    0                    0                    0
## 22                    0                    0                    0
## 23                    0                    0                    1
## 24                    1                    1                    0
## 25                    0                    0                    0
## 26                    0                    0                    0
## 27                    0                    1                    0
## 28                    0                    0                    0
## 29                    0                    0                    0
## 30                    0                    0                    0
## 31                    0                    1                    1
## 32                    0                    0                    0
## 33                    1                    0                    0
## 34                    0                    0                    1
## 35                    0                    0                    0
## 36                    0                    1                    0
## 37                    1                    0                    1
## 38                    0                    1                    0
## 39                    0                    0                    0
## 40                    0                    0                    0
## 41                    1                    0                    0
## 42                    0                    0                    0
## 43                    0                    0                    0
## 44                    0                    0                    0
## 45                    0                    1                    0
```

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## 46                 0                 0                 0
## 47                 1                 1                 1
## 48                 0                 0                 0
##    CBlog_exploded_exp_6 CBlog_exploded_exp_7 CBlog_exploded_exp_8
## 1                  0                 0                 0
## 2                  1                 0                 0
## 3                  0                 0                 0
## 4                  0                 0                 0
## 5                  0                 0                 1
## 6                  1                 1                 1
## 7                  0                 0                 0
## 8                  0                 0                 0
## 9                  1                 0                 0
## 10                 0                 1                 0
## 11                 0                 0                 0
## 12                 0                 0                 0
## 13                 0                 0                 0
## 14                 1                 0                 1
## 15                 1                 0                 1
## 16                 0                 1                 0
## 17                 0                 0                 0
## 18                 0                 0                 0
## 19                 1                 0                 1
## 20                 0                 0                 0
## 21                 0                 0                 0
## 22                 0                 1                 0
## 23                 0                 1                 0
## 24                 0                 1                 0
## 25                 0                 1                 1
## 26                 0                 0                 0
## 27                 1                 1                 0
## 28                 1                 0                 0
## 29                 0                 0                 0
## 30                 0                 0                 1
## 31                 0                 0                 0
## 32                 1                 0                 0
## 33                 0                 0                 0
## 34                 0                 0                 0
## 35                 0                 0                 0
## 36                 0                 0                 0
## 37                 0                 1                 0
## 38                 0                 0                 0
## 39                 0                 0                 0
## 40                 0                 0                 0
## 41                 0                 0                 1
## 42                 0                 0                 0
## 43                 1                 0                 0
## 44                 1                 0                 1
## 45                 0                 0                 0
## 46                 0                 1                 0
## 47                 0                 1                 1
## 48                 0                 1                 0
##    CBlog_exploded_exp_9 CBlog_exploded_exp_10 CBlog_exploded_exp_11
## 1                  0                  0                  0
## 2                  0                  0                  0
```

```
## 3                0                0                0
## 4                0                0                0
## 5                0                1                0
## 6                0                1                0
## 7                0                1                0
## 8                0                0                0
## 9                1                1                0
## 10               1                0                0
## 11               0                1                0
## 12               0                0                0
## 13               0                0                1
## 14               1                0                0
## 15               0                1                0
## 16               0                0                0
## 17               1                1                1
## 18               1                1                1
## 19               0                1                0
## 20               1                0                0
## 21               0                0                0
## 22               0                0                0
## 23               0                1                0
## 24               0                1                0
## 25               0                0                0
## 26               0                0                0
## 27               0                0                1
## 28               0                0                0
## 29               0                0                0
## 30               1                1                0
## 31               1                0                0
## 32               1                0                1
## 33               0                0                0
## 34               0                0                0
## 35               1                0                0
## 36               0                0                0
## 37               0                0                0
## 38               0                1                0
## 39               1                0                1
## 40               0                0                0
## 41               0                0                0
## 42               0                0                0
## 43               0                0                0
## 44               0                0                0
## 45               0                0                0
## 46               0                0                0
## 47               0                0                0
## 48               0                1                1
##    CBlog_exploded_exp_12 CBlog_exploded_exp_13 CBlog_exploded_exp_14
## 1                0                1                0
## 2                0                0                0
## 3                0                0                0
## 4                0                0                1
## 5                0                0                0
## 6                0                0                1
## 7                0                0                0
## 8                1                0                0
```

```
## 9                  0                  1                  1
## 10                 1                  0                  1
## 11                 0                  0                  0
## 12                 0                  0                  1
## 13                 0                  1                  0
## 14                 0                  0                  0
## 15                 0                  1                  0
## 16                 0                  0                  0
## 17                 0                  1                  0
## 18                 1                  0                  1
## 19                 0                  0                  0
## 20                 0                  0                  0
## 21                 0                  0                  0
## 22                 0                  0                  0
## 23                 0                  0                  0
## 24                 0                  0                  0
## 25                 0                  0                  1
## 26                 1                  0                  1
## 27                 0                  0                  0
## 28                 0                  0                  0
## 29                 0                  0                  0
## 30                 0                  0                  1
## 31                 0                  0                  1
## 32                 0                  0                  1
## 33                 0                  0                  0
## 34                 0                  0                  1
## 35                 0                  0                  0
## 36                 0                  0                  0
## 37                 1                  0                  0
## 38                 1                  0                  0
## 39                 1                  0                  1
## 40                 1                  0                  0
## 41                 0                  0                  0
## 42                 0                  0                  0
## 43                 0                  0                  0
## 44                 1                  0                  0
## 45                 0                  0                  0
## 46                 1                  0                  1
## 47                 0                  0                  1
## 48                 0                  0                  0
##    CBlog_exploded_exp_15 CBlog_exploded_exp_16 CBlog_exploded_exp_17
## 1                  0                  1                  0
## 2                  0                  1                  0
## 3                  0                  1                  0
## 4                  0                  1                  0
## 5                  0                  0                  1
## 6                  1                  1                  0
## 7                  0                  0                  0
## 8                  1                  0                  0
## 9                  1                  0                  1
## 10                 0                  0                  1
## 11                 0                  1                  0
## 12                 0                  0                  0
## 13                 0                  0                  0
## 14                 1                  0                  0
```

```
## 15                0                0                0
## 16                0                1                1
## 17                0                0                0
## 18                0                1                0
## 19                0                0                1
## 20                0                1                1
## 21                0                0                1
## 22                0                0                1
## 23                1                0                1
## 24                0                0                1
## 25                0                1                1
## 26                1                0                0
## 27                0                0                1
## 28                0                1                1
## 29                0                0                0
## 30                0                0                1
## 31                1                0                0
## 32                0                0                0
## 33                0                0                0
## 34                0                0                0
## 35                0                0                0
## 36                0                0                0
## 37                0                0                0
## 38                0                0                0
## 39                0                0                0
## 40                0                1                0
## 41                0                1                0
## 42                0                0                0
## 43                0                0                0
## 44                1                0                0
## 45                0                0                1
## 46                0                0                0
## 47                0                0                0
## 48                0                0                0
##    CBlog_exploded_exp_18 CBlog_exploded_exp_19 CBlog_exploded_exp_20
## 1                 0                0                0
## 2                 1                0                0
## 3                 0                0                0
## 4                 0                0                0
## 5                 1                0                0
## 6                 0                0                1
## 7                 0                0                0
## 8                 0                0                0
## 9                 1                1                1
## 10                1                1                0
## 11                0                0                0
## 12                0                0                1
## 13                0                0                0
## 14                1                1                0
## 15                0                0                0
## 16                0                0                1
## 17                0                0                1
## 18                0                0                0
## 19                0                1                1
## 20                0                0                1
```

```
## 21                 0                 0                 0
## 22                 0                 0                 0
## 23                 0                 0                 0
## 24                 0                 0                 1
## 25                 0                 1                 0
## 26                 1                 1                 0
## 27                 0                 0                 1
## 28                 0                 0                 0
## 29                 0                 0                 0
## 30                 0                 0                 1
## 31                 1                 1                 0
## 32                 0                 1                 0
## 33                 0                 0                 0
## 34                 0                 1                 1
## 35                 0                 1                 0
## 36                 0                 0                 0
## 37                 0                 1                 0
## 38                 0                 1                 0
## 39                 0                 0                 0
## 40                 1                 0                 1
## 41                 1                 0                 0
## 42                 0                 0                 0
## 43                 1                 0                 0
## 44                 0                 0                 1
## 45                 1                 1                 0
## 46                 0                 1                 0
## 47                 0                 0                 1
## 48                 0                 0                 0
##    CBlog_exploded_exp_21 CBlog_exploded_exp_22 CBlog_exploded_exp_23
## 1                  0                 0                 0
## 2                  0                 0                 0
## 3                  0                 0                 0
## 4                  0                 0                 1
## 5                  0                 0                 1
## 6                  0                 0                 0
## 7                  0                 1                 1
## 8                  0                 0                 0
## 9                  1                 1                 0
## 10                 1                 0                 0
## 11                 0                 0                 0
## 12                 1                 0                 0
## 13                 0                 0                 0
## 14                 0                 1                 1
## 15                 0                 1                 0
## 16                 0                 0                 0
## 17                 0                 0                 0
## 18                 1                 0                 1
## 19                 0                 1                 0
## 20                 1                 0                 0
## 21                 0                 0                 0
## 22                 0                 1                 0
## 23                 1                 1                 1
## 24                 0                 0                 0
## 25                 0                 0                 1
## 26                 1                 0                 0
```

```
## 27                 0                 0                 1
## 28                 0                 1                 0
## 29                 0                 1                 0
## 30                 0                 1                 0
## 31                 1                 0                 0
## 32                 1                 0                 0
## 33                 0                 1                 0
## 34                 0                 0                 0
## 35                 0                 0                 0
## 36                 0                 0                 0
## 37                 0                 0                 1
## 38                 0                 0                 0
## 39                 0                 0                 1
## 40                 0                 0                 0
## 41                 0                 0                 0
## 42                 0                 0                 0
## 43                 0                 0                 0
## 44                 1                 0                 1
## 45                 0                 0                 0
## 46                 0                 0                 1
## 47                 0                 0                 0
## 48                 0                 0                 0
##    CBlog_exploded_exp_24 CBlog_exploded_exp_25 CBlog_exploded_exp_26
## 1                  0                 0                 0
## 2                  0                 1                 1
## 3                  0                 0                 1
## 4                  1                 0                 0
## 5                  1                 0                 1
## 6                  1                 0                 0
## 7                  0                 0                 0
## 8                  0                 0                 0
## 9                  1                 0                 0
## 10                 1                 0                 0
## 11                 0                 0                 1
## 12                 0                 1                 0
## 13                 1                 0                 0
## 14                 1                 0                 1
## 15                 1                 0                 1
## 16                 1                 0                 0
## 17                 1                 1                 0
## 18                 1                 0                 0
## 19                 0                 0                 1
## 20                 0                 0                 0
## 21                 0                 0                 0
## 22                 0                 0                 0
## 23                 0                 0                 0
## 24                 1                 1                 0
## 25                 0                 0                 1
## 26                 0                 0                 0
## 27                 1                 0                 1
## 28                 1                 0                 0
## 29                 0                 0                 0
## 30                 0                 0                 0
## 31                 0                 0                 0
## 32                 0                 0                 0
```

```
## 33                  1                  0                  0
## 34                  1                  0                  0
## 35                  0                  0                  0
## 36                  0                  0                  0
## 37                  0                  1                  0
## 38                  0                  1                  0
## 39                  0                  0                  1
## 40                  1                  0                  0
## 41                  0                  0                  0
## 42                  0                  0                  0
## 43                  1                  0                  0
## 44                  0                  0                  0
## 45                  1                  0                  1
## 46                  0                  1                  1
## 47                  1                  0                  0
## 48                  0                  0                  0
##    CBlog_exploded_exp_27 CBlog_exploded_exp_28 CBlog_exploded_exp_29
## 1                      0                     0                     0
## 2                      0                     0                     0
## 3                      1                     0                     1
## 4                      0                     0                     0
## 5                      0                     1                     1
## 6                      1                     0                     0
## 7                      0                     0                     1
## 8                      0                     0                     0
## 9                      1                     1                     1
## 10                     1                     0                     0
## 11                     0                     0                     0
## 12                     0                     0                     0
## 13                     0                     1                     0
## 14                     0                     0                     1
## 15                     0                     0                     0
## 16                     1                     0                     0
## 17                     0                     1                     1
## 18                     0                     0                     1
## 19                     0                     1                     0
## 20                     0                     0                     0
## 21                     0                     0                     0
## 22                     0                     0                     0
## 23                     1                     0                     1
## 24                     1                     1                     0
## 25                     0                     0                     0
## 26                     1                     0                     0
## 27                     0                     0                     0
## 28                     0                     0                     0
## 29                     0                     0                     0
## 30                     0                     0                     0
## 31                     0                     1                     0
## 32                     1                     0                     1
## 33                     0                     0                     0
## 34                     0                     0                     0
## 35                     0                     0                     0
## 36                     0                     0                     1
## 37                     0                     0                     0
## 38                     1                     1                     0
```

```
## 39                  0                  0                  0
## 40                  0                  0                  0
## 41                  0                  0                  0
## 42                  0                  0                  1
## 43                  1                  0                  0
## 44                  0                  1                  0
## 45                  0                  1                  1
## 46                  0                  1                  1
## 47                  0                  0                  0
## 48                  0                  0                  1
##    CBlog_exploded_exp_30 VRlog_exploded_exp_1 VRlog_exploded_exp_2
## 1                      1                    0                    0
## 2                      0                    0                    1
## 3                      0                    0                    1
## 4                      1                    1                    0
## 5                      1                    0                    0
## 6                      0                    0                    0
## 7                      0                    0                    0
## 8                      0                    0                    0
## 9                      1                    0                    0
## 10                     1                    0                    0
## 11                     0                    0                    0
## 12                     1                    1                    0
## 13                     0                    0                    1
## 14                     1                    0                    0
## 15                     0                    0                    0
## 16                     0                    0                    0
## 17                     0                    0                    0
## 18                     1                    0                    0
## 19                     0                    0                    0
## 20                     0                    1                    0
## 21                     0                    0                    0
## 22                     0                    0                    0
## 23                     0                    0                    1
## 24                     0                    1                    0
## 25                     1                    0                    0
## 26                     0                    0                    1
## 27                     0                    0                    0
## 28                     0                    0                    0
## 29                     0                    0                    0
## 30                     1                    0                    0
## 31                     0                    1                    1
## 32                     0                    0                    1
## 33                     0                    0                    1
## 34                     0                    0                    1
## 35                     0                    0                    0
## 36                     1                    0                    0
## 37                     0                    1                    0
## 38                     0                    0                    0
## 39                     0                    1                    0
## 40                     0                    0                    0
## 41                     0                    0                    0
## 42                     0                    1                    1
## 43                     0                    0                    0
## 44                     0                    0                    0
```

```
## 45                 1                 0                 0
## 46                 0                 0                 0
## 47                 0                 1                 0
## 48                 0                 0                 1
##    VRlog_exploded_exp_3 VRlog_exploded_exp_4 VRlog_exploded_exp_5
## 1                     0                    1                    1
## 2                     0                    0                    1
## 3                     0                    0                    0
## 4                     0                    0                    0
## 5                     0                    0                    1
## 6                     0                    1                    1
## 7                     0                    0                    0
## 8                     0                    0                    0
## 9                     1                    0                    0
## 10                    0                    0                    0
## 11                    0                    0                    0
## 12                    0                    1                    0
## 13                    0                    0                    0
## 14                    0                    0                    0
## 15                    0                    0                    0
## 16                    0                    0                    1
## 17                    0                    0                    1
## 18                    1                    0                    0
## 19                    1                    1                    0
## 20                    0                    0                    1
## 21                    0                    0                    0
## 22                    0                    0                    0
## 23                    0                    0                    1
## 24                    0                    0                    0
## 25                    0                    0                    0
## 26                    0                    1                    0
## 27                    0                    0                    0
## 28                    0                    1                    0
## 29                    0                    0                    0
## 30                    0                    1                    0
## 31                    1                    0                    0
## 32                    0                    0                    0
## 33                    0                    0                    0
## 34                    0                    0                    0
## 35                    0                    0                    0
## 36                    0                    0                    0
## 37                    0                    0                    1
## 38                    0                    1                    0
## 39                    0                    0                    0
## 40                    0                    0                    0
## 41                    0                    0                    0
## 42                    0                    0                    0
## 43                    1                    0                    0
## 44                    0                    0                    0
## 45                    1                    0                    0
## 46                    0                    1                    0
## 47                    0                    0                    1
## 48                    0                    0                    0
##    VRlog_exploded_exp_6 VRlog_exploded_exp_7 VRlog_exploded_exp_8
## 1                     0                    0                    0
```

```
## 2                1                0                0
## 3                0                0                1
## 4                0                0                0
## 5                0                0                0
## 6                0                0                0
## 7                0                1                0
## 8                0                0                0
## 9                0                1                1
## 10               1                0                0
## 11               0                0                0
## 12               0                0                0
## 13               0                0                0
## 14               0                0                0
## 15               0                1                0
## 16               0                0                1
## 17               0                0                1
## 18               0                1                0
## 19               1                0                0
## 20               0                0                0
## 21               0                0                0
## 22               0                0                0
## 23               0                0                1
## 24               0                0                1
## 25               0                1                0
## 26               0                0                1
## 27               0                0                0
## 28               0                0                0
## 29               0                0                0
## 30               0                0                1
## 31               0                0                0
## 32               0                0                0
## 33               0                0                0
## 34               0                1                0
## 35               1                0                0
## 36               0                1                0
## 37               0                0                0
## 38               0                0                0
## 39               0                0                0
## 40               0                0                0
## 41               0                0                0
## 42               0                0                1
## 43               0                0                0
## 44               0                1                0
## 45               1                0                0
## 46               0                1                1
## 47               0                0                0
## 48               0                0                0
##    VRlog_exploded_exp_9 VRlog_exploded_exp_10 VRlog_exploded_exp_11
## 1                0                0                0
## 2                0                1                0
## 3                1                0                1
## 4                0                0                0
## 5                0                1                1
## 6                0                1                0
## 7                1                0                0
```

```
## 8                0                0                0
## 9                0                1                1
## 10               1                0                0
## 11               0                0                0
## 12               0                1                0
## 13               0                1                0
## 14               0                0                1
## 15               0                1                1
## 16               1                0                0
## 17               1                0                0
## 18               0                0                0
## 19               0                0                0
## 20               0                0                0
## 21               0                0                0
## 22               0                0                0
## 23               0                0                0
## 24               0                0                0
## 25               1                0                1
## 26               0                0                0
## 27               0                0                0
## 28               0                0                1
## 29               0                0                0
## 30               0                0                0
## 31               0                0                1
## 32               0                0                0
## 33               1                0                0
## 34               1                1                0
## 35               0                0                0
## 36               0                0                1
## 37               0                0                0
## 38               0                0                0
## 39               0                0                0
## 40               0                0                0
## 41               0                0                0
## 42               0                1                0
## 43               1                0                0
## 44               0                0                0
## 45               1                0                0
## 46               0                0                1
## 47               0                0                0
## 48               0                0                1
##    VRlog_exploded_exp_12 VRlog_exploded_exp_13 VRlog_exploded_exp_14
## 1                0                0                0
## 2                0                0                0
## 3                0                0                0
## 4                1                0                1
## 5                1                1                0
## 6                1                0                0
## 7                0                0                0
## 8                0                0                0
## 9                0                1                1
## 10               1                0                0
## 11               0                0                0
## 12               0                0                0
## 13               1                1                0
```

```
## 14                0                0                0
## 15                0                0                0
## 16                0                0                1
## 17                0                0                1
## 18                0                1                1
## 19                0                0                1
## 20                0                0                0
## 21                0                0                1
## 22                0                0                0
## 23                0                0                1
## 24                0                0                0
## 25                0                0                1
## 26                0                0                0
## 27                0                1                1
## 28                0                0                0
## 29                0                0                0
## 30                1                0                1
## 31                0                0                0
## 32                0                0                0
## 33                0                0                0
## 34                0                0                0
## 35                0                0                0
## 36                0                1                0
## 37                0                0                1
## 38                0                1                0
## 39                0                1                1
## 40                0                0                0
## 41                0                0                0
## 42                1                0                0
## 43                0                0                0
## 44                0                0                0
## 45                0                1                1
## 46                1                0                1
## 47                0                1                1
## 48                0                0                0
##    VRlog_exploded_exp_15 VRlog_exploded_exp_16 VRlog_exploded_exp_17
## 1                 0                0                0
## 2                 0                0                0
## 3                 1                1                0
## 4                 0                0                0
## 5                 1                0                0
## 6                 0                1                1
## 7                 0                0                0
## 8                 0                0                0
## 9                 0                0                0
## 10                1                1                0
## 11                0                0                0
## 12                0                0                0
## 13                0                0                1
## 14                0                0                1
## 15                0                0                1
## 16                1                0                1
## 17                0                0                0
## 18                1                0                1
## 19                0                1                0
```

```
## 20                  0                  0                  0
## 21                  0                  1                  0
## 22                  0                  0                  0
## 23                  0                  1                  1
## 24                  0                  0                  0
## 25                  0                  1                  0
## 26                  0                  1                  0
## 27                  0                  0                  0
## 28                  1                  1                  0
## 29                  0                  0                  0
## 30                  0                  1                  0
## 31                  0                  0                  0
## 32                  1                  0                  0
## 33                  0                  0                  0
## 34                  0                  1                  0
## 35                  0                  1                  1
## 36                  0                  0                  0
## 37                  1                  0                  0
## 38                  0                  0                  1
## 39                  0                  0                  0
## 40                  0                  1                  0
## 41                  0                  0                  0
## 42                  1                  1                  0
## 43                  0                  0                  0
## 44                  0                  1                  1
## 45                  0                  1                  0
## 46                  0                  1                  0
## 47                  0                  0                  0
## 48                  1                  0                  1
##    VRlog_exploded_exp_18 VRlog_exploded_exp_19 VRlog_exploded_exp_20
## 1                   0                  1                  1
## 2                   0                  1                  0
## 3                   1                  1                  1
## 4                   0                  0                  1
## 5                   1                  0                  0
## 6                   0                  0                  0
## 7                   0                  1                  0
## 8                   0                  0                  0
## 9                   1                  0                  0
## 10                  0                  1                  0
## 11                  0                  0                  0
## 12                  0                  0                  0
## 13                  0                  1                  0
## 14                  0                  0                  0
## 15                  0                  1                  0
## 16                  0                  0                  0
## 17                  0                  0                  0
## 18                  0                  1                  1
## 19                  0                  0                  0
## 20                  0                  0                  1
## 21                  0                  0                  0
## 22                  0                  0                  0
## 23                  0                  0                  0
## 24                  0                  0                  0
## 25                  0                  0                  1
```

```
## 26                 1                 1                 0
## 27                 0                 0                 0
## 28                 0                 0                 0
## 29                 0                 0                 0
## 30                 0                 1                 0
## 31                 1                 0                 0
## 32                 0                 0                 1
## 33                 0                 0                 1
## 34                 0                 0                 0
## 35                 0                 0                 0
## 36                 0                 0                 1
## 37                 0                 0                 1
## 38                 0                 0                 0
## 39                 0                 0                 0
## 40                 0                 0                 0
## 41                 0                 0                 0
## 42                 1                 0                 1
## 43                 0                 0                 1
## 44                 1                 0                 0
## 45                 0                 0                 0
## 46                 1                 0                 0
## 47                 0                 0                 1
## 48                 0                 0                 0
##    VRlog_exploded_exp_21 VRlog_exploded_exp_22 VRlog_exploded_exp_23
## 1                  0                 1                 1
## 2                  0                 0                 0
## 3                  0                 1                 0
## 4                  0                 1                 0
## 5                  1                 0                 0
## 6                  1                 0                 1
## 7                  1                 0                 0
## 8                  1                 0                 0
## 9                  0                 1                 0
## 10                 0                 0                 1
## 11                 0                 0                 0
## 12                 0                 0                 0
## 13                 0                 1                 0
## 14                 1                 0                 0
## 15                 0                 0                 0
## 16                 0                 0                 0
## 17                 0                 1                 0
## 18                 0                 0                 0
## 19                 0                 0                 0
## 20                 0                 0                 0
## 21                 0                 0                 0
## 22                 0                 0                 0
## 23                 1                 1                 0
## 24                 0                 0                 0
## 25                 1                 0                 0
## 26                 0                 0                 0
## 27                 0                 0                 0
## 28                 0                 0                 0
## 29                 0                 0                 0
## 30                 0                 0                 0
## 31                 0                 0                 0
```

```
## 32                    0                    0                    0
## 33                    0                    0                    1
## 34                    0                    0                    0
## 35                    0                    1                    0
## 36                    0                    0                    0
## 37                    0                    1                    0
## 38                    0                    0                    0
## 39                    0                    1                    0
## 40                    0                    0                    0
## 41                    0                    0                    0
## 42                    0                    0                    0
## 43                    0                    0                    0
## 44                    0                    0                    0
## 45                    0                    0                    0
## 46                    0                    1                    0
## 47                    0                    0                    0
## 48                    0                    0                    0
##    VRlog_exploded_exp_24 VRlog_exploded_exp_25 VRlog_exploded_exp_26
## 1                     0                     0                     0
## 2                     0                     0                     0
## 3                     0                     0                     1
## 4                     0                     1                     0
## 5                     0                     0                     1
## 6                     0                     0                     0
## 7                     0                     1                     0
## 8                     1                     0                     0
## 9                     1                     1                     0
## 10                    1                     0                     1
## 11                    0                     0                     1
## 12                    0                     1                     0
## 13                    0                     0                     0
## 14                    0                     0                     0
## 15                    1                     0                     0
## 16                    0                     0                     0
## 17                    0                     1                     1
## 18                    0                     0                     0
## 19                    1                     0                     0
## 20                    0                     0                     0
## 21                    0                     0                     0
## 22                    0                     0                     1
## 23                    0                     1                     1
## 24                    0                     0                     0
## 25                    1                     0                     0
## 26                    0                     0                     0
## 27                    0                     0                     1
## 28                    0                     1                     0
## 29                    0                     0                     0
## 30                    0                     0                     0
## 31                    0                     1                     0
## 32                    1                     0                     0
## 33                    0                     0                     0
## 34                    0                     0                     0
## 35                    0                     0                     1
## 36                    0                     0                     1
## 37                    0                     0                     1
```

```
## 38                 1                 0                 0
## 39                 1                 0                 1
## 40                 0                 1                 0
## 41                 0                 0                 0
## 42                 1                 0                 0
## 43                 0                 0                 0
## 44                 0                 0                 0
## 45                 1                 0                 0
## 46                 0                 0                 0
## 47                 1                 0                 0
## 48                 1                 1                 0
##    VRlog_exploded_exp_27 VRlog_exploded_exp_28 VRlog_exploded_exp_29
## 1                      0                     0                     1
## 2                      0                     0                     1
## 3                      0                     1                     1
## 4                      0                     1                     0
## 5                      0                     0                     0
## 6                      1                     0                     0
## 7                      0                     0                     0
## 8                      0                     0                     0
## 9                      0                     0                     0
## 10                     0                     0                     0
## 11                     0                     0                     0
## 12                     0                     0                     0
## 13                     0                     0                     0
## 14                     0                     0                     1
## 15                     0                     0                     0
## 16                     0                     0                     0
## 17                     0                     0                     0
## 18                     0                     1                     0
## 19                     1                     1                     0
## 20                     0                     1                     0
## 21                     0                     0                     0
## 22                     0                     0                     0
## 23                     1                     0                     0
## 24                     0                     0                     0
## 25                     1                     1                     1
## 26                     1                     0                     0
## 27                     1                     0                     0
## 28                     1                     0                     0
## 29                     1                     1                     0
## 30                     0                     0                     0
## 31                     1                     0                     1
## 32                     0                     0                     0
## 33                     0                     0                     0
## 34                     0                     0                     0
## 35                     0                     1                     0
## 36                     0                     1                     0
## 37                     0                     1                     0
## 38                     0                     0                     1
## 39                     0                     1                     1
## 40                     0                     0                     0
## 41                     0                     0                     0
## 42                     0                     0                     1
## 43                     0                     0                     1
```

```
## 44                 0                 1                 0
## 45                 0                 0                 0
## 46                 0                 0                 0
## 47                 0                 0                 0
## 48                 0                 0                 1
##    VRlog_exploded_exp_30 VR_abs_pump VR_abs_exp VR_abs_pump_mean CB_abs_pump
## 1                      0         885         7         29.500000         436
## 2                      1         492         7         16.400000         839
## 3                      1         864        14         28.800000         979
## 4                      0         412         7         13.733333         591
## 5                      0        1056         9         35.200000        1077
## 6                      1         914        10         30.466667        1484
## 7                      1         525         6         17.500000         663
## 8                      0         664         2         22.133333         478
## 9                      0         987        11         32.900000        1228
## 10                     0        1395         9         46.500000         914
## 11                     1         414         2         13.800000         566
## 12                     0         327         4         10.900000         515
## 13                     0         669         7         22.300000         656
## 14                     0         472         4         15.733333        1106
## 15                     0         561         6         18.700000         859
## 16                     0         611         6         20.366667         758
## 17                     0         823         7         27.433333        1386
## 18                     0         913         9         30.433333         730
## 19                     0         997         8         33.233333         854
## 20                     0        1054         4         35.133333        1055
## 21                     0         451         2         15.033333         321
## 22                     0         222         1          7.400000         277
## 23                     0        1171        11         39.033333        1338
## 24                     1         395         3         13.166667         722
## 25                     0        1036        11         34.533333         467
## 26                     1         467         8         15.566667         884
## 27                     0         625         4         20.833333         827
## 28                     0         749         6         24.966667         714
## 29                     0         236         2          7.866667         409
## 30                     1         599         7         19.966667         950
## 31                     0         690         8         23.000000         847
## 32                     0         611         4         20.366667         856
## 33                     0         481         4         16.033333         325
## 34                     0         761         5         25.366667        1030
## 35                     0         701         6         23.366667         682
## 36                     0         209         6          6.966667         444
## 37                     0         943         8         31.433333         993
## 38                     1         763         6         25.433333        1126
## 39                     0         797         8         26.566667         770
## 40                     0         137         2          4.566667         336
## 41                     0         316         0         10.533333         428
## 42                     0         582        11         19.400000         496
## 43                     0         359         4         11.966667         506
## 44                     0         708         5         23.600000         868
## 45                     1         451         8         15.033333        1165
## 46                     1        1151        10         38.366667         790
## 47                     0         715         6         23.833333         643
## 48                     0         624         7         20.800000         599
##    CB_abs_exp CB_abs_pump_mean
```

```
## 1          4       14.533333
## 2          6       27.966667
## 3          5       32.633333
## 4          5       19.700000
## 5         12        35.900000
## 6         13        49.466667
## 7          4       22.100000
## 8          3       15.933333
## 9         21        40.933333
## 10         12        30.466667
## 11         4        18.866667
## 12         5        17.166667
## 13         7        21.866667
## 14         12        36.866667
## 15         8        28.633333
## 16         8        25.266667
## 17         9        46.200000
## 18         11        24.333333
## 19         9        28.466667
## 20         7        35.166667
## 21         1        10.700000
## 22         3         9.233333
## 23         10        44.600000
## 24         10        24.066667
## 25         10        15.566667
## 26         7        29.466667
## 27         9        27.566667
## 28         5        23.800000
## 29         2        13.633333
## 30         8        31.666667
## 31         10        28.233333
## 32         8        28.533333
## 33         3        10.833333
## 34         6        34.333333
## 35         3        22.733333
## 36         3        14.800000
## 37         7        33.100000
## 38         8        37.533333
## 39         8        25.666667
## 40         5        11.200000
## 41         4        14.266667
## 42         2        16.533333
## 43         5        16.866667
## 44         9        28.933333
## 45         10        38.833333
## 46         10        26.333333
## 47         9        21.433333
## 48         4        19.966667
```

