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Exploratory study of alcohol dependent individuals and causes of drinking relapse by analyzing long-term Ecological Momentary Assessment (EMA) and interviews

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Abstract

The aim of the study is to identify whether stress, self-efficacy, craving and affect influences alcohol relapse. Previous literature proves the complexity of lapses. High levels of stress and craving is seen as a predictor of future lapses. Furthermore literature shows, that self-efficacy is especially low before drinking lapses. A negative affect is also seen as a predictor. Moreover studies highlight the usefulness to analyze data at the time before a lapse occurs. By analyzing week patterns it will be ensured to identify predictors of lapse.

The data is extracted from an experiment, which was recorded over the course of 100 days. Four participants had to fill in a questionnaire every three hours. The questionnaire included questions about stress, self-efficacy, affect and craving. In total, the four participants recorded 36 lapses. In addition to this exit interviews of the participants were analyzed.

The results show, that there are patterns of predictors regarding to lapses. However it was found, that there are stronger patterns on the day of the lapse than in the week before lapses. Moreover there are connections between predictors. Similarities as well as differences between the participants, regarding to drinking patterns could be identified by analyzing exit interviews.

All variables in this EMA study appeared to have some predictive ability, when looking at the weeks prior to lapses across the four individuals. This predictive pattern seems even stronger when zooming in at days before lapses. Comparing the different predictors, craving, self-efficacy, and stress appeared the most consistent

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1 Introduction

The diagnostic and statistical manual of mental disorders (DSM-IV) characterizes alcohol dependence as drinking which leads to clinically significant impairment, a lack of control over the amount of alcohol consumed despite realization of the alcohol problem (American Psychiatric Association, 2000). According to the Trimbos Instituut (2015) there are 30.000 people with a primary alcohol addiction in the Netherlands. In addition to that, the estimated number of unreported cases will be higher. Alcoholics have several difficult external and internal circumstances and feelings. The first step is realizing the problem. Then alcohol dependent individuals will understand the importance of seeking help and following a treatment plan. Otherwise there are various difficulties involved with an alcoholic's treatment. Furthermore patients will deal with withdrawal symptoms (Adamson, Sellman & Frampton, 2009, Kosten & O'Conner, 2003). It is a common phenomenon that alcoholics have lapses or relapses during treatment. Lapses can be seen as singular drinking incidents, whereas relapses are described as to remain sober (Flannery, Poole, Gallop & Volpicelli, 2003). Because of these frequent relapses during treatment, researchers are interested in identifying the causes of lapses and relapses. The overall goal is the prediction and reduction of lapses and relapses. The aim of the study is to examine important prospective factors of lapses. Moreover the study aims to identify patterns before a lapse, in order to improve prediction and prevention of future drinking lapses. To begin, differences between lapses and relapses will be discussed, followed by possible prospective factors such as self efficacy, stress, affect and craving.

Drinking lapses can be defined as one action at one period of time. Relapse is associated with continuous drinking. The definition is dependent on frequency and quantity of drinking (Fuller, 1997). Several articles use the word *lapse* instead of *relapse*. Shiffman et al (2000) use the word lapse when they talk about one action. When drinking is seen as normal, instead of an exception it is called relapse (Shiffman et al, 2000). Previous literature shows that self-efficacy, affect, stress and craving are possible predictors of alcohol lapses. Such predictors will be presented.

By analyzing possible predictors of drinking relapse, self efficacy was identified as an important factor (Sugarman, Kaufman, Trucco, Brown & Greenfield, 2013). Bandura (1977) defines self-efficacy as "the belief, that one has the ability to cope effectively with high-risk situations". Self efficacy is therefore the belief that someone is able to influence themselves and not be influenced by external circumstances, other persons or by chance or luck.