#Dataset for absolute pumps (used for normality test)

```
abs <- d1_abs %>%
  select(VR_abs_pump, VR_abs_exp, VR_abs_pump_mean, CB_abs_pump, CB_abs_exp, CB_abs_p
ump_mean)
abs
```

```
##    VR_abs_pump VR_abs_exp VR_abs_pump_mean CB_abs_pump CB_abs_exp
## 1          885         7        29.500000         436          4
## 2          492         7        16.400000         839          6
## 3          864        14        28.800000         979          5
## 4          412         7        13.733333         591          5
## 5         1056         9        35.200000        1077         12
## 6          914        10        30.466667        1484         13
## 7          525         6        17.500000         663          4
## 8          664         2        22.133333         478          3
## 9          987        11        32.900000        1228         21
## 10        1395         9        46.500000         914         12
## 11         414         2        13.800000         566          4
## 12         327         4        10.900000         515          5
## 13         669         7        22.300000         656          7
## 14         472         4        15.733333        1106         12
## 15         561         6        18.700000         859          8
## 16         611         6        20.366667         758          8
## 17         823         7        27.433333        1386          9
## 18         913         9        30.433333         730         11
## 19         997         8        33.233333         854          9
## 20        1054         4        35.133333        1055          7
## 21         451         2        15.033333         321          1
## 22         222         1         7.400000         277          3
## 23        1171        11        39.033333        1338         10
## 24         395         3        13.166667         722         10
## 25        1036        11        34.533333         467         10
## 26         467         8        15.566667         884          7
## 27         625         4        20.833333         827          9
## 28         749         6        24.966667         714          5
## 29         236         2         7.866667         409          2
## 30         599         7        19.966667         950          8
## 31         690         8        23.000000         847         10
## 32         611         4        20.366667         856          8
## 33         481         4        16.033333         325          3
## 34         761         5        25.366667        1030          6
## 35         701         6        23.366667         682          3
## 36         209         6         6.966667         444          3
## 37         943         8        31.433333         993          7
## 38         763         6        25.433333        1126          8
## 39         797         8        26.566667         770          8
## 40         137         2         4.566667         336          5
## 41         316         0        10.533333         428          4
## 42         582        11        19.400000         496          2
## 43         359         4        11.966667         506          5
## 44         708         5        23.600000         868          9
## 45         451         8        15.033333        1165         10
## 46        1151        10        38.366667         790         10
## 47         715         6        23.833333         643          9
## 48         624         7        20.800000         599          4
##    CB_abs_pump_mean
## 1         14.533333
## 2         27.966667
## 3         32.633333
## 4         19.700000
## 5         35.900000
```

```
## 6       49.466667
## 7       22.100000
## 8       15.933333
## 9       40.933333
## 10      30.466667
## 11      18.866667
## 12      17.166667
## 13      21.866667
## 14      36.866667
## 15      28.633333
## 16      25.266667
## 17      46.200000
## 18      24.333333
## 19      28.466667
## 20      35.166667
## 21      10.700000
## 22       9.233333
## 23      44.600000
## 24      24.066667
## 25      15.566667
## 26      29.466667
## 27      27.566667
## 28      23.800000
## 29      13.633333
## 30      31.666667
## 31      28.233333
## 32      28.533333
## 33      10.833333
## 34      34.333333
## 35      22.733333
## 36      14.800000
## 37      33.100000
## 38      37.533333
## 39      25.666667
## 40      11.200000
## 41      14.266667
## 42      16.533333
## 43      16.866667
## 44      28.933333
## 45      38.833333
## 46      26.333333
## 47      21.433333
## 48      19.966667
```

Normality test for absolute pumps

```
shapiro.test(abs$VR_abs_pump)

##
##  Shapiro-Wilk normality test
##
## data:  abs$VR_abs_pump
## W = 0.98598, p-value = 0.8301
```

```
shapiro.test(abs$VR_abs_exp)

##
##  Shapiro-Wilk normality test
##
## data:  abs$VR_abs_exp
## W = 0.97843, p-value = 0.5151

shapiro.test(abs$VR_abs_pump_mean)

##
##  Shapiro-Wilk normality test
##
## data:  abs$VR_abs_pump_mean
## W = 0.98598, p-value = 0.8301

shapiro.test(abs$CB_abs_pump)

##
##  Shapiro-Wilk normality test
##
## data:  abs$CB_abs_pump
## W = 0.97506, p-value = 0.393

shapiro.test(abs$CB_abs_exp)

##
##  Shapiro-Wilk normality test
##
## data:  abs$CB_abs_exp
## W = 0.92729, p-value = 0.005424

shapiro.test(abs$CB_abs_pump_mean)

##
##  Shapiro-Wilk normality test
##
## data:  abs$CB_abs_pump_mean
## W = 0.97506, p-value = 0.393
```

New dataset with only columns needed for correlations

```
df3 <-
  d1_abs %>%
  select(Age, Gender, BISTotal, EVTotal, BCTotal, BSSSTotal, AUDITTotal, DrugTotal, CigarettesT
otal, SexTotal, StealTotal,GABSTotal,VR_abs_pump, VR_abs_exp,  CB_abs_pump, CB_abs_exp)
print(df3)

##    Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal DrugTotal
## 1   28      1       29       8      26        23          0       0.0
## 2   19      1       26      11       18        19          5       0.0
## 3   25      0       17      11       19        26          5       0.0
## 4   25      0       28      11       20        32          3       0.0
## 5   25      0       15      13       26        25          3       0.0
## 6   23      1       19      10       24        25          5       1.0
## 7   25      0       22       4       21        20          1       0.0
## 8   27      1       27       6       15        19          1       1.0
```

```
## 9   26     0     34     13     14      32      12     35.0
## 10  20     1     42     13     19      38      11      0.0
## 11  20     1     18      9     20      32       3      0.0
## 12  18     1     22      7     18      18       5      0.0
## 13  19     1     30      8     15      32      18      0.0
## 14  29     0     19      5     16      18       6      0.0
## 15  19     1     22      9     24      23       1      0.0
## 16  22     1     30      5     23      18       7      0.0
## 17  19     1     29      9     19      36      21      0.0
## 18  20     1     20      8     19      26       9      0.0
## 19  24     0     28     12     21      37       8      7.0
## 20  20     0     17      6     24      25       2      0.0
## 21  26     0     30     13     24      19       5      0.0
## 22  26     1     21      9     24      18       5      0.0
## 23  22     0     21     14     19      31      14      0.2
## 24  20     1     38     10     19      22       5      1.0
## 25  32     0     20     12     28      29       5      0.0
## 26  20     1     21      8     18      16       5      0.0
## 27  19     1     27     11     22      28       5      0.0
## 28  20     1     19     11     21      21       1      0.0
## 29  19     1     36      9     14      24      10      1.0
## 30  18     1     25      9     19      29       7      0.0
## 31  19     0     15     10     29      30       9      9.0
## 32  22     1     36      8     18      27       6      2.0
## 33  21     1     26     12     18      34       7     15.0
## 34  19     1     24     10     23      30       6      2.0
## 35  18     1     22      9     22      33       7      2.0
## 36  19     1     42      7     18      24       6      0.0
## 37  19     1     22      9     20      22      11      0.0
## 38  19     1     24      9     20      26       5      0.0
## 39  24     0     29     10     14      33      21      0.0
## 40  19     1     21      7     20      19       9      0.0
## 41  18     1     13     10     19      20       5      0.0
## 42  23     1     21      8     18      24       4      1.0
## 43  19     1     21     12     18      25       2      0.0
## 44  21     1     25      6     17      27       5      0.0
## 45  18     1     43      6     20      28       6      0.0
## 46  21     1     24     11     16      23       8      0.0
## 47  19     1     29     11     24      27       7      0.0
## 48  24     1     30     11     22      25       5      0.0
##    CigarettesTotal SexTotal StealTotal GABSTotal VR_abs_pump VR_abs_exp
## 1               0       0         0        7.0        885         7
## 2               0       0         0        6.2        492         7
## 3               0       0         0        8.4        864        14
## 4               0       0         0        5.2        412         7
## 5               0       0         0        9.0       1056         9
## 6               0       0         1        3.2        914        10
## 7               0       0         0        6.6        525         6
## 8               0       1         0        4.6        664         2
## 9               0       1         1        5.6        987        11
## 10              0       2         3        4.8       1395         9
## 11              0       1         0        1.4        414         2
## 12              0       0         0        5.6        327         4
## 13              0       1         0        6.2        669         7
## 14              0       0         0        4.8        472         4
```

```
## 15          0     0     0   7.0     561      6
## 16          0     0     0   7.2     611      6
## 17          0     2     0   8.6     823      7
## 18          0     2     0   1.2     913      9
## 19          0     0     0   4.4     997      8
## 20          0     1     0   8.2    1054      4
## 21          0     0     0   7.6     451      2
## 22          0     0     0   6.6     222      1
## 23          0     2     0   7.4    1171     11
## 24          0     1     0   2.4     395      3
## 25          0     1     0   6.0    1036     11
## 26          0     0     0   4.6     467      8
## 27          0     0     0   7.8     625      4
## 28          0     0     0   6.4     749      6
## 29          0     0     0   5.4     236      2
## 30          0     0     0   6.8     599      7
## 31          0     0     0   6.2     690      8
## 32          2     0     1   4.4     611      4
## 33          1     3     1   7.8     481      4
## 34          2     1     0   6.6     761      5
## 35          4     1     3   4.8     701      6
## 36          0     0     1   6.0     209      6
## 37          0     0     0   6.0     943      8
## 38          0     0     0   5.4     763      6
## 39          0     3     0   5.6     797      8
## 40          0     1     0   2.6     137      2
## 41          0     0     0   6.6     316      0
## 42          0     1     0   4.4     582     11
## 43          0     0     0   1.4     359      4
## 44          0     1     0   5.4     708      5
## 45          0     0     0   7.0     451      8
## 46          0     0     1   4.6    1151     10
## 47          0     0     0   6.2     715      6
## 48          0     1     0   1.0     624      7
##    CB_abs_pump CB_abs_exp
## 1          436          4
## 2          839          6
## 3          979          5
## 4          591          5
## 5         1077         12
## 6         1484         13
## 7          663          4
## 8          478          3
## 9         1228         21
## 10         914         12
## 11         566          4
## 12         515          5
## 13         656          7
## 14        1106         12
## 15         859          8
## 16         758          8
## 17        1386          9
## 18         730         11
## 19         854          9
## 20        1055          7
```

```
## 21        321         1
## 22        277         3
## 23       1338        10
## 24        722        10
## 25        467        10
## 26        884         7
## 27        827         9
## 28        714         5
## 29        409         2
## 30        950         8
## 31        847        10
## 32        856         8
## 33        325         3
## 34       1030         6
## 35        682         3
## 36        444         3
## 37        993         7
## 38       1126         8
## 39        770         8
## 40        336         5
## 41        428         4
## 42        496         2
## 43        506         5
## 44        868         9
## 45       1165        10
## 46        790        10
## 47        643         9
## 48        599         4
```