Individuals with a high self-efficacy belief in difficult situations are more likely to engage in effective coping strategies. This in turn will help them to persist with these behavioral patterns (Bischof, Rumpf, Meyer, Hapke & John, 2005, Greenfield, Hufford, Vagge, Muenz, Costello & Weiss, 2000). Individuals, who are unable to use effective coping strategies, report an increased use of alcohol as a strategy to cope with negative affect and high risk situations (Witkiewitz & Masyn, 2008). An article by Holt, Litt and Cooney (2012) presents the role of self-efficacy, negative affect and craving regarding lapses. According to the cognitive behavioral model of relapse the key factors of lapses are intrapersonal factors. They identified self-efficacy as a prospective predictor of lapses. In order to measure self-efficacy in a natural environment and in near real-time Ecological Momentary Assessment was used (EMA). Concurrent alcohol treatments often focus on enhancement of abstinence instead of lapse risk factors. Traditionally research focus on characteristics which are enduring, but it seems to be more effective to investigate more proximal factors, such as self-efficacy, negative and craving which may be modifiable in an intervention. For this reason proximal factors with an EMA method were conducted over a period of 28 days. 48 participants were included in the experiment. Furthermore variables were measured five-times per day between 8:00 AM and 10:00 PM. Results show that self-efficacy can be seen as a prospective predictor. However a low level of abstinence self-efficacy (ASE) of smoking seems to be more able to predict drinking lapse than low level of abstinence self-efficacy of drinking. The authors mentioned some limitation, for example that four weeks of EMA analysis are too few and that there were small percentages of participants, who lapsed (N=29). An experiment of Cooney et al (2007), which was conducted over fourteen days with an electronic diary emerges, that drinking lapse was predicted through low self-efficacy. Ecological data was used, because problems with faked compliance can be avoided through exact recording of date and time. Moreover retrospective recall bias is avoided through EMA. Results show that low self-efficacy reduces the ability to cope with temptation. A well as Holt et al (2012), Conney et al (2007) reported limitations, caused by too short time periods of the experiment.

With regards to the literature of lapse and relapse, Craving appears to be a major contributing factor. It is shown that craving is a complex element, whereby internal cues as well as external, environmental cues play a role (Ludwig &Wikler, 1974). Craving is influenced by social, psychological and environmental factors (Sugarman, 2013; McKay, 2011; Brown, 1995). According to the cognitive behavioral model of relapse and lapse, the urges to drink or craving are determinants. Shiffman et al (1997) found with EMA methods that craving is a prospective factor of lapses. As described before craving is a complex factor.

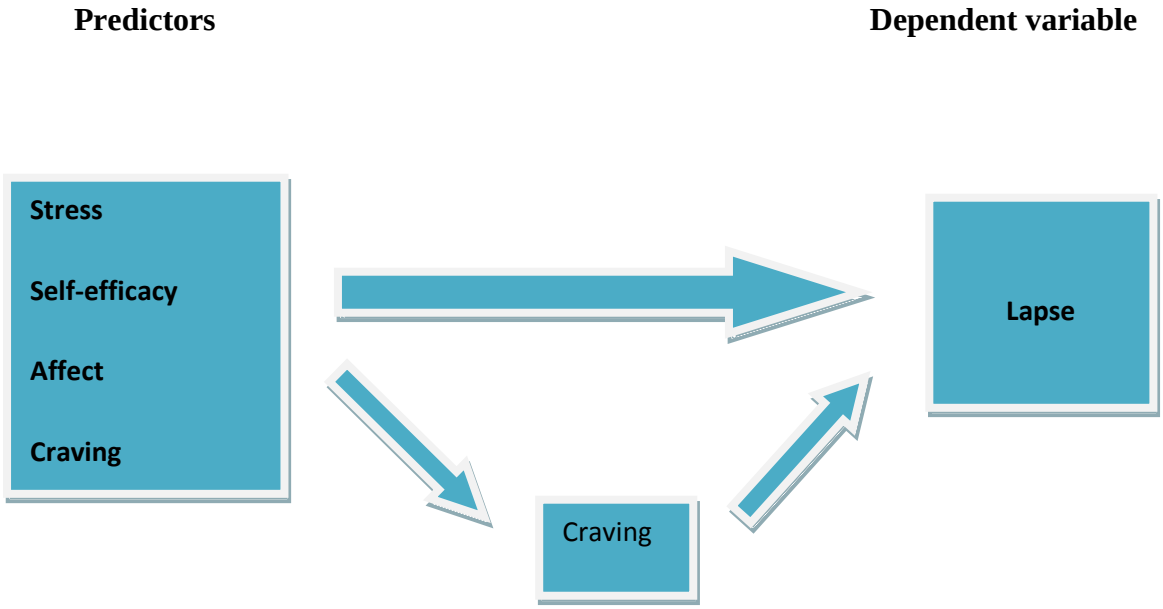
For example alcohol is used to decrease negative affect. Negative affect can therefore be seen as a trigger, which influences craving of alcohol and in turn lead to an alcohol lapse (McKay, 2011). Furthermore there are different versions of stress, one of them is craving caused by stress (Brown, 1995).In addition Holt, Litt and Cooney (2012) discussed the role of craving caused by self-efficacy. In conclusion, craving can be seen as both, a predictor of lapse or as a mediator between predictor and lapse.

Affect is identified as another predictor of relapse (McKay, 2011). Literature showed an association between negative affect and alcohol relapse after a period of abstinence. However little is known about the correlation. Witkiewitz and Villarroel (2009) conducted an experiment, which gives more insight about the relation between negative affect and drinking behavior. Changes in drinking behavior were associated with changes in negative affect. They concluded that the two variables are dynamically linked. Cooney et al (1997) also reported a relationship between drinking and negative affect. They found that alcohol beverage presentation and negative affect imagery led to increased desire to drink. Other studies also demonstrate negative affect as a predictor of relapse. They show the interplay between negative affect, craving and substance use. Learning based models give explanation for this relationship. The use of alcohol temporarily diminishes painful emotions. These negative emotions in turn trigger the desire to alcohol. Abstinence of alcohol is experienced as craving. According to this, people drink alcohol in order to reduce negative emotions (McKay, 2011). Besides Hodgins, el Guebaly & Armstrong (1995) verify the relationship between affect and relapse. Participants who reported relapses frequently also reported negative affect. There is a negative impact of negative affect in recovery. Chance of lapse and relapse increase when affect becomes negative. Therefore clients should be educated on the role of affect and how it influences recovery. They should learn to identify situations with potential to trigger negative affect in order to overcome relapse (Strowig, 2000).

In addition to this, stress seems to be an important and influential factor regarding the risk of relapse. For example Brown (1995) discusses the importance of stress and vulnerability. Moreover as mentioned previously stress related craving and relapse is a complex mechanism, which consists of different cues. There are interoceptive cues, which describe stimuli within an organism and exteroceptive cues which means stimuli that are external to an organism are responsible for craving (Ludwig & Wikler, 1974). The internal cues are more influential than the external. Sinha (2007) identified a stress related mechanism, where stress leads to distress, anxiety and craving. This in turn leads to an alcohol abuse relapse risk. Emotional stress seems to play a role in motivation to drink alcohol. Indeed

previous literature shows effect of stress and negative affect regarding to alcohol consumption, but the role of stress was elusive until now (Sinha, 2012). Alcohol use can lead to neuradaptive changes in stress and reward system, which means that alcohol dependent individuals turn to alcohol as a method of coping. The outcome of this is that stress increases the risk of relapse. There are two situations in which relapse occur. The first one is emotional and stressful situations. Other situations are drug or alcohol related. Literature from Sinha et al (2009) shows, that alcoholics have higher cortisol levels, increased heart rate and blood pressure and cravings. With a laboratory study they show, that exposure to stress increase craving rate and in turn possibility of relapse. Another view of stress and relapse is that chronic alcoholics struggle with anxiety, negative affect, changes in sleep patterns, appetite, aggressive behaviors, changes in attention, concentration and memory. All these effects may lead to stress as well (Sinha, 2012). Stress is described as an increased secretion or over activity of stress hormones such as norepinephrine and cortisol (Heinrichs &Koob, 2004). Because of this multilevel view of stress and relapse, it is difficult to connect prominent cognitive-behavioral strategies in alcohol treatment with realistic craving situations. Other laboratory studies show the relationship between reported high stress level and physiological responses such as higher heart rate and blood pressure regarding to craving and relapse (Sinha, 2012). Fox et al (2007) also discussed the multifaceted phenomenon of stress and relapse. They show that stress predicts change in emotions and in turn increased chance of relapse. Even from an animal view, findings show that exposure to stress may facilitate alcohol relapse (Rodd et al, 2005). Stress induced craving seems to be a predictor of alcohol relapse propensity (Higley et al, 2011). Findings suggest that stress and hormonal responses could help for diagnosis and evaluating relapse propensity. They support the need to address the effect of stress and relapse via pharmacological, cognitive or behavioral alcohol treatment in order to prevent relapses (Hgley et al, 2011). Furthermore Brown et al (1995) highlighted the importance of vulnerability and describe a stress-vulnerability model of relapse. They conclude that cognitive as well as behavioral interventions are necessary to improve coping and in turn decrease the risk of relapse.