Questionnaire x Absolute Pump correlations

```
rcorr(as.matrix(df3),type = "spearman")
```

```
##                 Age Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
## Age            1.00  -0.55    -0.04    0.16    0.07     -0.09      -0.25
## Gender        -0.55   1.00     0.24   -0.29   -0.16     -0.19      -0.02
## BISTotal      -0.04   0.24     1.00   -0.01   -0.28      0.21       0.33
## EVTotal        0.16  -0.29    -0.01    1.00    0.16      0.41       0.13
## BCTotal        0.07  -0.16    -0.28    0.16    1.00     -0.01      -0.32
## BSSSTotal     -0.09  -0.19     0.21    0.41   -0.01      1.00       0.44
## AUDITTotal    -0.25  -0.02     0.33    0.13   -0.32      0.44       1.00
## DrugTotal      0.08  -0.08     0.11    0.18   -0.11      0.32       0.24
## CigarettesTotal -0.14   0.18     0.10    0.03    0.00      0.31       0.13
## SexTotal       0.10  -0.01     0.09    0.08   -0.24      0.49       0.35
## StealTotal     0.01   0.15     0.26    0.18   -0.20      0.30       0.28
## GABSTotal     -0.05  -0.26    -0.04    0.10    0.33      0.04      -0.03
## VR_abs_pump    0.27  -0.31    -0.12    0.35    0.19      0.44       0.24
## VR_abs_exp     0.21  -0.31    -0.06    0.32    0.03      0.36       0.28
## CB_abs_pump   -0.08  -0.21    -0.08    0.05    0.01      0.29       0.24
## CB_abs_exp     0.05  -0.23    -0.03    0.20    0.05      0.30       0.36
##                DrugTotal CigarettesTotal SexTotal StealTotal GABSTotal
## Age                 0.08          -0.14     0.10       0.01     -0.05
## Gender             -0.08           0.18    -0.01       0.15     -0.26
```

```
## BISTotal           0.11          0.10    0.09      0.26    -0.04
## EVTotal            0.18          0.03    0.08      0.18     0.10
## BCTotal           -0.11          0.00   -0.24     -0.20     0.33
## BSSSTotal          0.32          0.31    0.49      0.30     0.04
## AUDITTotal         0.24          0.13    0.35      0.28    -0.03
## DrugTotal          1.00          0.54    0.24      0.39    -0.20
## CigarettesTotal    0.54          1.00    0.22      0.48     0.01
## SexTotal           0.24          0.22    1.00      0.15    -0.15
## StealTotal         0.39          0.48    0.15      1.00    -0.20
## GABSTotal         -0.20          0.01   -0.15     -0.20     1.00
## VR_abs_pump        0.11          0.00    0.28      0.19     0.16
## VR_abs_exp         0.04         -0.19    0.11      0.17     0.02
## CB_abs_pump        0.07         -0.02    0.01      0.08     0.17
## CB_abs_exp         0.02         -0.20    0.08      0.12    -0.02
##                VR_abs_pump VR_abs_exp CB_abs_pump CB_abs_exp
## Age                   0.27       0.21       -0.08       0.05
## Gender               -0.31      -0.31       -0.21      -0.23
## BISTotal             -0.12      -0.06       -0.08      -0.03
## EVTotal               0.35       0.32        0.05       0.20
## BCTotal               0.19       0.03        0.01       0.05
## BSSSTotal             0.44       0.36        0.29       0.30
## AUDITTotal            0.24       0.28        0.24       0.36
## DrugTotal             0.11       0.04        0.07       0.02
## CigarettesTotal       0.00      -0.19       -0.02      -0.20
## SexTotal              0.28       0.11        0.01       0.08
## StealTotal            0.19       0.17        0.08       0.12
## GABSTotal             0.16       0.02        0.17      -0.02
## VR_abs_pump           1.00       0.67        0.57       0.57
## VR_abs_exp            0.67       1.00        0.50       0.51
## CB_abs_pump           0.57       0.50        1.00       0.72
## CB_abs_exp            0.57       0.51        0.72       1.00
##
## n= 48
##
##
## P
##                Age    Gender BISTotal EVTotal BCTotal BSSSTotal AUDITTotal
## Age                   0.0000 0.7649   0.2926  0.6281  0.5223    0.0861
## Gender         0.0000        0.1067   0.0429  0.2666  0.1921    0.9078
## BISTotal       0.7649 0.1067         0.9506  0.0523  0.1602    0.0232
## EVTotal        0.2926 0.0429 0.9506          0.2872  0.0041    0.3707
## BCTotal        0.6281 0.2666 0.0523   0.2872         0.9363    0.0247
## BSSSTotal      0.5223 0.1921 0.1602   0.0041  0.9363           0.0019
## AUDITTotal     0.0861 0.9078 0.0232   0.3707  0.0247  0.0019
## DrugTotal      0.5688 0.5885 0.4454   0.2088  0.4386  0.0250    0.1037
## CigarettesTotal 0.3484 0.2117 0.5199   0.8470  0.9733  0.0321    0.3700
## SexTotal       0.5205 0.9687 0.5425   0.5910  0.0994  0.0004    0.0155
## StealTotal     0.9579 0.3039 0.0800   0.2134  0.1700  0.0417    0.0522
## GABSTotal      0.7419 0.0792 0.7709   0.4981  0.0211  0.7827    0.8324
## VR_abs_pump    0.0599 0.0312 0.4322   0.0162  0.1874  0.0017    0.1061
## VR_abs_exp     0.1473 0.0300 0.6833   0.0289  0.8627  0.0114    0.0533
## CB_abs_pump    0.5996 0.1558 0.5864   0.7529  0.9721  0.0483    0.0975
## CB_abs_exp     0.7491 0.1084 0.8631   0.1729  0.7132  0.0403    0.0125
##                DrugTotal CigarettesTotal SexTotal StealTotal GABSTotal
## Age               0.5688    0.3484         0.5205   0.9579     0.7419
```

```
## Gender          0.5885    0.2117          0.9687   0.3039     0.0792
## BISTotal        0.4454    0.5199          0.5425   0.0800     0.7709
## EVTotal         0.2088    0.8470          0.5910   0.2134     0.4981
## BCTotal         0.4386    0.9733          0.0994   0.1700     0.0211
## BSSSTotal       0.0250    0.0321          0.0004   0.0417     0.7827
## AUDITTotal      0.1037    0.3700          0.0155   0.0522     0.8324
## DrugTotal               0.0000          0.0989   0.0055     0.1804
## CigarettesTotal 0.0000                  0.1273   0.0005     0.9643
## SexTotal        0.0989    0.1273                   0.3151     0.2973
## StealTotal      0.0055    0.0005          0.3151             0.1816
## GABSTotal       0.1804    0.9643          0.2973   0.1816
## VR_abs_pump     0.4582    0.9799          0.0498   0.1967     0.2926
## VR_abs_exp      0.7651    0.1868          0.4480   0.2491     0.8721
## CB_abs_pump     0.6331    0.8852          0.9374   0.5836     0.2481
## CB_abs_exp      0.9045    0.1683          0.5971   0.4261     0.8684
##                 VR_abs_pump VR_abs_exp CB_abs_pump CB_abs_exp
## Age             0.0599      0.1473     0.5996      0.7491
## Gender          0.0312      0.0300     0.1558      0.1084
## BISTotal        0.4322      0.6833     0.5864      0.8631
## EVTotal         0.0162      0.0289     0.7529      0.1729
## BCTotal         0.1874      0.8627     0.9721      0.7132
## BSSSTotal       0.0017      0.0114     0.0483      0.0403
## AUDITTotal      0.1061      0.0533     0.0975      0.0125
## DrugTotal       0.4582      0.7651     0.6331      0.9045
## CigarettesTotal 0.9799      0.1868     0.8852      0.1683
## SexTotal        0.0498      0.4480     0.9374      0.5971
## StealTotal      0.1967      0.2491     0.5836      0.4261
## GABSTotal       0.2926      0.8721     0.2481      0.8684
## VR_abs_pump                 0.0000     0.0000      0.0000
## VR_abs_exp      0.0000                 0.0003      0.0002
## CB_abs_pump     0.0000      0.0003                 0.0000
## CB_abs_exp      0.0000      0.0002     0.0000
```

Appendix 15

Complete R Code Used for Answering H2, Includes Datasets, MI, and t-test

Load libraries

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyv
erse 1.3.2 ──
## ✔ ggplot2 3.4.0     ✔ purrr   0.3.5
## ✔ tibble  3.1.8     ✔ dplyr   1.0.10
## ✔ tidyr   1.2.1     ✔ stringr 1.5.0
## ✔ readr   2.1.2     ✔ forcats 0.5.2
## ── Conflicts ────────────────────────────────────────── tidyverse
_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
```

```
library(dbplyr)
```

```
##
## Attaching package: 'dbplyr'
##
## The following objects are masked from 'package:dplyr':
##
##     ident, sql

library(dplyr)
library(rstanarm)

## Loading required package: Rcpp
## This is rstanarm version 2.21.3
## - See https://mc-stan.org/rstanarm/articles/priors for changes to default priors!
## - Default priors may change, so it's safest to specify priors, even if equivalent to the defaults.
## - For execution on a local, multicore CPU with excess RAM we recommend calling
##   options(mc.cores = parallel::detectCores())

library(bayr)

## Registered S3 methods overwritten by 'bayr':
##   method          from
##   coef.stanreg    rstanarm
##   predict.stanreg rstanarm
##   print.tbl_obs   mascutils
##
## Attaching package: 'bayr'
##
## The following objects are masked from 'package:rstanarm':
##
##     fixef, ranef

library(brms)

## Registered S3 methods overwritten by 'brms':
##   method          from
##   coef.brmsfit    bayr
##   predict.brmsfit bayr
## Loading 'brms' package (version 2.18.0). Useful instructions
## can be found by typing help('brms'). A more detailed introduction
## to the package is available through vignette('brms_overview').
##
## Attaching package: 'brms'
##
## The following objects are masked from 'package:bayr':
##
##     fixef, ranef
##
## The following objects are masked from 'package:rstanarm':
##
##     dirichlet, exponential, get_y, lasso, ngrps
##
## The following object is masked from 'package:stats':
##
##     ar

library(mascutils)
```

```
##
## Attaching package: 'mascutils'
##
## The following object is masked from 'package:bayr':
##
##     as_tbl_obs
##
## The following object is masked from 'package:rstanarm':
##
##     logit
##
## The following object is masked from 'package:tidyr':
##
##     expand_grid
##
## The following object is masked from 'package:base':
##
##     mode
```

Import Data adjusted pump

```
adj <-
  read_csv("/Users/nesyalaviza/Desktop/Master/Thesis/DataCollection/adjdataset5.csv") %>%
  print()

## Rows: 96 Columns: 34
## ── Column specification ────────────────────────────────────────────────────────
## Delimiter: ","
## chr  (3): ParticipantCode, Version, TaskOrder
## dbl (31): ParticipantID, Pump1, Pump2, Pump3, Pump4, Pump5, Pump6, Pump7, Pu...
##
## ℹ Use `spec()` to retrieve the full column specification for this data.
## ℹ Specify the column types or set `show_col_types = FALSE` to quiet this message.

## # A tibble: 96 × 34
##    ParticipantID ParticipantCode    Version Pump1 Pump2 Pump3 Pump4 Pump5 Pump6
##            <dbl> <chr>              <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
##  1             1 2022-09-1613:55:11 VR         46    NA    30     0     0     6
##  2             3 2022-09-2613:46:34 VR         11     0    12    15     0     0
##  3             4 2022-09-2616:05:50 VR         23     0    17    35    41    41
##  4             5 2022-10-0509:18:45 VR          0     7    16     1    14    17
##  5             7 2022-10-0515:17:22 VR         50    51    52    50     0    53
##  6             8 2022-10-0609:31:09 VR         20    16    19     0     0     4
##  7             9 2022-10-0611:42:12 VR         NA    15    NA    NA    18    22
##  8            10 2022-10-0713:38:15 VR         17    15    23    16    19    17
##  9            11 2022-10-0715:05:37 VR         22    43     0    15    40    37
## 10            12 2022-10-1014:02:06 VR         21    29    32    44    54     0
## # … with 86 more rows, and 25 more variables: Pump7 <dbl>, Pump8 <dbl>,
## #   Pump9 <dbl>, Pump10 <dbl>, Pump11 <dbl>, Pump12 <dbl>, Pump13 <dbl>,
## #   Pump14 <dbl>, Pump15 <dbl>, Pump16 <dbl>, Pump17 <dbl>, Pump18 <dbl>,
## #   Pump19 <dbl>, Pump20 <dbl>, Pump21 <dbl>, Pump22 <dbl>, Pump23 <dbl>,
```

```
## #   Pump24 <dbl>, Pump25 <dbl>, Pump26 <dbl>, Pump27 <dbl>, Pump28 <dbl>,
## #   Pump29 <dbl>, Pump30 <dbl>, TaskOrder <chr>
```

Make new coloumns to calculate total and mean of adjusted pumps. Also, calculate sum of each round

```
adj$adj_pump <- adj %>%
  select(starts_with("Pump")) %>% rowSums()
adj$adj_pump_mean <- adj %>%
  select(starts_with("Pump")) %>% rowMeans()

adj$adj_first10 <- apply(adj[4:13],1,sum)
adj$adj_middle10 <- apply(adj[14:23],1,sum)
adj$adj_last10 <- apply(adj[24:33],1,sum)

adj$adj_first10_mean <- apply(adj[,4:13],1,mean)
adj$adj_middle10_mean <- apply(adj[,14:23],1,mean)
adj$adj_last10_mean <- apply(adj[,24:33],1,mean)

adj$earnings <- adj$adj_pump*50

print(adj)
```

```
## # A tibble: 96 × 43
##    ParticipantID ParticipantCode    Version Pump1 Pump2 Pump3 Pump4 Pump5 Pump6
##            <dbl> <chr>              <chr>   <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
##  1             1 2022-09-1613:55:11 VR         46    NA    30     0     0     6
##  2             3 2022-09-2613:46:34 VR         11     0    12    15     0     0
##  3             4 2022-09-2616:05:50 VR         23     0    17    35    41    41
##  4             5 2022-10-0509:18:45 VR          0     7    16     1    14    17
##  5             7 2022-10-0515:17:22 VR         50    51    52    50     0    53
##  6             8 2022-10-0609:31:09 VR         20    16    19     0     0     4
##  7             9 2022-10-0611:42:12 VR         NA    15    NA    NA    18    22
##  8            10 2022-10-0713:38:15 VR         17    15    23    16    19    17
##  9            11 2022-10-0715:05:37 VR         22    43     0    15    40    37
## 10            12 2022-10-1014:02:06 VR         21    29    32    44    54     0
## # … with 86 more rows, and 34 more variables: Pump7 <dbl>, Pump8 <dbl>,
## #   Pump9 <dbl>, Pump10 <dbl>, Pump11 <dbl>, Pump12 <dbl>, Pump13 <dbl>,
## #   Pump14 <dbl>, Pump15 <dbl>, Pump16 <dbl>, Pump17 <dbl>, Pump18 <dbl>,
## #   Pump19 <dbl>, Pump20 <dbl>, Pump21 <dbl>, Pump22 <dbl>, Pump23 <dbl>,
## #   Pump24 <dbl>, Pump25 <dbl>, Pump26 <dbl>, Pump27 <dbl>, Pump28 <dbl>,
## #   Pump29 <dbl>, Pump30 <dbl>, TaskOrder <chr>, adj_pump <dbl>,
## #   adj_pump_mean <dbl>, adj_first10 <dbl>, adj_middle10 <dbl>, …
```

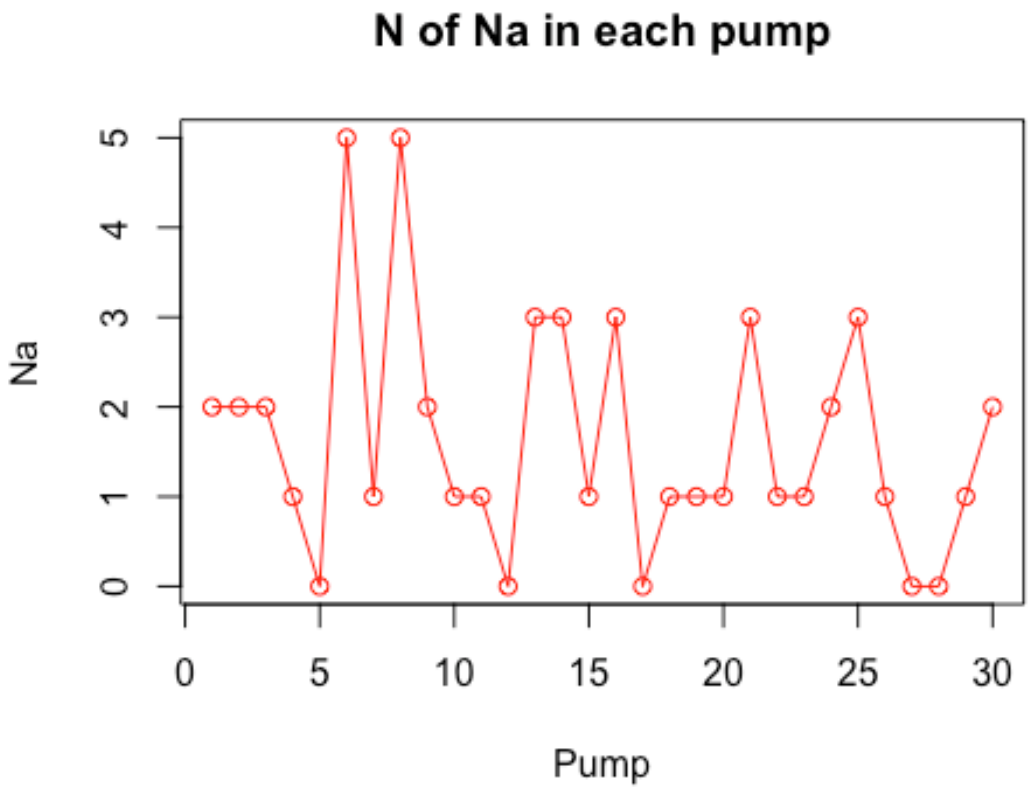
Missing data pattern from pump 1 to pump 30 in VR

```
Pump <- c(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30)
Na <-c(2,2,2,1,0,5,1,5,2,1,1,0,3,3,1,3,0,1,1,1,3,1,1,2,3,1,0,0,1,2)
df<- data.frame(Pump,Na)
print(df)
```

```
##    Pump Na
## 1     1  2
## 2     2  2
## 3     3  2
## 4     4  1
## 5     5  0
## 6     6  5
## 7     7  1
## 8     8  5
## 9     9  2
## 10   10  1
## 11   11  1
## 12   12  0
## 13   13  3
## 14   14  3
## 15   15  1
## 16   16  3
## 17   17  0
## 18   18  1
## 19   19  1
## 20   20  1
## 21   21  3
## 22   22  1
## 23   23  1
## 24   24  2
## 25   25  3
## 26   26  1
## 27   27  0
## 28   28  0
## 29   29  1
## 30   30  2
```

Make a graph from the missing data in each pump