Figure 1 Conceptual Model of Current Research



1.1 Current Study

Traditional methodologies have to deal with several problems such as recall bias in retrospective studies. Furthermore proximal factors of lapse are subjective and variable over time. For traditional methodologies it is therefore difficult to capture these factors when lapses occur. Because numerous symptoms of alcohol addiction are subjective, it is necessary to measure these symptoms accurately. Repeated measurements are needed, ideally in a natural environment rather than in a laboratory (Hardt and Rutter, 2004). Ecological momentary assessment (EMA) is able to identify behaviors and experiences in real time and in natural environments. EMA aims to minimize recall bias and in turn maximize ecological validity. It is an effective method in the field of relapse research, because it is necessary to have information about cognition and behavior in real time and real life. This makes it possible to find patterns in alcohol relapses (Litt,Cooney & Morse, 1998). With the help of EMA it will be possible to show the complex nature of alcohol use and identify the patterns of alcohol use and underlying mental processes, because of the quality and richness of the data (Neal et al, 2006). EMA has statistical power and allows for smaller sampler (Lukasiewicz et al, 2007). Moreover using devices such as cellular phones enables self reporting (Collins, Kashdan & Gollnisch, 2003). Continuous measurements are vital, because the common characteristics of stress and affect fluctuate rapidly over time (Liu, 2009; Miller, 2015). This new data will help to enable understanding of the relationship between alcohol use and human cognition. EMA methodology gives the opportunity to improve the treatment of alcoholics in

the future (Morgenstern, Kuerbis & Muench, 2014). The most frequent limitation described in relevant literature, is that length of experiments are too short. Variables are oftentimes recorded in a two-week or four-week period.

In conclusion there are several factors, which influence alcohol relapse such as stress, craving, self efficacy and affect. Moreover literature shows different methods types of measuring the intrapersonal factors. Conventional methods measure data at limited points of time, for example with pre- or post tests. However the chosen parameters fluctuate over time. EMA seems to overcome problems of traditional studies such as recall bias. In addition to this previous EMA studies report limitations regarding to time of executed experiments. For future research authors often recommend more time for conducting relapse studies. The following study comprised an experiment which took longer than experiments in previous research. Literature shows the importance of focusing on the time before lapses in order to recognize prospective factors.

Interviews of participants will be integrated in the study in order to increase the validity of the study it is chosen. The qualitative method will be used to support or verify and interpret findings of the quantitatie method (Bartholomew, Parcel, Kok, Gottlieb & Fernandez, 2011). Mixed- methods permit an eclectic view of complex problems (Johnson & Onwuegbuzie 2004). As described previously the study of lapses and its influential factors are complex. Therefore qualitative as well as quantitative analysis of alcohol relapse will be analyzed in order to indicate the connections. In order to understand lapse and relapse and it's causes, the following research question will be discussed.

- The patterns identified during the course of the study, and from the analysis of the EMA data and interviews, would suggest stress, self-efficacy, affect and craving are primary causes of alcoholic lapse or relapse.