```
plot(df,type = "o",col = "red", xlab = "Pump", ylab = "Na", main = "N of Na in each pump")
```



#

Load library for adjusted pump

```
library(mice)

##
## Attaching package: 'mice'

## The following object is masked from 'package:stats':
##
##     filter

## The following objects are masked from 'package:base':
##
##     cbind, rbind

data(adj)

## Warning in data(adj): data set 'adj' not found

dim(adj)

## [1] 96 43
```

Compute MI with 5 times means for adjusted data

```
library(mice)
adjMI5 = mice(adj,m=5, defaultMethod = c("pmm"))
```

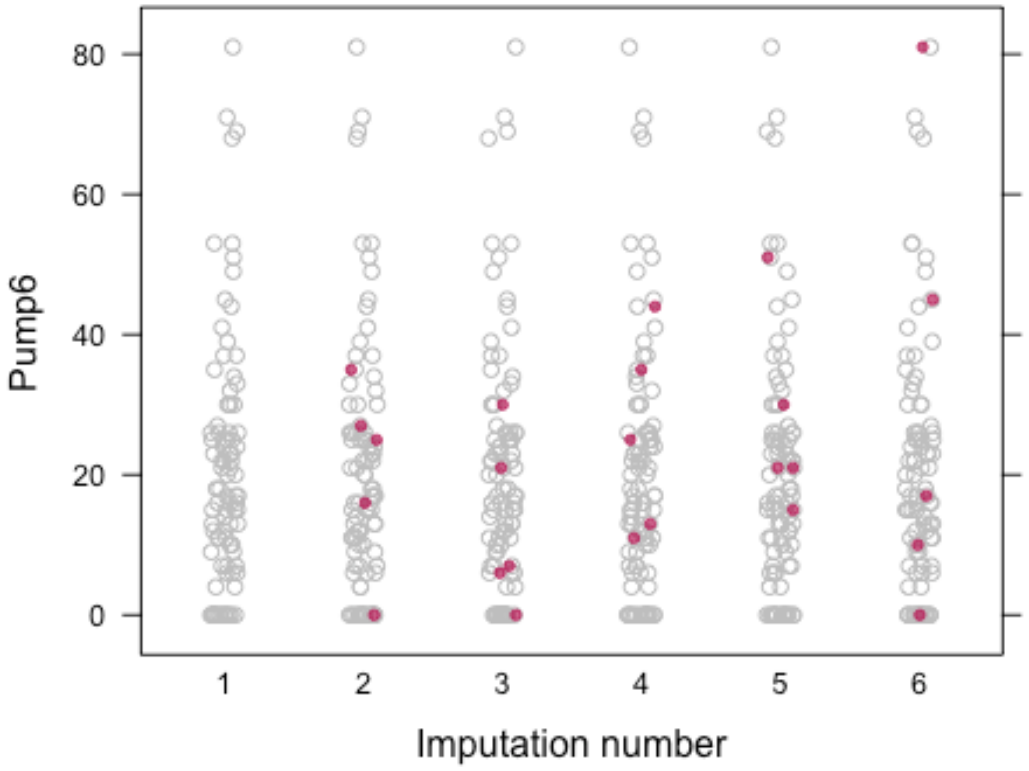
```
##
##  iter imp variable
##   1   1 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   1   2 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   1   3 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   1   4 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   1   5 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   2   1 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   2   2 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   2   3 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   2   4 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   2   5 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   3   1 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   3   2 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   3   3 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   3   4 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   3   5 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   4   1 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   4   2 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##   4   3 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
```

```
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  4  4 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  4  5 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  5  1 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  5  2 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  5  3 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  5  4 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10
##  5  5 Pump1 Pump2 Pump3 Pump4 Pump6 Pump7 Pump8 Pump9 Pump10 Pump11 Pump
13 Pump14 Pump15 Pump16 Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pu
mp25 Pump26 Pump29 Pump30 adj_pump* adj_first10 adj_middle10 adj_last10

## Warning: Number of logged events: 626
```

Visualise MI result compare to the original data

```
stripplot(adjMI5, Pump6~.imp, col=c("grey",mdc(2)),pch=c(1,20))
```



One of example complete dataset of adjusted pump after MI

```
d1_adj = complete(adjMI5,1)
d1_adj
```

```
##    ParticipantID    ParticipantCode Version Pump1 Pump2 Pump3 Pump4 Pump5 Pump6
## 1              1 2022-09-1613:55:11      VR    46    48    30     0     0     6
## 2              3 2022-09-2613:46:34      VR    11     0    12    15     0     0
## 3              4 2022-09-2616:05:50      VR    23     0    17    35    41    41
## 4              5 2022-10-0509:18:45      VR     0     7    16     1    14    17
## 5              7 2022-10-0515:17:22      VR    50    51    52    50     0    53
## 6              8 2022-10-0609:31:09      VR    20    16    19     0     0     4
## 7              9 2022-10-0611:42:12      VR    44    15    42    52    18    22
## 8             10 2022-10-0713:38:15      VR    17    15    23    16    19    17
## 9             11 2022-10-0715:05:37      VR    22    43     0    15    40    37
## 10            12 2022-10-1014:02:06      VR    21    29    32    44    54     0
## 11            14 2022-10-1113:15:52      VR    10    12    13    11    14    10
## 12            15 2022-10-1115:07:19      VR     0     5     8     0     6     7
## 13            16 2022-10-1209:53:27      VR    24     0    16    22    21    25
## 14            17 2022-10-1211:19:41      VR     4     6     7     8     8     9
## 15            19 2022-10-1216:23:39      VR    14    18    14    15    17    20
## 16            20 2022-10-1409:06:16      VR    18    19    18    22     0    18
## 17            21 2022-10-1411:48:43      VR    17    34    46    53     0    27
## 18            22 2022-10-1413:34:23      VR    23    38     0    37    34    53
## 19            23 2022-10-1416:18:36      VR    56    54     0     0    20     0
## 20            24 2022-10-1709:44:38      VR     0    34     6     3     0    39
```

## 21	25	2022-10-1711:34:41	VR	10	10	10	11	15	18
## 22	26	2022-10-1713:17:14	VR	4	5	5	6	6	4
## 23	27	2022-10-1716:01:09	VR	35	0	39	59	0	0
## 24	28	2022-10-1813:37:35	VR	0	7	7	8	8	10
## 25	29	2022-10-1816:02:03	VR	29	0	33	45	52	68
## 26	30	2022-10-1913:15:49	VR	12	0	9	0	13	16
## 27	31	2022-10-1915:58:43	VR	9	13	15	22	11	16
## 28	32	2022-10-2109:47:20	VR	25	30	30	0	21	30
## 29	33	2022-10-2111:11:30	VR	5	5	6	4	4	35
## 30	35	2022-10-2116:06:17	VR	18	35	33	0	20	25
## 31	36	2022-10-2412:13:44	VR	0	0	0	10	18	20
## 32	37	2022-10-2413:03:17	VR	6	0	6	7	11	25
## 33	38	2022-10-2415:54:38	VR	21	0	31	17	14	12
## 34	39	2022-10-2509:08:34	VR	30	0	24	24	26	23
## 35	40	2022-10-2511:06:44	VR	8	13	17	20	28	0
## 36	41	2022-10-2513:04:50	VR	6	6	8	10	8	7
## 37	42	2022-10-2515:29:19	VR	0	11	19	32	0	27
## 38	43	2022-10-2609:50:41	VR	28	16	16	0	20	22
## 39	44	2022-10-2611:07:53	VR	0	15	18	17	18	26
## 40	45	2022-10-2613:23:25	VR	5	5	4	5	5	6
## 41	46	2022-10-2615:12:11	VR	7	9	10	10	11	11
## 42	47	2022-10-2710:06:20	VR	0	0	20	25	25	25
## 43	48	2022-10-2711:31:27	VR	11	14	0	9	7	13
## 44	49	2022-10-2713:46:40	VR	22	18	21	19	17	32
## 45	50	2022-10-2715:04:37	VR	8	15	0	10	10	0
## 46	51	2022-10-2810:08:42	VR	21	19	29	0	37	51
## 47	52	2022-10-2811:07:34	VR	0	11	19	19	0	17
## 48	53	2022-10-2813:41:56	VR	20	0	18	19	23	26
## 49	1	20220916-143915	CB	19	22	0	17	21	24
## 50	3	20220926-130047	CB	55	55	0	15	20	0
## 51	4	20220926-152218	CB	8	12	14	17	0	7
## 52	5	20221005-094257	CB	22	5	9	20	20	21
## 53	7	20221005-154755	CB	48	48	0	45	0	45
## 54	8	20221006-101659	CB	88	0	0	92	0	0
## 55	9	20221006-123540	CB	18	18	15	23	25	23
## 56	10	20221007-131640	CB	0	9	12	12	11	13
## 57	11	20221007-154912	CB	75	0	0	0	0	0
## 58	12	20221010-131959	CB	0	30	31	47	64	69
## 59	14	20221011-135446	CB	10	10	15	0	16	15
## 60	15	20221011-153402	CB	10	3	14	15	20	24
## 61	16	20221012-093441	CB	21	0	24	0	0	16
## 62	17	20221012-120634	CB	22	36	42	52	60	0
## 63	19	20221012-154436	CB	0	26	31	37	38	0
## 64	20	20221014-100057	CB	0	0	13	18	21	26
## 65	21	20221014-110739	CB	40	53	57	68	75	81
## 66	22	20221014-131152	CB	16	15	16	18	42	23
## 67	23	20221014-155112	CB	31	32	38	41	67	0
## 68	24	20221017-091007	CB	36	42	0	43	0	34
## 69	25	20221017-111507	CB	10	12	10	11	10	11
## 70	26	20221017-134850	CB	10	12	13	13	14	13
## 71	27	20221017-152345	CB	44	52	61	70	0	71
## 72	28	20221018-131447	CB	21	21	0	0	31	30
## 73	29	20221018-153449	CB	0	10	10	12	12	15
## 74	30	20221019-135312	CB	29	31	34	35	41	44
## 75	31	20221019-151220	CB	44	47	102	0	39	0

```
## 76          32   20221021-092009     CB    5   10   10   12   17    0
## 77          33   20221021-120209     CB    0   16   17   21   19   22
## 78          35   20221021-151103     CB   27   27   30   34   40   49
## 79          36   20221024-114719     CB   58    0   43    0    0   33
## 80          37   20221024-133438     CB   21   30   40   45   40    0
## 81          38   20221024-151929     CB    5    6    0    5    5    6
## 82          39   20221025-094005     CB    0   29   33   36    0   35
## 83          40   20221025-114413     CB   13    0   12   24   19   25
## 84          41   20221025-132921     CB   15   16   20    0   10   15
## 85          42   20221025-145706     CB   29   34    0   34    0   30
## 86          43   20221026-090715     CB    0   21   42    0   43   12
## 87          44   20221026-114837     CB    0    0    8   14   27   26
## 88          45   20221026-130040     CB    7    8    9    9   10    9
## 89          46   20221026-154131     CB   16   18    0   12   17   14
## 90          47   20221027-093105     CB   16    0   10   13   16   16
## 91          48   20221027-110539     CB   34    0   13   23   19    0
## 92          49   20221027-130411     CB   66    0   30   47   56    0
## 93          50   20221027-154358     CB    0   25   31    0   32   37
## 94          51   20221028-094115     CB    0    4    7    8   12   21
## 95          52   20221028-115717     CB    0   41    0    0    0   11
## 96          53   20221028-131024     CB   11   15   14   15   15   15
##    Pump7 Pump8 Pump9 Pump10 Pump11 Pump12 Pump13 Pump14 Pump15 Pump16 Pump17
## 1     33    36    42     40     24     29     32     39      0     37     45
## 2     12    13    20      0     15     15     20     16     18     18     18
## 3     46     0     0     52      0     31     38     64      0      0     39
## 4     15    24     0     18     17      0     13      0     12     12     11
## 5     54    59    55      0      0      0      0     40      0     30     40
## 6     15    22    23      0      9      0     38     36     46      0      0
## 7      0    46     0     50     20     25     15     19     19     20     19
## 8     24    25    23     20     18     19     26     23     24     24     26
## 9      0     0    24      0      0     38      0      0     22     37     33
## 10    44    44     0     50     33      0     55     65      0      0     30
## 11    13    16    13     15     13     15     15     15     13     17     16
## 12     8     7    43      0      6      7      8      9     10      8      8
## 13    19    26    23      0     18      0      0     21     28     22      0
## 14    11    14    16     20      0     10     12     14     18     18      0
## 15     0    20    25      0      0     12     14     29     18     12      0
## 16    22     0     0     18     18     19     21      0      0     13      0
## 17    33     0     0     20     26     32     31      0     23     32     32
## 18     0    38    20     31     53     28      0      0      0     28      0
## 19    18    36    36     48     41     47     43      0     31      0     26
## 20    38    44    36     44     38      1     36     36     39     38     40
## 21    18    24    21     17     30     20     15      0     15      0     15
## 22     6     6     7      6      2      7      7      8      8      9      9
## 23    31     0    30     33     36     40     40      0     44      0      0
## 24    13     0    13     13     13     10     12     12     11     14     14
## 25     0    47     0     27      0     21     40      0     26      0     22
## 26    13     0     9     13     14     19     18     26     23      0     17
## 27    19    23    21     23     26     44      0      0      6     14     20
## 28    25    20    29     30      0     30     30     30      0      0     20
## 29     6     7     6      6      6      7      9      6      8      5      6
## 30    35     0    24     28     40      0     13      0     16      0      6
## 31    20    20    34     19      0     22     31     25     20     23     27
## 32    12    12    12     15     15     15     16     21      0     17     15
## 33    14    14     0     13     11     11     13     14     13     16     17
```

```
## 34    0   12    0    0   21   21   21   21   25    0   18
## 35   18   24   19   23   20   32   42   42   29    0    0
## 36    0   10   12   13    0    6    0   65    4    4    4
## 37   15   20   34   40   39   25   46    0    0   64   36
## 38   19    5   19   26   30   39    0   26   36   29    0
## 39   33   35   43   30   33   56    0    0   28   35   37
## 40    5    5    6    4    4    7    6    5    4    0    4
## 41   10    8    8    8    8    9    9   10   10   11   11
## 42   30    0   54    0   25    0   25   25    0    0   25
## 43    8   35    0    5    6    6    8    8    8    9    9
## 44    0   23   24   23   25   30   33   42   32    0    0
## 45   15   15    0   17   14   20    0    0   10    0   15
## 46    0    0   61   65    0    0   21    0   37    0   37
## 47   21   21   26   28   26   29    0    0   20   26   28
## 48   27   23   25   20    0   21   20   24    0   15    0
## 49   35   12   17   13    9   15    0   15   18    0    8
## 50   10   15   25   30   40   35   40   40   40    0   10
## 51   11   11   13   13   18   20   24   25   27    0   26
## 52   21   22   22   21   22   21   23    0   21    0   20
## 53   48    0   48    0   45   48   49   50   55   60    0
## 54    0    0   51    0   71   81   67    0    0    0   44
## 55   22   24   16    0   16   15   19   25   30   25   25
## 56   11   19   17   19   19    0   12   16    0   14   13
## 57   62   62    0    0   65   70    0    0    0   65    0
## 58    0   57    0   42   51    0   34    0   30   53    0
## 59   15   15   20    0   19   14   17   17   17    0   20
## 60   25   18   29   25   25   22   15    0   10   25   30
## 61   21   25   17   25    0   21    0   25   29   13   24
## 62   62    0    0   24   34   40   52   24    0   50   64
## 63   28    0   25    0   20   30    0   38   31   37   38
## 64    0   26   27   30   30   29   30   32   39    0    0
## 65   94   97    0    0    0   33    0   17   19   33   43
## 66   49   11    0    0    0    0   11    0   11    0    8
## 67   28    0   28    0   19   20   29   36   35   41    0
## 68   38   40    0   38   35   34   33   33   41    0    0
## 69   10   12   12   10   12   10   10   10   12   14    0
## 70    0    7    7    8   10    9    8   11   13   10    0
## 71    0   39   38    0   52   57   14   60    0   51    0
## 72    0   27   29    0   27   29   31   29   35   30    0
## 73    0    0   10   15   12   20   20    0   10    0    0
## 74    0   40   45   50   46    0   48    0    0    6   23
## 75    0    9   18   25    0   15   21   26   35   41    0
## 76   12   13   23   18   20   25   30   25   40    0    0
## 77    4    5   14   17   16   17   16   13   22   22   17
## 78   55    0    0    0   19   30   42    0   29   41    0
## 79   16   46    0   45   46    5   40    0    0   25   31
## 80   40   35    0   20    0   10   31    0   11   25   22
## 81    6    7    8    9    9    8   10   10   10   11   12
## 82   36   37   40   38   36   36   35    0   43   45   48
## 83   32   37    0   10   20   20   30   22   17   19   31
## 84    8    6   10   12    8   12   10    8   10   10   20
## 85    0   16   22   24   45    0    9   40   40   31   60
## 86   44   57   68    0   33    0   25   39   50   15   36
## 87   42   57    0   29    0    0   25    0   20   20   20
## 88   11   12   12   14   16    0   14   18   19    0   18
```

```
## 89    17    0   12    13    14    16    16    16    16     0    12
## 90    17   17   19    18    17    16    19    20    19     0    20
## 91    11   18   16    12    20    19    24    20    21    23    24
## 92    42    0   27    36    33     0    24    32     0    26    22
## 93    38   45   42    47    53    40    51    55    61    59     0
## 94     0   13   22    24    33     0    28     0    36    37    41
## 95     0    0   16    24    30    26    33     0    20    20    30
## 96     0   15   16     0     0    13    14    15    15    18    16
##    Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pump25 Pump26 Pump27 Pump2
8
## 1     34     0     0    41     0     0     0    30    36    34    42
## 2     20     0    20    18    20    20    21    20    20    22    22
## 3      0     0     0    19     0    36    36    40     0    36     0
## 4     11    11     0    11     0     8    11     0    12    10     0
## 5      0    30    40     0    25    30    40    41     0    29    34
## 6     38    43    45     0    40     0    44    49    52     0    52
## 7     23     0    15     0    15    20    33     0    17    15    21
## 8     27    27    29     0    24    27     0    22    24    22    21
## 9      0    31    34    35     0    36     0     0    43    47    55
## 10    55     0    46    38    59     0     0    60     0    61    64
## 11    15    18    16    19    17    14    15    17     0    10    12
## 12    12    50    13    10    14    18    16     0     8    10    12
## 13    22     0    18    20     0    22    27    20    28    23    26
## 14    21    24    26     0    10    14    18    22    24    30    35
## 15    10     0    20    16    20    21     0    25    29    20    27
## 16    13    13    16    20    19    20    21    22    26    32    43
## 17    38    31    33    33     0    24    25     0     0     8    28
## 18    21     0     0    11    24    23    34    40    38    43     0
## 19    42    33    40     9    50    46     0    29    46     0     0
## 20    35    41     0    38    39    38    42    38    39    39     0
## 21    10    12    13    27    10    16    20    14    15    15    21
## 22    10    11    11    12    12    13    13    13     0     3     4
## 23    36    50    56     0     0    36    94     0     0     0    45
## 24    15    14    16    14    15    18    16    18    20    18    19
## 25    51    48     0     0    40    61     0    38    52     0     0
## 26     0     0    13    15    18    17    20    22    23     0    17
## 27    20    25    23    12    25    29    38    42     0     0     9
## 28    30    20    30    18    31    25    25     0    25     0    30
## 29     7     9    11     9    10    12    11    16    18     0     0
## 30    10     0    12     9    13    15    21    24     3    19    31
## 31     0    40    25    26    41    26    33     0    30     0    31
## 32    29    31     0    29    33    27     0    33    30    35    40
## 33    17    18     0    16    17     0    15    16    38    16    17
## 34    20    24    22    24    24    26    30    31    36    41    43
## 35    15    17    26    24     0    18    34    26     0    18     0
## 36     4     4     0     4     4     5     4     7     0     6     0
## 37    45    39     0    29     0    46    44    54     0    27     0
## 38    28    18    15    18    19    31     0    19    29    27    34
## 39    41    41    43    39     0    46     0    33     0    29     0
## 40     3     3     4     3     3     5     6     0     3     4     4
## 41    10    11    11    12    12    11    13    13    12    12    13
## 42     0    20     0    16    24    10     0    48    10    16    24
## 43    12    14     0    10    13    11    14    52    13    15    16
## 44     0    18    20    25    30    22    30    15    26    42     0
## 45    19    18    22    16    25    18     0    17    19    22    26
```

```
## 46     0    34    57    62     0    48    43    52    51    54    60
## 47    27    30     0    25    25    27     0    22    28    34    26
## 48    24    30    31    25    27    29     0     0    22    25    20
## 49    14    10    13     7     8    14    19    19    19    18    11
## 50     0    22    30    30    35    30    33     0     0    25    26
## 51    27    33    26    44    52    63    58    76     0     0    67
## 52    19    22    23    24    28     0     0    22    25    26    24
## 53     0    48    48    48    50     0     0    48     0    48     0
## 54    49    60     0    70    49    18     0    21    51     0    20
## 55    30    21    37    32     0     0    15    25    33    21    31
## 56    15    19    20    16    15    19    21    20    21    17    18
## 57     0     0     0     0     0    62     0    58    77     0     0
## 58     0     0     0     0    12    23     0    15    25     0    17
## 59    19    18    20    18    24    26    27    31     0    22    23
## 60    30    42     0     0     5    10    15     0     8    12    16
## 61    23    27    18    26    29    23     0    27    30    23     0
## 62     0     0    40    70     0     0     0    33     0    40    56
## 63    22    27    31    36     0    31     0    27     0    30    34
## 64    28    36     0    31    35    35     0    20    24     0    20
## 65    62    67     0    39    48    59     0     0    40    38     0
## 66    12    26    46     0    30     0     0    21    24    51    21
## 67    25     0     0    23     0    26    32    27     0    24     0
## 68    37    40     0     0    33    32    33    34    34    33    34
## 69    10    12    12     9    10    11    12     8    10    11     9
## 70     9     9    11     9     0    11     7    10    11     2     7
## 71    64    39    59     0     0     0    36    54    62     0    62
## 72    20    21     0    27    27    27     0     0    24     0     0
## 73    10     0    10    25    35     0    15    20     0    20    21
## 74     0     0     3     0    19    26    27    39    38     0    27
## 75    29    31     0    16    33     0     0    11     0    10    15
## 76    34    30    35    39     0    20     0    19    29    27    30
## 77     6    19     7     9     0     4    10    14    15    13    10
## 78    27    29     0    20     0    15    34    24    42    25    50
## 79     0     0    30     0    37    14    43    13    38    17     0
## 80    34     0    44     0    32    42    37    35    41     0    20
## 81    13    15    16    18     0    15     0    12    14    15    16
## 82    47     0     0    29    36    39     0    36    37    39    43
## 83    24     0    12    28    17    22    16    26    34    19    44
## 84    10    20    25     5    10    20    20    30    30    34     6
## 85    76     0    17    63    46     0    29     0    16    47    83
## 86    49     0    67    49    81    59    84     0    34     0     0
## 87    20    25    32    24    26     0    27    27     0    26    30
## 88     0    14     0    10    11    14     0    10     8     8     2
## 89     0     9    11    13    13    16    12    14    15    17    17
## 90    20    20    20    20    20    20    20    20    20    11    16
## 91     0     6    17    20    19    23     0     6    20     0     3
## 92    29    40     0     0    14     0    19    26    25    29     0
## 93     0     0    40    40    49    48     0    51     0    39     0
## 94    45     0    40    31    42     0    46     0     0    18     0
## 95    15    39     0    28    29    21     0    15     2    25    15
## 96    18    20    20    20    22    25    30    37    39    43    46
##    Pump29 Pump30 TaskOrder adj_pump adj_pump_mean adj_first10 adj_middle10
## 1       0     44        VR      768           NA         287          239
## 2       0      0        CB      406     13.533333          83          160
## 3       0      0        CB      588           NA         255          171
```

```
## 4    25    9    VR    294        NA    111        87
## 5    40   41    VR    884  29.466667    424       180
## 6    51    0    VR    667        NA    119       255
## 7    23   20    VR    626        NA    283       175
## 8    24   26    CB    632  21.066667    199       243
## 9    52   54    VR    698  23.266667    181       195
## 10   76   83    CB   1043  34.766667    318       284
## 11   14    0    VR    398  13.266667    127       153
## 12   14   16    VR    324        NA     79       129
## 13   20   25    CB    516  17.200000    176       129
## 14    0   34    VR    433  14.433333    103       143
## 15   29   29    CB    468        NA    143       118
## 16   46   50    VR    547  18.233333    135       113
## 17   32   25    CB    683  22.766667    230       278
## 18   43   45    CB    705  23.500000    274       130
## 19   36   33    CB    837        NA    268       303
## 20   45   46    CB    884        NA    240       304
## 21   14   19    CB    468        NA    154       130
## 22    5    5    VR    217   7.233333     55        82
## 23   51   67    CB    768        NA    230       302
## 24   26    0    CB    374  12.466667     79       131
## 25    0   21    CB    683        NA    287       205
## 26   28    0    VR    370        NA     84       130
## 27   23   20    CB    548  18.266667    172       178
## 28   30   23    CB    637  21.233333    240       190
## 29    4    7    VR    270        NA     90        74
## 30   30    0    CB    480  16.000000    218        97
## 31    0   25    CB    566  18.866667    141       213
## 32   30   45    VR    548        NA    103       160
## 33   18   19    CB    468        NA    136       130
## 34   39   40    VR    683        NA    142       193
## 35   12   48    VR    596        NA    170       222
## 36    3    3    VR    130        NA     80        90
## 37   17   41    CB    768        NA    203       294
## 38    0    0    CB    588        NA    172       221
## 39    0   21    VR    719        NA    235       314
## 40    6    6    CB    130  4.333333     50        40
## 41   13   13    VR    316  10.533333     92       100
## 42    0   11    CB    442        NA    179       120
## 43    0    7    CB    316        NA     97        80
## 44   22   22    CB    637        NA    203       200
## 45   19    0    VR    370  12.333333     90       118
## 46   58    0    CB    897  29.900000    283       186
## 47   44   50    VR    629  20.966667    162       186
## 48    0   23    CB    537  17.900000    201       165
## 49    6    0    VR    403  13.433333    180       102
## 50   33   29    CB    723  24.100000    225       257
## 51    0   76    CB    768  25.600000    106       226
## 52   24    0    VR    527  17.566667    183       171
## 53    0    0    VR    879  29.300000    282       403
## 54   49   40    VR    921  30.700000    231       372
## 55    0   15    VR    599  19.966667    184       243
## 56   20   17    CB    435  14.500000    123       128
## 57    0    0    VR    596  19.866667    199       200
## 58   28    0    CB    611        NA    340       171
```

```
## 59    25    27      VR     500    16.666667       116        161
## 60    20     0      VR     468    15.600000       183        199
## 61    18    30      CB     535    17.833333       149        180
## 62     0     0      VR     801    26.700000       298        304
## 63    39    23      CB     679    22.633333       185        274
## 64    20    32      VR     602    20.066667       161        224
## 65     0    39      CB    1102    36.733333       565        274
## 66     0     0      CB     451    15.033333       190        114
## 67    23    32      CB     657    21.900000       265        205
## 68    34    46      CB     837    27.900000       271        253
## 69    10    10      CB     310    10.333333       108        102
## 70     8     9      VR     261     8.700000        97         90
## 71     0    48      CB    1033    34.433333       375        396
## 72    25    26      CB     537    17.900000       159        222
## 73    22     0      CB     324    10.800000        84         82
## 74    26    32      VR     705          NA       340        126
## 75    21    23      CB     611    20.366667       284        198
## 76    30    35      CB     588    19.600000       120        239
## 77    11    18      VR     394    13.133333       135        155
## 78    30     0      CB     719    23.966667       262        217
## 79    42    26      CB     648    21.600000       241        177
## 80     0    25      VR     667          NA       271        180
## 81    15    18      CB     294     9.800000        57        114
## 82    42    48      VR     923    30.766667       284        290
## 83    27    26      VR     626    20.866667       172        195
## 84     0     0      VR     400    13.333333       112        133
## 85    29    48      CB     868    28.933333       189        318
## 86    60    15      CB     983    32.766667       287        314
## 87    38    44      VR     607    20.233333       203        162
## 88     1     6      CB     270     9.000000       101         99
## 89    18    14      VR     378    12.600000       119        110
## 90     0    20      CB     480          NA       142        175
## 91     8    23      CB     442    14.733333       146        174
## 92    19    25      CB     667    22.233333       304        206
## 93     0     0      VR     883    29.433333       297        359
## 94     0    14      CB     522    17.400000       111        260
## 95    20    20      VR     480    16.000000        92        213
## 96     0    33      CB     560    18.666667       116        149
##    adj_last10 adj_first10_mean adj_middle10_mean adj_last10_mean earnings
## 1         223              NA               NA            NA       NA
## 2         163             8.3             16.0          16.3    20300
## 3         171            25.5               NA            NA       NA
## 4          87              NA              8.7            NA       NA
## 5         280            42.4             18.0          28.0    44200
## 6         295            11.9             25.5            NA       NA
## 7         165              NA             17.5            NA       NA
## 8         190            19.9             24.3          19.0    31600
## 9         322            18.1             19.5          32.2    34900
## 10        441            31.8             28.4          44.1    52150
## 11        118            12.7             15.3          11.8    19900
## 12        118              NA               NA          11.8       NA
## 13        211            17.6             12.9          21.1    25800
## 14        187            10.3             14.3          18.7    21650
## 15        216            14.3               NA          21.6       NA
## 16        299            13.5             11.3          29.9    27350
```

```
## 17  175  23.0  27.8  17.5  34150
## 18  301  27.4  13.0  30.1  35250
## 19  241  26.8  30.3    NA     NA
## 20  364    NA  30.4  36.4     NA
## 21  171  15.4    NA    NA     NA
## 22   80   5.5   8.2   8.0  10850
## 23  293    NA  30.2  29.3     NA
## 24  164   7.9  13.1  16.4  18700
## 25  212    NA    NA  21.2     NA
## 26  160    NA  13.0  16.0     NA
## 27  198  17.2  17.8  19.8  27400
## 28  207  24.0  19.0  20.7  31850
## 29   87    NA   7.4   8.7     NA
## 30  165  21.8   9.7  16.5  24000
## 31  212  14.1  21.3  21.2  28300
## 32  302    NA    NA  30.2     NA
## 33  172  13.6  13.0    NA     NA
## 34  334    NA  19.3  33.4     NA
## 35  175  17.0    NA    NA     NA
## 36   36   8.0    NA   3.6     NA
## 37  258    NA  29.4  25.8     NA
## 38  172    NA  22.1    NA     NA
## 39  167  23.5  31.4    NA     NA
## 40   40   5.0   4.0   4.0   6500
## 41  124   9.2  10.0  12.4  15800
## 42  162  17.9  12.0    NA     NA
## 43  149    NA   8.0    NA     NA
## 44  234    NA  20.0  23.4     NA
## 45  162   9.0  11.8  16.2  18500
## 46  428  28.3  18.6  42.8  44850
## 47  281  16.2  18.6  28.1  31450
## 48  171  20.1  16.5  17.1  26850
## 49  121  18.0  10.2  12.1  20150
## 50  241  22.5  25.7  24.1  36150
## 51  436  10.6  22.6  43.6  38400
## 52  173  18.3  17.1  17.3  26350
## 53  194  28.2  40.3  19.4  43950
## 54  318  23.1  37.2  31.8  46050
## 55  172  18.4  24.3  17.2  29950
## 56  184  12.3  12.8  18.4  21750
## 57  197  19.9  20.0  19.7  29800
## 58  120  34.0    NA  12.0     NA
## 59  223  11.6  16.1  22.3  25000
## 60   86  18.3  19.9   8.6  23400
## 61  206  14.9  18.0  20.6  26750
## 62  199  29.8  30.4  19.9  40050
## 63  220  18.5  27.4  22.0  33950
## 64  217  16.1  22.4  21.7  30100
## 65  263  56.5  27.4  26.3  55100
## 66  147  19.0  11.4  14.7  22550
## 67  187  26.5  20.5  18.7  32850
## 68  313  27.1  25.3  31.3  41850
## 69  100  10.8  10.2  10.0  15500
## 70   74   9.7   9.0   7.4  13050
## 71  262  37.5  39.6  26.2  51650
```

```
## 72       156          15.9          22.2          15.6   26850
## 73       158           8.4           8.2          15.8   16200
## 74       234            NA          12.6          23.4      NA
## 75       129          28.4          19.8          12.9   30550
## 76       229          12.0          23.9          22.9   29400
## 77       104          13.5          15.5          10.4   19700
## 78       240          26.2          21.7          24.0   35950
## 79       230          24.1          17.7          23.0   32400
## 80       232          27.1            NA          23.2      NA
## 81       123           5.7          11.4          12.3   14700
## 82       349          28.4          29.0          34.9   46150
## 83       259          17.2          19.5          25.9   31300
## 84       155          11.2          13.3          15.5   20000
## 85       361          18.9          31.8          36.1   43400
## 86       382          28.7          31.4          38.2   49150
## 87       242          20.3          16.2          24.2   30350
## 88        70          10.1           9.9           7.0   13500
## 89       149          11.9          11.0          14.9   18900
## 90       167          14.2            NA          16.7      NA
## 91       122          14.6          17.4          12.2   22100
## 92       157          30.4          20.6          15.7   33350
## 93       227          29.7          35.9          22.7   44150
## 94       151          11.1          26.0          15.1   26100
## 95       175           9.2          21.3          17.5   24000
## 96       295          11.6          14.9          29.5   28000
```

t-test for total pump in adjusted pump VR and CB total pump

```
res = t.test(adj_pump~ Version, data= d1_adj, paired = TRUE)
res

##
##  Paired t-test
##
## data:  adj_pump by Version
## t = 1.8012, df = 47, p-value = 0.0781
## alternative hypothesis: true mean difference is not equal to 0
## 95 percent confidence interval:
##   -6.620559 119.870559
## sample estimates:
## mean difference
##          56.625
```

Dataset for statistic summary

```
d1_adj = complete(adjMI5,4)

d1_adj$adj_pump_MI <- d1_adj %>%
  select(starts_with("Pump")) %>% rowSums()
d1_adj$adj_pump_mean_MI <- d1_adj %>%
  select(starts_with("Pump")) %>% rowMeans()
```

```
d1_adj$adj_first10_MI <- apply(d1_adj[4:13],1,sum)
d1_adj$adj_middle10_MI <- apply(d1_adj[14:23],1,sum)
d1_adj$adj_last10_MI <- apply(d1_adj[24:33],1,sum)

d1_adj$adj_first10_mean_MI <- apply(d1_adj[,4:13],1,mean)
d1_adj$adj_middle10_mean_MI <- apply(d1_adj[,14:23],1,mean)
d1_adj$adj_last10_mean_MI <- apply(d1_adj[,24:33],1,mean)

d1_adj$earnings <- d1_adj$adj_pump_MI*50


d1_adj
```

```
##    ParticipantID    ParticipantCode Version Pump1 Pump2 Pump3 Pump4 Pump5 Pump6
## 1              1 2022-09-1613:55:11      VR    46    16    30     0     0     6
## 2              3 2022-09-2613:46:34      VR    11     0    12    15     0     0
## 3              4 2022-09-2616:05:50      VR    23     0    17    35    41    41
## 4              5 2022-10-0509:18:45      VR     0     7    16     1    14    17
## 5              7 2022-10-0515:17:22      VR    50    51    52    50     0    53
## 6              8 2022-10-0609:31:09      VR    20    16    19     0     0     4
## 7              9 2022-10-0611:42:12      VR    22    15    17     0    18    22
## 8             10 2022-10-0713:38:15      VR    17    15    23    16    19    17
## 9             11 2022-10-0715:05:37      VR    22    43     0    15    40    37
## 10            12 2022-10-1014:02:06      VR    21    29    32    44    54     0
## 11            14 2022-10-1113:15:52      VR    10    12    13    11    14    10
## 12            15 2022-10-1115:07:19      VR     0     5     8     0     6     7
## 13            16 2022-10-1209:53:27      VR    24     0    16    22    21    25
## 14            17 2022-10-1211:19:41      VR     4     6     7     8     8     9
## 15            19 2022-10-1216:23:39      VR    14    18    14    15    17    20
## 16            20 2022-10-1409:06:16      VR    18    19    18    22     0    18
## 17            21 2022-10-1411:48:43      VR    17    34    46    53     0    27
## 18            22 2022-10-1413:34:23      VR    23    38     0    37    34    53
## 19            23 2022-10-1416:18:36      VR    56    54     0     0    20     0
## 20            24 2022-10-1709:44:38      VR     0    34    18     3     0    39
## 21            25 2022-10-1711:34:41      VR    10    10    10    11    15    18
## 22            26 2022-10-1713:17:14      VR     4     5     5     6     6     4
## 23            27 2022-10-1716:01:09      VR    35     0    39    59     0    15
## 24            28 2022-10-1813:37:35      VR     0     7     7     8     8    10
## 25            29 2022-10-1816:02:03      VR    29     0    33    45    52    68
## 26            30 2022-10-1913:15:49      VR    12     0     9     0    13    21
## 27            31 2022-10-1915:58:43      VR     9    13    15    22    11    16
## 28            32 2022-10-2109:47:20      VR    25    30    30     0    21    30
## 29            33 2022-10-2111:11:30      VR     5     5     6     4     4    30
## 30            35 2022-10-2116:06:17      VR    18    35    33     0    20    25
## 31            36 2022-10-2412:13:44      VR     0     0     0    10    18    20
## 32            37 2022-10-2413:03:17      VR     6     0     6     7    11    21
## 33            38 2022-10-2415:54:38      VR    21     0    31    17    14    12
## 34            39 2022-10-2509:08:34      VR    30     0    24    24    26    23
## 35            40 2022-10-2511:06:44      VR     8    13    17    20    28     0
## 36            41 2022-10-2513:04:50      VR     6     6     8    10     8     7
## 37            42 2022-10-2515:29:19      VR     0    11    19    32     0    51
## 38            43 2022-10-2609:50:41      VR    28    16    16     0    20    22
## 39            44 2022-10-2611:07:53      VR     0    15    18    17    18    26
## 40            45 2022-10-2613:23:25      VR     5     5     4     5     5     6
```

```
## 41        46 2022-10-2615:12:11    VR    7    9   10   10   11   11
## 42        47 2022-10-2710:06:20    VR    0    0   20   25   25   25
## 43        48 2022-10-2711:31:27    VR   11   14    0    9    7   13
## 44        49 2022-10-2713:46:40    VR   44   18   21   19   17   32
## 45        50 2022-10-2715:04:37    VR    8   15    0   10   10    0
## 46        51 2022-10-2810:08:42    VR   21   19   29    0   37   51
## 47        52 2022-10-2811:07:34    VR    0   11   19   19    0   17
## 48        53 2022-10-2813:41:56    VR   20    0   18   19   23   26
## 49         1   20220916-143915    CB   19   22    0   17   21   24
## 50         3   20220926-130047    CB   55   55    0   15   20    0
## 51         4   20220926-152218    CB    8   12   14   17    0    7
## 52         5   20221005-094257    CB   22    5    9   20   20   21
## 53         7   20221005-154755    CB   48   48    0   45    0   45
## 54         8   20221006-101659    CB   88    0    0   92    0    0
## 55         9   20221006-123540    CB   18   18   15   23   25   23
## 56        10   20221007-131640    CB    0    9   12   12   11   13
## 57        11   20221007-154912    CB   75    0    0    0    0    0
## 58        12   20221010-131959    CB    0   30   31   47   64   69
## 59        14   20221011-135446    CB   10   10   15    0   16   15
## 60        15   20221011-153402    CB   10    3   14   15   20   24
## 61        16   20221012-093441    CB   21    0   24    0    0   16
## 62        17   20221012-120634    CB   22   36   42   52   60    0
## 63        19   20221012-154436    CB    0   26   31   37   38    0
## 64        20   20221014-100057    CB    0    0   13   18   21   26
## 65        21   20221014-110739    CB   40   53   57   68   75   81
## 66        22   20221014-131152    CB   16   15   16   18   42   23
## 67        23   20221014-155112    CB   31   32   38   41   67    0
## 68        24   20221017-091007    CB   36   42    0   43    0   34
## 69        25   20221017-111507    CB   10   12   10   11   10   11
## 70        26   20221017-134850    CB   10   12   13   13   14   13
## 71        27   20221017-152345    CB   44   52   61   70    0   71
## 72        28   20221018-131447    CB   21   21    0    0   31   30
## 73        29   20221018-153449    CB    0   10   10   12   12   15
## 74        30   20221019-135312    CB   29   31   34   35   41   44
## 75        31   20221019-151220    CB   44   47  102    0   39    0
## 76        32   20221021-092009    CB    5   10   10   12   17    0
## 77        33   20221021-120209    CB    0   16   17   21   19   22
## 78        35   20221021-151103    CB   27   27   30   34   40   49
## 79        36   20221024-114719    CB   58    0   43    0    0   33
## 80        37   20221024-133438    CB   21   30   40   45   40    0
## 81        38   20221024-151929    CB    5    6    0    5    5    6
## 82        39   20221025-094005    CB    0   29   33   36    0   35
## 83        40   20221025-114413    CB   13    0   12   24   19   25
## 84        41   20221025-132921    CB   15   16   20    0   10   15
## 85        42   20221025-145706    CB   29   34    0   34    0   30
## 86        43   20221026-090715    CB    0   21   42    0   43   12
## 87        44   20221026-114837    CB    0    0    8   14   27   26
## 88        45   20221026-130040    CB    7    8    9    9   10    9
## 89        46   20221026-154131    CB   16   18    0   12   17   14
## 90        47   20221027-093105    CB   16    0   10   13   16   16
## 91        48   20221027-110539    CB   34    0   13   23   19    0
## 92        49   20221027-130411    CB   66    0   30   47   56    0
## 93        50   20221027-154358    CB    0   25   31    0   32   37
## 94        51   20221028-094115    CB    0    4    7    8   12   21
## 95        52   20221028-115717    CB    0   41    0    0    0   11
```

```
## 96          53    20221028-131024     CB    11    15    14    15    15    15
##    Pump7 Pump8 Pump9 Pump10 Pump11 Pump12 Pump13 Pump14 Pump15 Pump16 Pump17
## 1     33    36    42     40     24     29     32     39     35     60     45
## 2     12    13    20      0     15     15     20     16     18     18     18
## 3     46     0     0     52      0     31     19     64      0      0     39
## 4     15    39    45     18     17      0     13      0     12     12     11
## 5     54    59    55      0      0      0      0     40      0     30     40
## 6     15    22    23      0      9      0     38     36     46      0      0
## 7      0     0     0      6     20     25     15     19     19     20     19
## 8     24    25    23     20     18     19     26     23     24     24     26
## 9      0     0    24      0      0     38      0      0     22     37     33
## 10    44    44     0     50     33      0     55     65      0      0     30
## 11    13    16    13     15     13     15     15     15     13     17     16
## 12     8     7    51      0      6      7      8      9     10      8      8
## 13    19    26    23      0     18      0      0     21     28     22      0
## 14    11    14    16     20      0     10     12     14     18     18      0
## 15     0    20    25      0      0     12     14     17     18     12      0
## 16    22     0     0     18     18     19     21      0      0     13      0
## 17    33     0     0     20     26     32     31      0     23     32     32
## 18     0    38    20     31     53     28      0      0      0     28      0
## 19    18    36    36     48     41     47     43      0     31      0     26
## 20    38    44    36     44     38      1     36     36     39     38     40
## 21    18    24    21     17     13     20     15      0     15      0     15
## 22     6     6     7      6      2      7      7      8      8      9      9
## 23    31     0    30     33     36     40     40      0     44      0      0
## 24    13     0    13     13     13     10     12     12     11     14     14
## 25     0    47     0     27      0     21     31      0     26      0     22
## 26    13     0     9     13     14     19     18     26     23      0     17
## 27    19    23    21     23     26     44      0      0      6     14     20
## 28    25    20    29     30      0     30     30     30      0      0     20
## 29     6     7     6      6      6      7      9      6      8      5      6
## 30    35     0    24     28     40      0     13      0     16      0      6
## 31    20    20    34     19      0     22     31     25     20     23     27
## 32    12    12    12     15     15     15     16     21      0      0     15
## 33    14    14     0     13     11     11     13     14     13     16     17
## 34     0    22     0      0     21     21     21     21     25      0     18
## 35    18    24    19     23     20     32     42     40     29      0      0
## 36     0    10    12     13      0      6      0     60      4      4      4
## 37    15    20    34     40     39     25     46      0      0     64     36
## 38    19    13    19     26     30     39      0     26     36     29      0
## 39    33    35    43     30     33     56      0      0     28     35     37
## 40     5     5     6      4      4      7      6      5      4      0      4
## 41    10     8     8      8      8      9      9     10     10     11     11
## 42    30     0    54      0     25      0     25     25      0      0     25
## 43     8    12     0      5      6      6      8      8      8      9      9
## 44     0    23    24     23     25     30     33     42     32      0      0
## 45    15    15     0     17     14     20      0      0     10      0     15
## 46     0     0    61     65      0      0     21      0     37      0     37
## 47    21    21    26     28     26     29      0      0     20     26     28
## 48    27    23    25     20      0     21     20     24      0     15      0
## 49    35    12    17     13      9     15      0     15     18      0      8
## 50    10    15    25     30     40     35     40     40     40      0     10
## 51    11    11    13     13     18     20     24     25     27      0     26
## 52    21    22    22     21     22     21     23      0     21      0     20
## 53    48     0    48      0     45     48     49     50     55     60      0
```

```
## 54    0    0   51    0   71   81   67    0    0    0   44
## 55   22   24   16    0   16   15   19   25   30   25   25
## 56   11   19   17   19   19    0   12   16    0   14   13
## 57   62   62    0    0   65   70    0    0    0   65    0
## 58    0   57    0   42   51    0   34    0   30   53    0
## 59   15   15   20    0   19   14   17   17   17    0   20
## 60   25   18   29   25   25   22   15    0   10   25   30
## 61   21   25   17   25    0   21    0   25   29   13   24
## 62   62    0    0   24   34   40   52   24    0   50   64
## 63   28    0   25    0   20   30    0   38   31   37   38
## 64    0   26   27   30   30   29   30   32   39    0    0
## 65   94   97    0    0    0   33    0   17   19   33   43
## 66   49   11    0    0    0    0   11    0   11    0    8
## 67   28    0   28    0   19   20   29   36   35   41    0
## 68   38   40    0   38   35   34   33   33   41    0    0
## 69   10   12   12   10   12   10   10   10   12   14    0
## 70    0    7    7    8   10    9    8   11   13   10    0
## 71    0   39   38    0   52   57   14   60    0   51    0
## 72    0   27   29    0   27   29   31   29   35   30    0
## 73    0    0   10   15   12   20   20    0   10    0    0
## 74   25   40   45   50   46    0   48    0    0    6   23
## 75    0    9   18   25    0   15   21   26   35   41    0
## 76   12   13   23   18   20   25   30   25   40    0    0
## 77    4    5   14   17   16   17   16   13   22   22   17
## 78   55    0    0    0   19   30   42    0   29   41    0
## 79   16   46    0   45   46    5   40    0    0   25   31
## 80   40   35    0   20    0   10   33    0   11   25   22
## 81    6    7    8    9    9    8   10   10   10   11   12
## 82   36   37   40   38   36   36   35    0   43   45   48
## 83   32   37    0   10   20   20   30   22   17   19   31
## 84    8    6   10   12    8   12   10    8   10   10   20
## 85    0   16   22   24   45    0    9   40   40   31   60
## 86   44   57   68    0   33    0   25   39   50   15   36
## 87   42   57    0   29    0    0   25    0   20   20   20
## 88   11   12   12   14   16    0   14   18   19    0   18
## 89   17    0   12   13   14   16   16   16   16    0   12
## 90   17   17   19   18   17   16   19   20   19   31   20
## 91   11   18   16   12   20   19   24   20   21   23   24
## 92   42    0   27   36   33    0   24   32    0   26   22
## 93   38   45   42   47   53   40   51   55   61   59    0
## 94    0   13   22   24   33    0   28    0   36   37   41
## 95    0    0   16   24   30   26   33    0   20   20   30
## 96    0   15   16    0    0   13   14   15   15   18   16
##    Pump18 Pump19 Pump20 Pump21 Pump22 Pump23 Pump24 Pump25 Pump26 Pump27 Pump2
8
## 1     51    0    0   41    0    0   36   30   36   34   42
## 2     20    0   20   18   20   20   21   20   20   22   22
## 3      0    0    0   19    0   35   36   40    0   36    0
## 4     11   11    0   11    0    8   11    0   12   10    0
## 5      0   30   40    0   25   30   40   41    0   29   34
## 6     38   43   45    0   28    0   44   49   52    0   52
## 7     23    0   15    0   15   20   32    0   17   15   21
## 8     27   27   29    0   24   27    0   22   24   22   21
## 9      0   31   34   35    0   36    0    0   43   47   55
## 10    55    0   46   38   59    0    0   60    0   61   64
```

```
## 11   15   18   16   19   17   14   15   17    0   10   12
## 12   12   50   13   10   14   18   16    0    8   10   12
## 13   22    0   18   20    0   22   27   20   28   23   26
## 14   21   24   26    0   10   14   18   22   24   30   35
## 15   10    0   20   16   20   21    0   25   29   20   27
## 16   13   13   16   20   19   20   21   22   26   32   43
## 17   38   31   33   33    0   24   25    0    0    8   28
## 18   21    0    0   11   24   23   34   40   38   43    0
## 19   42   33   40   29   50   46    0   29   46    0    0
## 20   35   41    0   38   39   38   42   38   39   39    0
## 21   10   12   13   18   10   16   20   14   15   15   21
## 22   10   11   11   12   12   13   13   13    0    3    4
## 23   36   50   56    0    0   36   94    0    0    0   45
## 24   15   14   16   14   15   18   16   18   20   18   19
## 25   51   48    0    0   40   61    0   38   52    0    0
## 26    0    0   13   15   18   17   20   22   23    0   17
## 27   20   25   23   12   25   29   38   42    0    0    9
## 28   30   20   30   18   31   25   25    0   25    0   30
## 29    7    9   11    9   10   12   11   16   18    0    0
## 30   10    0   12    9   13   15   21   24    3   19   31
## 31    0   40   25   26   41   26   33    0   30    0   31
## 32   29   31    0   29   33   27    0   33   30   35   40
## 33   17   18    0   16   17    0   15   16    0   16   17
## 34   20   24   22   24   24   26   30   31   36   41   43
## 35   15   17   26   24    0   18   34   26    0   18    0
## 36    4    4    0    4    4    5    4    7    0    6    0
## 37   45   39    0   29    0   46   44   54    0   27    0
## 38   28   18   15   18   19   31    0   33   29   27   34
## 39   41   41   43   29    0   46    0   33    0   29    0
## 40    3    3    4    3    3    5    6    0    3    4    4
## 41   10   11   11   12   12   11   13   13   12   12   13
## 42    0   20    0   16   24   10    0   51   10   16   24
## 43   12   14    0   10   13   11   14   37   13   15   16
## 44    0   18   20   25   30   22   30   15   26   42    0
## 45   19   18   22   16   25   18    0   17   19   22   26
## 46    0   34   57   62    0   48   43   52   51   54   60
## 47   27   30    0   25   25   27    0   22   28   34   26
## 48   24   30   31   25   27   29    0    0   22   25   20
## 49   14   10   13    7    8   14   19   19   19   18   11
## 50    0   22   30   30   35   30   33    0    0   25   26
## 51   27   33   26   44   52   63   58   76    0    0   67
## 52   19   22   23   24   28    0    0   22   25   26   24
## 53    0   48   48   48   50    0    0   48    0   48    0
## 54   49   60    0   70   49   18    0   21   51    0   20
## 55   30   21   37   32    0    0   15   25   33   21   31
## 56   15   19   20   16   15   19   21   20   21   17   18
## 57    0    0    0    0    0   62    0   58   77    0    0
## 58    0    0   22    0   12   23    0   15   25    0   17
## 59   19   18   20   18   24   26   27   31    0   22   23
## 60   30   42    0    0    5   10   15    0    8   12   16
## 61   23   27   18   26   29   23    0   27   30   23    0
## 62    0    0   40   70    0    0    0   33    0   40   56
## 63   22   27   31   36    0   31    0   27    0   30   34
## 64   28   36    0   31   35   35    0   20   24    0   20
## 65   62   67    0   39   48   59    0    0   40   38    0
```

```
## 66    12    26    46     0    30     0     0    21    24    51    21
## 67    25     0     0    23     0    26    32    27     0    24     0
## 68    37    40     0     0    33    32    33    34    34    33    34
## 69    10    12    12     9    10    11    12     8    10    11     9
## 70     9     9    11     9     0    11     7    10    11     2     7
## 71    64    39    59     0     0     0    36    54    62     0    62
## 72    20    21     0    27    27    27     0     0    24     0     0
## 73    10     0    10    25    35     0    15    20     0    20    21
## 74     0     0     3     0    19    26    27    39    38     0    27
## 75    29    31     0    16    33     0     0    11     0    10    15
## 76    34    30    35    39     0    20     0    19    29    27    30
## 77     6    19     7     9     0     4    10    14    15    13    10
## 78    27    29     0    20     0    15    34    24    42    25    50
## 79     0     0    30     0    37    14    43    13    38    17     0
## 80    34     0    44     0    32    42    37    35    41     0    20
## 81    13    15    16    18     0    15     0    12    14    15    16
## 82    47     0     0    29    36    39     0    36    37    39    43
## 83    24     0    12    28    17    22    16    26    34    19    44
## 84    10    20    25     5    10    20    20    30    30    34     6
## 85    76     0    17    63    46     0    29     0    16    47    83
## 86    49     0    67    49    81    59    84     0    34     0     0
## 87    20    25    32    24    26     0    27    27     0    26    30
## 88     0    14     0    10    11    14     0    10     8     8     2
## 89     0     9    11    13    13    16    12    14    15    17    17
## 90    20    20    20    20    20    20    20    20    20    11    16
## 91     0     6    17    20    19    23     0     6    20     0     3
## 92    29    40     0     0    14     0    19    26    25    29     0
## 93     0     0    40    40    49    48     0    51     0    39     0
## 94    45     0    40    31    42     0    46     0     0    18     0
## 95    15    39     0    28    29    21     0    15     2    25    15
## 96    18    20    20    20    22    25    30    37    39    43    46
##    Pump29 Pump30 TaskOrder adj_pump adj_pump_mean adj_first10 adj_middle10
## 1       0    44        VR      868           NA         235          304
## 2       0     0        CB      406     13.533333          83          160
## 3       0     0        CB      599           NA         255          149
## 4      60     9        VR      394           NA         176           87
## 5      40    41        VR      884     29.466667         424          180
## 6      51     0        VR      667           NA         119          255
## 7      23    35        VR      451           NA         106          175
## 8      24    26        CB      632     21.066667         199          243
## 9      52    54        VR      698     23.266667         181          195
## 10     76    83        CB     1043     34.766667         318          284
## 11     14     0        VR      398     13.266667         127          153
## 12     14    16        VR      324           NA          84          130
## 13     20    25        CB      516     17.200000         176          129
## 14      0    34        VR      433     14.433333         103          143
## 15     29    29        CB      480           NA         143          102
## 16     46    50        VR      547     18.233333         135          113
## 17     32    25        CB      683     22.766667         230          278
## 18     43    45        CB      705     23.500000         274          130
## 19     36    33        CB      837           NA         268          303
## 20     45    46        CB      883           NA         268          304
## 21     14    19        CB      451           NA         154          110
## 22      5     5        VR      217      7.233333          55           82
## 23     51    67        CB      801           NA         235          302
```

```
## 24   26    0    CB   374  12.466667   79   131
## 25    0   21    CB   698         NA  298   198
## 26   28    0    VR   394         NA   90   130
## 27   23   20    CB   548  18.266667  172   178
## 28   30   23    CB   637  21.233333  240   190
## 29    4    7    VR   261         NA   90    74
## 30   30    0    CB   480  16.000000  218    97
## 31    0   25    CB   566  18.866667  141   213
## 32   30   45    VR   535         NA  106   143
## 33   18   19    CB   398         NA  136   130
## 34   39   40    VR   698         NA  142   193
## 35   12   32    VR   548         NA  170   226
## 36    3    3    VR   294         NA   80    82
## 37   17   41    CB   768         NA  230   294
## 38    0    0    CB   602         NA  183   221
## 39    0   21    VR   705         NA  235   314
## 40    6    6    CB   130   4.333333   50    40
## 41   13   13    VR   316  10.533333   92   100
## 42    0   11    CB   480         NA  179   120
## 43    0    7    CB   294         NA   83    80
## 44   22   22    CB   667         NA  235   200
## 45   19    0    VR   370  12.333333   90   118
## 46   58    0    CB   897  29.900000  283   186
## 47   44   50    VR   629  20.966667  162   186
## 48    0   23    CB   537  17.900000  201   165
## 49    6    0    VR   403  13.433333  180   102
## 50   33   29    CB   723  24.100000  225   257
## 51    0   76    CB   768  25.600000  106   226
## 52   24    0    VR   527  17.566667  183   171
## 53    0    0    VR   879  29.300000  282   403
## 54   49   40    VR   921  30.700000  231   372
## 55    0   15    VR   599  19.966667  184   243
## 56   20   17    CB   435  14.500000  123   128
## 57    0    0    VR   596  19.866667  199   200
## 58   28    0    CB   637         NA  340   195
## 59   25   27    VR   500  16.666667  116   161
## 60   20    0    VR   468  15.600000  183   199
## 61   18   30    CB   535  17.833333  149   180
## 62    0    0    VR   801  26.700000  298   304
## 63   39   23    CB   679  22.633333  185   274
## 64   20   32    VR   602  20.066667  161   224
## 65    0   39    CB  1102  36.733333  565   274
## 66    0    0    CB   451  15.033333  190   114
## 67   23   32    CB   657  21.900000  265   205
## 68   34   46    CB   837  27.900000  271   253
## 69   10   10    CB   310  10.333333  108   102
## 70    8    9    VR   261   8.700000   97    90
## 71    0   48    CB  1033  34.433333  375   396
## 72   25   26    CB   537  17.900000  159   222
## 73   22    0    CB   324  10.800000   84    82
## 74   26   32    VR   723         NA  318   126
## 75   21   23    CB   611  20.366667  284   198
## 76   30   35    CB   588  19.600000  120   239
## 77   11   18    VR   394  13.133333  135   155
## 78   30    0    CB   719  23.966667  262   217
```

```
## 79    42    26      CB     648    21.600000       241        177
## 80     0    25      VR     698          NA       271        177
## 81    15    18      CB     294     9.800000        57        114
## 82    42    48      VR     923    30.766667       284        290
## 83    27    26      VR     626    20.866667       172        195
## 84     0     0      VR     400    13.333333       112        133
## 85    29    48      CB     868    28.933333       189        318
## 86    60    15      CB     983    32.766667       287        314
## 87    38    44      VR     607    20.233333       203        162
## 88     1     6      CB     270     9.000000       101         99
## 89    18    14      VR     378    12.600000       119        110
## 90     0    20      CB     535          NA       142        205
## 91     8    23      CB     442    14.733333       146        174
## 92    19    25      CB     667    22.233333       304        206
## 93     0     0      VR     883    29.433333       297        359
## 94     0    14      CB     522    17.400000       111        260
## 95    20    20      VR     480    16.000000        92        213
## 96     0    33      CB     560    18.666667       116        149
##    adj_last10 adj_first10_mean adj_middle10_mean adj_last10_mean earnings
## 1         263              NA               NA            NA    41350
## 2         163             8.3             16.0          16.3    20300
## 3         163            25.5               NA            NA    28700
## 4         120              NA              8.7            NA    19000
## 5         280            42.4             18.0          28.0    44200
## 6         262            11.9             25.5            NA    32500
## 7         175              NA             17.5            NA    22650
## 8         190            19.9             24.3          19.0    31600
## 9         322            18.1             19.5          32.2    34900
## 10        441            31.8             28.4          44.1    52150
## 11        118            12.7             15.3          11.8    19900
## 12        118              NA               NA          11.8    17050
## 13        211            17.6             12.9          21.1    25800
## 14        187            10.3             14.3          18.7    21650
## 15        216            14.3               NA          21.6    23100
## 16        299            13.5             11.3          29.9    27350
## 17        175            23.0             27.8          17.5    34150
## 18        301            27.4             13.0          30.1    35250
## 19        259            26.8             30.3            NA    42000
## 20        364              NA             30.4          36.4    46200
## 21        160            15.4               NA            NA    21450
## 22         80             5.5              8.2           8.0    10850
## 23        293              NA             30.2          29.3    41850
## 24        164             7.9             13.1          16.4    18700
## 25        212              NA               NA          21.2    35600
## 26        160              NA             13.0          16.0    19000
## 27        198            17.2             17.8          19.8    27400
## 28        207            24.0             19.0          20.7    31850
## 29         87              NA              7.4           8.7    12000
## 30        165            21.8              9.7          16.5    24000
## 31        212            14.1             21.3          21.2    28300
## 32        302              NA               NA          30.2    27300
## 33        124            13.6             13.0            NA    20000
## 34        334              NA             19.3          33.4    33800
## 35        162            17.0               NA            NA    27750
## 36         36             8.0               NA           3.6    10100
```

```
## 37  258   NA  29.4  25.8  38700
## 38  190   NA  22.1    NA  29550
## 39  158 23.5  31.4    NA  35350
## 40   40  5.0   4.0   4.0   6500
## 41  124  9.2  10.0  12.4  15800
## 42  162 17.9  12.0    NA  23050
## 43  149   NA   8.0    NA  14750
## 44  234   NA  20.0  23.4  32750
## 45  162  9.0  11.8  16.2  18500
## 46  428 28.3  18.6  42.8  44850
## 47  281 16.2  18.6  28.1  31450
## 48  171 20.1  16.5  17.1  26850
## 49  121 18.0  10.2  12.1  20150
## 50  241 22.5  25.7  24.1  36150
## 51  436 10.6  22.6  43.6  38400
## 52  173 18.3  17.1  17.3  26350
## 53  194 28.2  40.3  19.4  43950
## 54  318 23.1  37.2  31.8  46050
## 55  172 18.4  24.3  17.2  29950
## 56  184 12.3  12.8  18.4  21750
## 57  197 19.9  20.0  19.7  29800
## 58  120 34.0    NA  12.0  32500
## 59  223 11.6  16.1  22.3  25000
## 60   86 18.3  19.9   8.6  23400
## 61  206 14.9  18.0  20.6  26750
## 62  199 29.8  30.4  19.9  40050
## 63  220 18.5  27.4  22.0  33950
## 64  217 16.1  22.4  21.7  30100
## 65  263 56.5  27.4  26.3  55100
## 66  147 19.0  11.4  14.7  22550
## 67  187 26.5  20.5  18.7  32850
## 68  313 27.1  25.3  31.3  41850
## 69  100 10.8  10.2  10.0  15500
## 70   74  9.7   9.0   7.4  13050
## 71  262 37.5  39.6  26.2  51650
## 72  156 15.9  22.2  15.6  26850
## 73  158  8.4   8.2  15.8  16200
## 74  234   NA  12.6  23.4  36700
## 75  129 28.4  19.8  12.9  30550
## 76  229 12.0  23.9  22.9  29400
## 77  104 13.5  15.5  10.4  19700
## 78  240 26.2  21.7  24.0  35950
## 79  230 24.1  17.7  23.0  32400
## 80  232 27.1    NA  23.2  34100
## 81  123  5.7  11.4  12.3  14700
## 82  349 28.4  29.0  34.9  46150
## 83  259 17.2  19.5  25.9  31300
## 84  155 11.2  13.3  15.5  20000
## 85  361 18.9  31.8  36.1  43400
## 86  382 28.7  31.4  38.2  49150
## 87  242 20.3  16.2  24.2  30350
## 88   70 10.1   9.9   7.0  13500
## 89  149 11.9  11.0  14.9  18900
## 90  167 14.2    NA  16.7  25550
## 91  122 14.6  17.4  12.2  22100
```

```
## 92       157          30.4          20.6          15.7    33350
## 93       227          29.7          35.9          22.7    44150
## 94       151          11.1          26.0          15.1    26100
## 95       175           9.2          21.3          17.5    24000
## 96       295          11.6          14.9          29.5    28000
##    adj_pump_MI adj_pump_mean_MI adj_first10_MI adj_middle10_MI adj_last10_MI
## 1          827       27.566667            249             315           263
## 2          406       13.533333             83             160           163
## 3          574       19.133333            255             153           166
## 4          380       12.666667            172              87           121
## 5          884       29.466667            424             180           280
## 6          650       21.666667            119             255           276
## 7          453       15.100000            100             175           178
## 8          632       21.066667            199             243           190
## 9          698       23.266667            181             195           322
## 10        1043       34.766667            318             284           441
## 11         398       13.266667            127             153           118
## 12         341       11.366667             92             131           118
## 13         516       17.200000            176             129           211
## 14         433       14.433333            103             143           187
## 15         462       15.400000            143             103           216
## 16         547       18.233333            135             113           299
## 17         683       22.766667            230             278           175
## 18         705       23.500000            274             130           301
## 19         840       28.000000            268             303           269
## 20         924       30.800000            256             304           364
## 21         429       14.300000            154             113           162
## 22         217        7.233333             55              82            80
## 23         837       27.900000            242             302           293
## 24         374       12.466667             79             131           164
## 25         712       23.733333            301             199           212
## 26         380       12.666667             90             130           160
## 27         548       18.266667            172             178           198
## 28         637       21.233333            240             190           207
## 29         240        8.000000             79              74            87
## 30         480       16.000000            218              97           165
## 31         566       18.866667            141             213           212
## 32         546       18.200000            102             142           302
## 33         400       13.333333            136             130           134
## 34         676       22.533333            149             193           334
## 35         555       18.500000            170             221           164
## 36         202        6.733333             80              86            36
## 37         774       25.800000            222             294           258
## 38         591       19.700000            179             221           191
## 39         707       23.566667            235             314           158
## 40         130        4.333333             50              40            40
## 41         316       10.533333             92             100           124
## 42         461       15.366667            179             120           162
## 43         295        9.833333             79              80           136
## 44         655       21.833333            221             200           234
## 45         370       12.333333             90             118           162
## 46         897       29.900000            283             186           428
## 47         629       20.966667            162             186           281
## 48         537       17.900000            201             165           171
## 49         403       13.433333            180             102           121
```

```
## 50       723      24.100000          225          257          241
## 51       768      25.600000          106          226          436
## 52       527      17.566667          183          171          173
## 53       879      29.300000          282          403          194
## 54       921      30.700000          231          372          318
## 55       599      19.966667          184          243          172
## 56       435      14.500000          123          128          184
## 57       596      19.866667          199          200          197
## 58       650      21.666667          340          190          120
## 59       500      16.666667          116          161          223
## 60       468      15.600000          183          199           86
## 61       535      17.833333          149          180          206
## 62       801      26.700000          298          304          199
## 63       679      22.633333          185          274          220
## 64       602      20.066667          161          224          217
## 65      1102      36.733333          565          274          263
## 66       451      15.033333          190          114          147
## 67       657      21.900000          265          205          187
## 68       837      27.900000          271          253          313
## 69       310      10.333333          108          102          100
## 70       261       8.700000           97           90           74
## 71      1033      34.433333          375          396          262
## 72       537      17.900000          159          222          156
## 73       324      10.800000           84           82          158
## 74       734      24.466667          374          126          234
## 75       611      20.366667          284          198          129
## 76       588      19.600000          120          239          229
## 77       394      13.133333          135          155          104
## 78       719      23.966667          262          217          240
## 79       648      21.600000          241          177          230
## 80       682      22.733333          271          179          232
## 81       294       9.800000           57          114          123
## 82       923      30.766667          284          290          349
## 83       626      20.866667          172          195          259
## 84       400      13.333333          112          133          155
## 85       868      28.933333          189          318          361
## 86       983      32.766667          287          314          382
## 87       607      20.233333          203          162          242
## 88       270       9.000000          101           99           70
## 89       378      12.600000          119          110          149
## 90       511      17.033333          142          202          167
## 91       442      14.733333          146          174          122
## 92       667      22.233333          304          206          157
## 93       883      29.433333          297          359          227
## 94       522      17.400000          111          260          151
## 95       480      16.000000           92          213          175
## 96       560      18.666667          116          149          295
##    adj_first10_mean_MI adj_middle10_mean_MI adj_last10_mean_MI
## 1                 24.9                 31.5                26.3
## 2                  8.3                 16.0                16.3
## 3                 25.5                 15.3                16.6
## 4                 17.2                  8.7                12.1
## 5                 42.4                 18.0                28.0
## 6                 11.9                 25.5                27.6
## 7                 10.0                 17.5                17.8
```

## 8	19.9	24.3	19.0
## 9	18.1	19.5	32.2
## 10	31.8	28.4	44.1
## 11	12.7	15.3	11.8
## 12	9.2	13.1	11.8
## 13	17.6	12.9	21.1
## 14	10.3	14.3	18.7
## 15	14.3	10.3	21.6
## 16	13.5	11.3	29.9
## 17	23.0	27.8	17.5
## 18	27.4	13.0	30.1
## 19	26.8	30.3	26.9
## 20	25.6	30.4	36.4
## 21	15.4	11.3	16.2
## 22	5.5	8.2	8.0
## 23	24.2	30.2	29.3
## 24	7.9	13.1	16.4
## 25	30.1	19.9	21.2
## 26	9.0	13.0	16.0
## 27	17.2	17.8	19.8
## 28	24.0	19.0	20.7
## 29	7.9	7.4	8.7
## 30	21.8	9.7	16.5
## 31	14.1	21.3	21.2
## 32	10.2	14.2	30.2
## 33	13.6	13.0	13.4
## 34	14.9	19.3	33.4
## 35	17.0	22.1	16.4
## 36	8.0	8.6	3.6
## 37	22.2	29.4	25.8
## 38	17.9	22.1	19.1
## 39	23.5	31.4	15.8
## 40	5.0	4.0	4.0
## 41	9.2	10.0	12.4
## 42	17.9	12.0	16.2
## 43	7.9	8.0	13.6
## 44	22.1	20.0	23.4
## 45	9.0	11.8	16.2
## 46	28.3	18.6	42.8
## 47	16.2	18.6	28.1
## 48	20.1	16.5	17.1
## 49	18.0	10.2	12.1
## 50	22.5	25.7	24.1
## 51	10.6	22.6	43.6
## 52	18.3	17.1	17.3
## 53	28.2	40.3	19.4
## 54	23.1	37.2	31.8
## 55	18.4	24.3	17.2
## 56	12.3	12.8	18.4
## 57	19.9	20.0	19.7
## 58	34.0	19.0	12.0
## 59	11.6	16.1	22.3
## 60	18.3	19.9	8.6
## 61	14.9	18.0	20.6
## 62	29.8	30.4	19.9

```
## 63          18.5          27.4          22.0
## 64          16.1          22.4          21.7
## 65          56.5          27.4          26.3
## 66          19.0          11.4          14.7
## 67          26.5          20.5          18.7
## 68          27.1          25.3          31.3
## 69          10.8          10.2          10.0
## 70           9.7           9.0           7.4
## 71          37.5          39.6          26.2
## 72          15.9          22.2          15.6
## 73           8.4           8.2          15.8
## 74          37.4          12.6          23.4
## 75          28.4          19.8          12.9
## 76          12.0          23.9          22.9
## 77          13.5          15.5          10.4
## 78          26.2          21.7          24.0
## 79          24.1          17.7          23.0
## 80          27.1          17.9          23.2
## 81           5.7          11.4          12.3
## 82          28.4          29.0          34.9
## 83          17.2          19.5          25.9
## 84          11.2          13.3          15.5
## 85          18.9          31.8          36.1
## 86          28.7          31.4          38.2
## 87          20.3          16.2          24.2
## 88          10.1           9.9           7.0
## 89          11.9          11.0          14.9
## 90          14.2          20.2          16.7
## 91          14.6          17.4          12.2
## 92          30.4          20.6          15.7
## 93          29.7          35.9          22.7
## 94          11.1          26.0          15.1
## 95           9.2          21.3          17.5
## 96          11.6          14.9          29.5
```

Statistic summary for average adjusted pumps

Total Adjusted Pump

```
d1_adj %>%
 group_by(Version) %>%
 summarize(
   mean = mean(adj_pump_MI),
   sd = sd(adj_pump_MI),
   median = median(adj_pump_MI),
   min = min(adj_pump_MI),
   max = max(adj_pump_MI),
   var= var(adj_pump_MI)
 )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max    var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl>  <dbl>
## 1 CB       612.  207.   600.   261  1102 42729.
## 2 VR       553.  206.   548.   130  1043 42497.
```

Mean Adjusted Pump

```
d1_adj %>%
  group_by(Version) %>%
  summarize(
    mean = mean(adj_pump_mean_MI),
    sd = sd(adj_pump_mean_MI),
    median = median(adj_pump_mean_MI),
    min = min(adj_pump_mean_MI),
    max = max(adj_pump_mean_MI),
    var= var(adj_pump_mean_MI)
  )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       20.4  6.89   20.0  8.7   36.7  47.5
## 2 VR       18.4  6.87   18.2  4.33  34.8  47.2
```

Earnings

```
d1_adj %>%
  group_by(Version) %>%
  summarize(
    mean = mean(earnings),
    sd = sd(earnings),
    median = median(earnings),
    min = min(earnings),
    max = max(earnings),
    var= var(earnings)
  )
```

```
## # A tibble: 2 × 7
##   Version   mean     sd median   min   max       var
##   <chr>    <dbl>  <dbl>  <dbl> <dbl> <dbl>     <dbl>
## 1 CB     30612. 10336.  30025 13050 55100 106822606.
## 2 VR     27664. 10307.  27375  6500 52150 106242738.
```

Total adjusted pump in the first 10

```
d1_adj %>%
  group_by(Version) %>%
  summarize(
    mean = mean(adj_first10_MI),
```

```
  sd = sd(adj_first10_MI),
  median = median(adj_first10_MI),
  min = min(adj_first10_MI),
  max = max(adj_first10_MI),
  var= var(adj_first10_MI)
 )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       202.  97.2   184.    57   565 9446.
## 2 VR       173.  80.0   171     50   424 6407.
```

Total adjusted pump in the middle 10

```
d1_adj %>%
 group_by(Version) %>%
 summarize(
  mean = mean(adj_middle10_MI),
  sd = sd(adj_middle10_MI),
  median = median(adj_middle10_MI),
  min = min(adj_middle10_MI),
  max = max(adj_middle10_MI),
  var= var(adj_middle10_MI)
 )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       208.  80.9   200.    82   403 6552.
## 2 VR       174.  73.2   162.    40   315 5359.
```

Total adjusted pump in the last 10

```
d1_adj %>%
 group_by(Version) %>%
 summarize(
  mean = mean(adj_last10_MI),
  sd = sd(adj_last10_MI),
  median = median(adj_last10_MI),
  min = min(adj_last10_MI),
  max = max(adj_last10_MI),
  var= var(adj_last10_MI)
 )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       203.  81.0   196.    70   436 6558.
## 2 VR       207.  88.7   188.    36   441 7860.
```

Average adjusted pump in the first 10

```
d1_adj %>%
  group_by(Version) %>%
  summarize(
    mean = mean(adj_first10_mean_MI),
    sd = sd(adj_first10_mean_MI),
    median = median(adj_first10_mean_MI),
    min = min(adj_first10_mean_MI),
    max = max(adj_first10_mean_MI),
    var= var(adj_first10_mean_MI)
  )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       20.2  9.72   18.4   5.7  56.5  94.5
## 2 VR       17.3  8.00   17.1   5    42.4  64.1
```

Average adjusted pump in the middle 10

```
d1_adj %>%
  group_by(Version) %>%
  summarize(
    mean = mean(adj_middle10_mean_MI),
    sd = sd(adj_middle10_mean_MI),
    median = median(adj_middle10_mean_MI),
    min = min(adj_middle10_mean_MI),
    max = max(adj_middle10_mean_MI),
    var= var(adj_middle10_mean_MI)
  )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       20.8  8.09   20.0   8.2  40.3  65.5
## 2 VR       17.4  7.32   16.2   4    31.5  53.6
```

Average adjusted pump in the last 10

```
d1_adj %>%
  group_by(Version) %>%
  summarize(
    mean = mean(adj_last10_mean_MI),
    sd = sd(adj_last10_mean_MI),
    median = median(adj_last10_mean_MI),
    min = min(adj_last10_mean_MI),
    max = max(adj_last10_mean_MI),
    var= var(adj_last10_mean_MI)
  )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       20.3  8.10   19.5   7    43.6  65.6
## 2 VR       20.7  8.87   18.8   3.6  44.1  78.6
```

Appendix 16

Complete R Code Used for Answering H3, Includes Datasets, Statistic Summary, and t-test

Load libraries

```
library(tidyverse)
```

```
## ── Attaching packages ─────────────────────────────────────── tidyv
erse 1.3.2 ──
## ✔ ggplot2 3.4.0      ✔ purrr   0.3.5
## ✔ tibble  3.1.8      ✔ dplyr   1.0.10
## ✔ tidyr   1.2.1      ✔ stringr 1.5.0
## ✔ readr   2.1.2      ✔ forcats 0.5.2
## ── Conflicts ────────────────────────────────────────── tidyverse
_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()
```

```
library(dplyr)
library(rstanarm)
```

```
## Loading required package: Rcpp
## This is rstanarm version 2.21.3
## - See https://mc-stan.org/rstanarm/articles/priors for changes to default priors!
## - Default priors may change, so it's safest to specify priors, even if equivalent to the defaults.
## - For execution on a local, multicore CPU with excess RAM we recommend calling
##   options(mc.cores = parallel::detectCores())
```

```
library(bayr)
```

```
## Registered S3 methods overwritten by 'bayr':
##   method         from
##   coef.stanreg   rstanarm
##   predict.stanreg rstanarm
##   print.tbl_obs  mascutils
##
## Attaching package: 'bayr'
##
## The following objects are masked from 'package:rstanarm':
##
##     fixef, ranef
```

```
library(brms)
```

```
## Registered S3 methods overwritten by 'brms':
##   method         from
##   coef.brmsfit   bayr
##   predict.brmsfit bayr
```

```
## Loading 'brms' package (version 2.18.0). Useful instructions
## can be found by typing help('brms'). A more detailed introduction
## to the package is available through vignette('brms_overview').
##
## Attaching package: 'brms'
##
## The following objects are masked from 'package:bayr':
##
##     fixef, ranef
##
## The following objects are masked from 'package:rstanarm':
##
##     dirichlet, exponential, get_y, lasso, ngrps
##
## The following object is masked from 'package:stats':
##
##     ar
```

```
library(mascutils)
```

```
##
## Attaching package: 'mascutils'
##
## The following object is masked from 'package:bayr':
##
##     as_tbl_obs
##
## The following object is masked from 'package:rstanarm':
##
##     logit
##
## The following object is masked from 'package:tidyr':
##
##     expand_grid
##
## The following object is masked from 'package:base':
##
##     mode
```

#Import file

```
presence =
  read_csv("/Users/nesyalaviza/Desktop/Master/Thesis/DataCollection/presence2.csv") %>%
  print()
```

```
## Rows: 480 Columns: 19
## ── Column specification ────────────────────────────────────────────────────────
## Delimiter: ","
## chr (12): Version, Dimension, Gendercoded, Nationality, Nationalitycoded, Oc...
## dbl  (7): ParticipantID, ParticipantID_2, Result, Age, Gender, Occupation, V...
##
## ℹ Use `spec()` to retrieve the full column specification for this data.
## ℹ Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
## # A tibble: 480 × 19
##    ParticipantID ParticipantID_2 Version Dimension Result   Age Gender
##            <dbl>           <dbl> <chr>   <chr>      <dbl> <dbl>  <dbl>
##  1             1               1 VR      G1             6    28      2
##  2             3               3 VR      G1             6    19      2
##  3             4               4 VR      G1             4    25      1
##  4             5               5 VR      G1             4    25      1
##  5             7               7 VR      G1             4    25      1
##  6             8               8 VR      G1             5    23      2
##  7             9               9 VR      G1             1    25      1
##  8            10              10 VR      G1             5    27      2
##  9            11              11 VR      G1             4    26      1
## 10            12           57229 VR      G1             5    20      2
## # … with 470 more rows, and 12 more variables: Gendercoded <chr>,
## #   Nationality <chr>, Nationalitycoded <chr>, Occupation <dbl>,
## #   Occupationcoded <chr>, Education <chr>, Educationcoded <chr>,
## #   VRExperience <dbl>, VRExperiencecoded <chr>, VisualImpairment <chr>,
## #   VisualImpairmentcoded <chr>, `Task Order` <chr>
```

```
presence %>%
  rename(IPQ = Result)
```

```
## # A tibble: 480 × 19
##    ParticipantID ParticipantID_2 Version Dimension   IPQ   Age Gender
##            <dbl>           <dbl> <chr>   <chr>      <dbl> <dbl>  <dbl>
##  1             1               1 VR      G1             6    28      2
##  2             3               3 VR      G1             6    19      2
##  3             4               4 VR      G1             4    25      1
##  4             5               5 VR      G1             4    25      1
##  5             7               7 VR      G1             4    25      1
##  6             8               8 VR      G1             5    23      2
##  7             9               9 VR      G1             1    25      1
##  8            10              10 VR      G1             5    27      2
##  9            11              11 VR      G1             4    26      1
## 10            12           57229 VR      G1             5    20      2
## # … with 470 more rows, and 12 more variables: Gendercoded <chr>,
## #   Nationality <chr>, Nationalitycoded <chr>, Occupation <dbl>,
## #   Occupationcoded <chr>, Education <chr>, Educationcoded <chr>,
## #   VRExperience <dbl>, VRExperiencecoded <chr>, VisualImpairment <chr>,
## #   VisualImpairmentcoded <chr>, `Task Order` <chr>
```

```
print(presence)
```

```
## # A tibble: 480 × 19
##    ParticipantID ParticipantID_2 Version Dimension Result   Age Gender
##            <dbl>           <dbl> <chr>   <chr>      <dbl> <dbl>  <dbl>
##  1             1               1 VR      G1             6    28      2
##  2             3               3 VR      G1             6    19      2
##  3             4               4 VR      G1             4    25      1
##  4             5               5 VR      G1             4    25      1
##  5             7               7 VR      G1             4    25      1
##  6             8               8 VR      G1             5    23      2
##  7             9               9 VR      G1             1    25      1
##  8            10              10 VR      G1             5    27      2
##  9            11              11 VR      G1             4    26      1
## 10            12           57229 VR      G1             5    20      2
```

```
## # … with 470 more rows, and 12 more variables: Gendercoded <chr>,
## #   Nationality <chr>, Nationalitycoded <chr>, Occupation <dbl>,
## #   Occupationcoded <chr>, Education <chr>, Educationcoded <chr>,
## #   VRExperience <dbl>, VRExperiencecoded <chr>, VisualImpairment <chr>,
## #   VisualImpairmentcoded <chr>, `Task Order` <chr>
```

Statistic summary

```
presence %>%
  group_by(Version) %>%
  summarize(
    mean = mean(Result),
    sd = sd(Result),
    median = median(Result),
    min = min(Result),
    max = max(Result),
    var= var(Result)
  )
```

```
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       9.54  8.34    7.5     1    37  69.5
## 2 VR      16.1  13.2    11       1    62 175.
```

Statistic summary for each dimension

```
presence %>%
  group_by(Dimension, Version) %>%
  summarize(
    mean = mean(Result),
    sd = sd(Result),
    median = median(Result),
    min = min(Result),
    max = max(Result),
    var= var(Result)
  )
```

```
## `summarise()` has grouped output by 'Dimension'. You can override using the
## `.groups` argument.
```

```
## # A tibble: 10 × 8
## # Groups:   Dimension [5]
##    Dimension Version  mean    sd median   min   max   var
##    <chr>     <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
##  1 G1        CB       1.62 1.06       1     1     5  1.13
##  2 G1        VR       4.38 0.866      4     1     6  0.75
##  3 INV       CB       5.44 2.56       4     3    12  6.55
##  4 INV       VR      11.2  3.24      11     3    21 10.5
##  5 Real      CB       9    1.62       9     5    13  2.64
##  6 Real      VR       8.23 1.40       8     5    11  1.97
##  7 SP        CB       7.79 3.63       7     4    15 13.2
```

```
##  8 SP       VR     16.4  2.99     17    8    26  8.93
##  9 Total    CB     23.9  6.02     23    15   37 36.3
## 10 Total    VR     40.2  6.58     41    18   62 43.3
```

Filtering data for total score

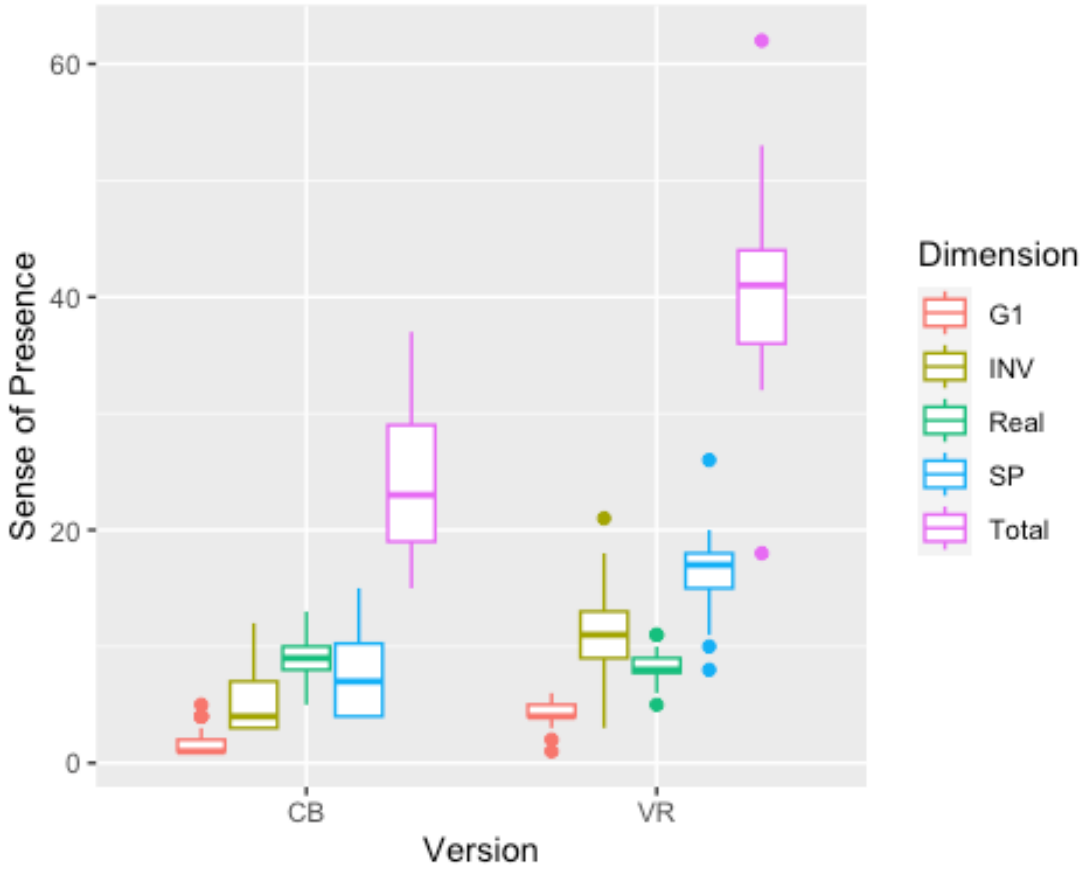
```
tot_presence <- presence %>%
  filter(Dimension == "Total") %>%
  select(Version, Result)%>%
  rename(IPQ = Result)

print(tot_presence)
```

```
## # A tibble: 96 × 2
##    Version   IPQ
##    <chr>   <dbl>
##  1 VR         53
##  2 VR         62
##  3 VR         35
##  4 VR         32
##  5 VR         33
##  6 VR         40
##  7 VR         18
##  8 VR         46
##  9 VR         37
## 10 VR         48
## # … with 86 more rows
```

Boxplot Per Version

```
PresencePlot <- ggplot(presence, aes(Version, Result, colour = Dimension)) +
  geom_boxplot()
print(PresencePlot + labs(y = "Sense of Presence", x = "Version"))
```



t test

```
res = t.test(IPQ~ Version, data= tot_presence, paired = TRUE)
res

##
##  Paired t-test
##
## data:  IPQ by Version
## t = -13.324, df = 47, p-value < 2.2e-16
## alternative hypothesis: true mean difference is not equal to 0
## 95 percent confidence interval:
##  -18.84732 -13.90268
## sample estimates:
## mean difference
##         -16.375
```

t test for alternative

```
res = t.test(IPQ~ Version, data= tot_presence, paired = TRUE, alternative="greater")
res

##
##  Paired t-test
##
## data:  IPQ by Version
## t = -13.324, df = 47, p-value = 1
```

```
## alternative hypothesis: true mean difference is greater than 0
## 95 percent confidence interval:
##  -18.43708       Inf
## sample estimates:
## mean difference
##         -16.375
```

Plot for t-test

```
# Subset weight data before treatment
CB <- subset(tot_presence,  Version == "CB", IPQ,
             drop = TRUE)
# subset weight data after treatment
VR <- subset(tot_presence,  Version == "VR", IPQ,
             drop = TRUE)
# Plot paired data
library(PairedData)

## Loading required package: MASS

##
## Attaching package: 'MASS'

## The following object is masked from 'package:dplyr':
##
##     select

## Loading required package: gld

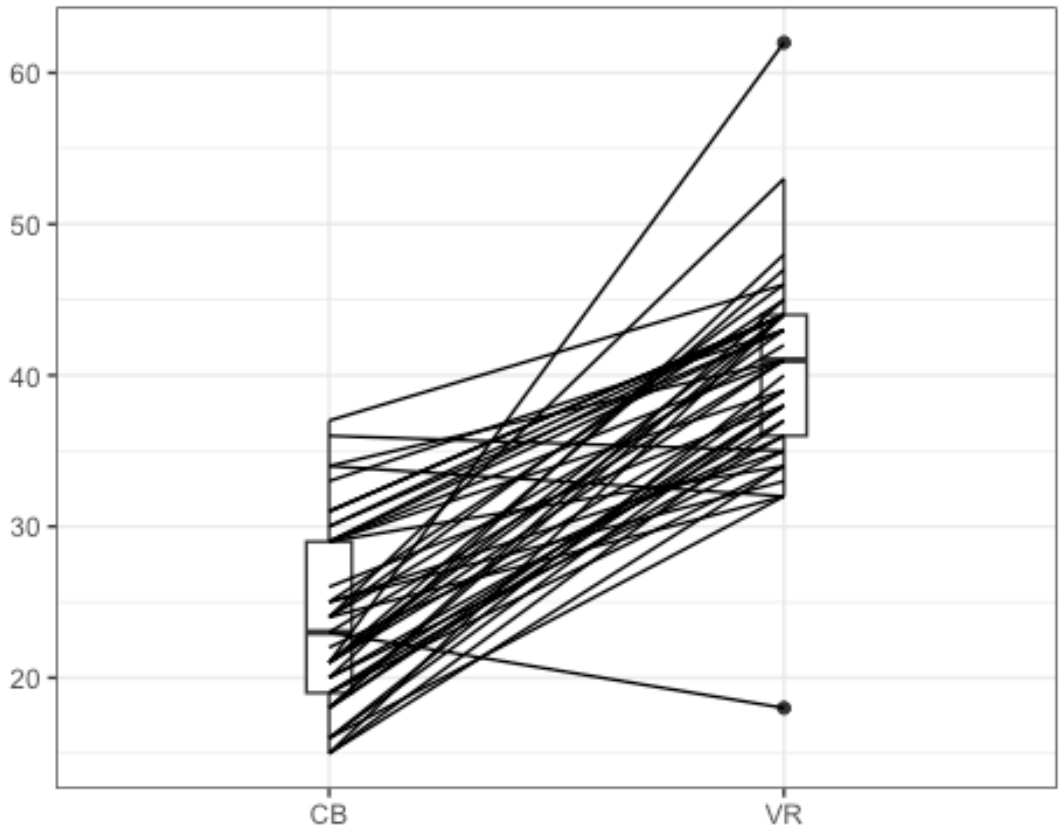
## Loading required package: mvtnorm

## Loading required package: lattice

##
## Attaching package: 'PairedData'

## The following object is masked from 'package:base':
##
##     summary

pd <- paired(CB, VR)
plot(pd, type = "profile") + theme_bw()
```



Appendix 17

Complete R Code Used for Answering H4, Includes Datasets, Statistic Summary, and t-test

Load libraries

```
library(tidyverse)

## ── Attaching packages ─────────────────────────────────────── tidyv
erse 1.3.2 ──
## ✔ ggplot2 3.4.0      ✔ purrr   0.3.5
## ✔ tibble  3.1.8      ✔ dplyr   1.0.10
## ✔ tidyr   1.2.1      ✔ stringr 1.5.0
## ✔ readr   2.1.2      ✔ forcats 0.5.2
## ── Conflicts ────────────────────────────────────────── tidyverse
_conflicts() ──
## ✖ dplyr::filter() masks stats::filter()
## ✖ dplyr::lag()    masks stats::lag()

library(dbplyr)

##
## Attaching package: 'dbplyr'
##
## The following objects are masked from 'package:dplyr':
##
##     ident, sql
```

```
library(rstanarm)

## Loading required package: Rcpp
## This is rstanarm version 2.21.3
## - See https://mc-stan.org/rstanarm/articles/priors for changes to default priors!
## - Default priors may change, so it's safest to specify priors, even if equivalent to the defaults.
## - For execution on a local, multicore CPU with excess RAM we recommend calling
##   options(mc.cores = parallel::detectCores())

library(bayr)

## Registered S3 methods overwritten by 'bayr':
##   method          from
##   coef.stanreg    rstanarm
##   predict.stanreg rstanarm
##   print.tbl_obs   mascutils
##
## Attaching package: 'bayr'
##
## The following objects are masked from 'package:rstanarm':
##
##     fixef, ranef

library(brms)

## Registered S3 methods overwritten by 'brms':
##   method          from
##   coef.brmsfit    bayr
##   predict.brmsfit bayr
## Loading 'brms' package (version 2.18.0). Useful instructions
## can be found by typing help('brms'). A more detailed introduction
## to the package is available through vignette('brms_overview').
##
## Attaching package: 'brms'
##
## The following objects are masked from 'package:bayr':
##
##     fixef, ranef
##
## The following objects are masked from 'package:rstanarm':
##
##     dirichlet, exponential, get_y, lasso, ngrps
##
## The following object is masked from 'package:stats':
##
##     ar

library(mascutils)

##
## Attaching package: 'mascutils'
##
## The following object is masked from 'package:bayr':
##
##     as_tbl_obs
##
```

```
## The following object is masked from 'package:rstanarm':
##
##     logit
##
## The following object is masked from 'package:tidyr':
##
##     expand_grid
##
## The following object is masked from 'package:base':
##
##     mode
```

Import file

```
umux =
  read_csv("/Users/nesyalaviza/Desktop/Master/Thesis/DataCollection/umux2.csv") %>%
  print()

## Rows: 96 Columns: 18
## ── Column specification ────────────────────────────────────────────────────────
## Delimiter: ","
## chr (11): Version, Gendercoded, Nationality, Nationalitycoded, Occupationcod...
## dbl  (7): Participant ID, Participant ID_2, Result, Age, Gender, Occupation,...
##
## ℹ Use `spec()` to retrieve the full column specification for this data.
## ℹ Specify the column types or set `show_col_types = FALSE` to quiet this message.

## # A tibble: 96 × 18
##    `Participant ID` `Participant ID_2` Version Result   Age Gender Gendercoded
##               <dbl>              <dbl> <chr>    <dbl> <dbl>  <dbl> <chr>
##  1                1                  1 VR          75    28      2 Female
##  2                3                  3 VR          83.3  19      2 Female
##  3                4                  4 VR          83.3  25      1 Male
##  4                5                  5 VR          33.3  25      1 Male
##  5                7                  7 VR          83.3  25      1 Male
##  6                8                  8 VR          91.7  23      2 Female
##  7                9                  9 VR          66.7  25      1 Male
##  8               10                 10 VR          91.7  27      2 Female
##  9               11                 11 VR          66.7  26      1 Male
## 10               12              57229 VR          83.3  20      2 Female
## # … with 86 more rows, and 11 more variables: Nationality <chr>,
## #   Nationalitycoded <chr>, Occupation <dbl>, Occupationcoded <chr>,
## #   Education <chr>, Educationcoded <chr>, VRExperience <dbl>,
## #   VRExperiencecoded <chr>, VisualImpairment <chr>,
## #   VisualImpairmentcoded <chr>, `Task Order` <chr>
```

Statistic summary

```
umux %>%
  group_by(Version) %>%
  summarize(
    mean = mean(Result),
    sd = sd(Result),
```

```
  median = median(Result),
  min = min(Result),
  max = max(Result),
  var= var(Result)
 )

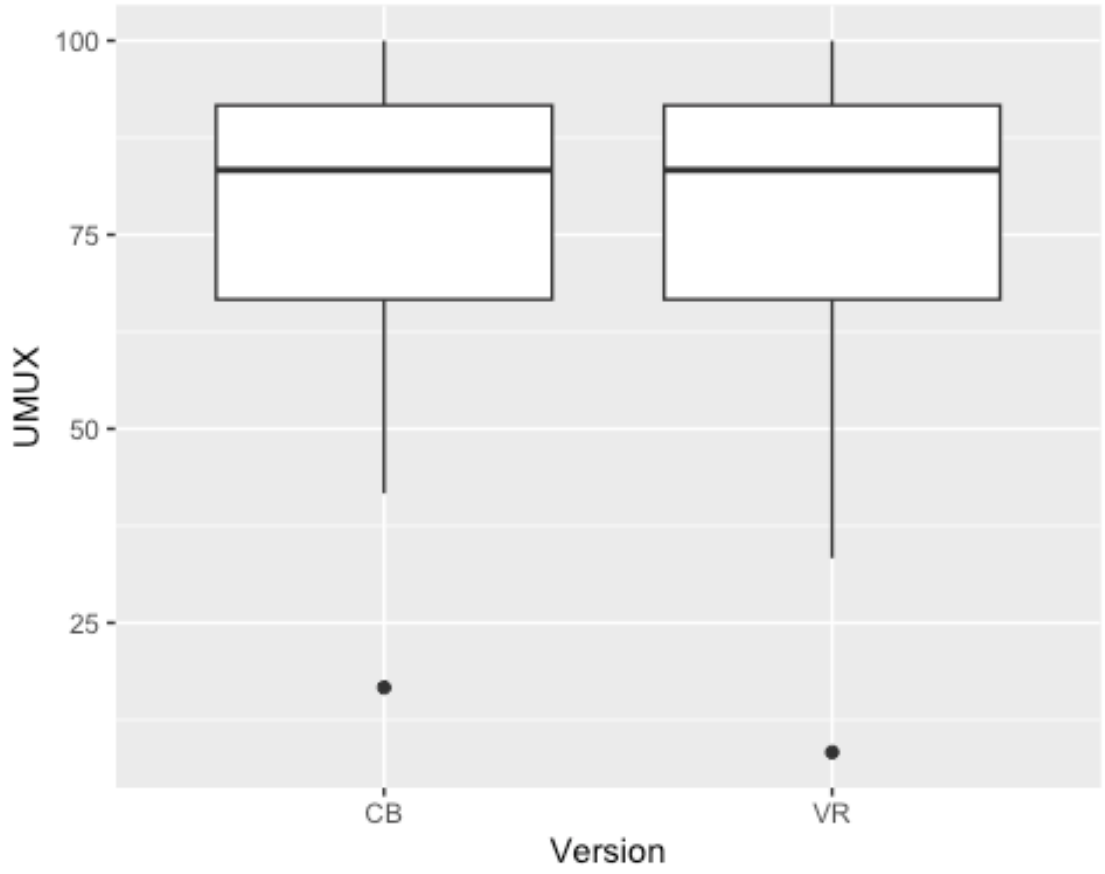
## # A tibble: 2 × 7
##   Version  mean    sd median   min   max   var
##   <chr>   <dbl> <dbl>  <dbl> <dbl> <dbl> <dbl>
## 1 CB       77.8  18.1   83.3 16.7    100  326.
## 2 VR       75.9  19.2   83.3  8.33   100  370.

df = umux[, c("Version","Result")]
agg = df%>% group_by(Version) %>%
  summarize(across(everything(), list(mean=mean, sum=sum)))
agg

## # A tibble: 2 × 3
##   Version Result_mean Result_sum
##   <chr>         <dbl>      <dbl>
## 1 CB             77.8      3733.
## 2 VR             75.9      3642.
```

Boxplot Per Version

```
umuxPlot <- ggplot(umux, aes(Version, Result)) +
  geom_boxplot()
print(umuxPlot + labs(y = "UMUX", x = "Version"))
```



t test

```
res = t.test(Result~ Version, data= umux, paired = TRUE)
res

##
##  Paired t-test
##
## data:  Result by Version
## t = 0.65227, df = 47, p-value = 0.5174
## alternative hypothesis: true mean difference is not equal to 0
## 95 percent confidence interval:
##  -3.980308  7.799752
## sample estimates:
## mean difference
##        1.909722
```

t test for alternative

```
res = t.test(Result~ Version, data= umux, paired = TRUE, alternative="greater")
res

##
##  Paired t-test
##
## data:  Result by Version
## t = 0.65227, df = 47, p-value = 0.2587
## alternative hypothesis: true mean difference is greater than 0
## 95 percent confidence interval:
##  -3.002959       Inf
## sample estimates:
## mean difference
##        1.909722
```

Plot for t-test

```
# Subset weight data before treatment
CB <- subset(umux,  Version == "CB", Result,
             drop = TRUE)
# subset weight data after treatment
VR <- subset(umux,  Version == "VR", Result,
             drop = TRUE)
# Plot paired data
library(PairedData)

## Loading required package: MASS

##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
##
##     select

## Loading required package: gld

## Loading required package: mvtnorm

## Loading required package: lattice

##
## Attaching package: 'PairedData'

## The following object is masked from 'package:base':
##
##     summary

pd <- paired(CB, VR)
plot(pd, type = "profile") + theme_bw()
```