2 Method

2.1 Selection of participants

There were four participants included in this study. All of whom were Dutch. There was one female and three male participant.. The age of the participants is 33, 44, 53 and 55 years. All of them experienced drinking lapses. They were recruited from Tactus-Verslavingszorg. All had participated in Tactus treatment plans. All of them are alcohol dependent and followed the "Alcohol de baas" program of Tactus.

During an interview before the experiment started, participants were asked about their goal. Three of the participants set their goal to be abstinent during the experiment. One participant aimed to drink maximal 2 entities and only on a Friday or Saturday. Given, that three participants drunk alcohol, although they pursued not to drink, drinking can be seen as lapses. The participant who wanted to reduce alcohol consumption drunk ten times during the experiment, in which seven times can be seen as lapses. The remaining drinking moments can be seen as reduced drinking, because it did not violate the goal. Furthermore drinking was seen as lapses instead of relapses, because they continued abstinence after drinking.

2.2 Materials

The materials were proved by the "Medisch Ehtische Toetsingscommissie Twente". It was necessary to prove the experiment, because the target group was vulnerable The study got a positive judgment from the commission (Number of approval: NL58392.044.16).

The questionnaire consisted of one question for each variable. Stress was measured with the question "Ben je momenteel gestrest? Op een schaal van 0 (niet gestrest) tot 10 (extreem gestrest)". Self-efficacy were asked with the question "In hoeverre denk je dat je momenteel in staat bent om je trek te weerstaan? Op een schaal van 0 (niet te weerstaan) tot 10 (makkelijk te weerstaan)". Regarding craving the participants were asked if they experience craving now "Heb je momenteel trek om te drinken? Op een schaal van 0 (geen trek) tot 10 (extreme trek)". In contrast to the other independent variables affect was measured with the two dimensional valence arousal matrix (Russell & Pratt, 1980). Participants had to pull a picture to their contemporary feeling, from negative and low energy (-50) to positive and high energy (50). The question was "Hoe voel je je op dit moment? Sleep het plaatje naar je huidige gevoel." The visual analogue scale aims to increase the participant's engagement by making self-reported surveys more visual (Thomas, Bremer,

Terhanian & Couper, 2007). Furthermore it seems to be less sensitive to comparative measurements (Carlsson, 1983).

Ooteman, Koeter, Verheul, Schippers, and Brink (2006) concluded that single-item measures are correlated with longer measures. Single-item measures are valuable instruments to identify current states. The repeated measurements of variables over a long time benefit the validity of the questionnaire (Bergkvist & Rossiter, 2007).

Furthermore they were asked to report lapses in a daily diary. One glass of beer, wine or shots is seen as one entity. The question regarding to lapse was "Hoeveel eenheden heb je toen gedronken? Probeer het aantal eenheden te schatten (1 bierglas, 1 wijnglas,1 shotglas sterke drank = 1 eenheid)".

In addition to this, exit interviews of the participants were analyzed in order to support the quantitative findings. During the exit interviews the participants got questions about their experience within the 100 days of the experiment. Participants discussed every single variable separate in order to identify important connections of variables and drinking behavior. Furthermore it was asked how participants define the variables. They also discussed possible treatments in the future. In order to analyze the interviews, a code schema (Appendix 1) was created. It was chosen for a deductive coding, because the schema was based on interview questions (Fereday & Muir-Cochrane, 2006).

2.3 Design and Procedure

The design can be described as a single case observational design. Participants were asked to fill in a short questionnaire every three hours. Oftentimes EMA designs are associated with compliance regarding to alcohol measurements. Nevertheless research showed, that an interval-contingent EMA design has lower burden in comparison to other EMA designs (van Lier et al, 2017). Therefore an application on their mobile phones was used, which signals the participants every three hours, that they had to fill in the questionnaire on their cell phones. It aimed to monitor craving, stress, affect, self-efficacy and report lapses. With the help of EMA, data was collected in real life situations. At the end of the 100 day experiment, the participants had an exit interview, in which they reported their experiences.

2.4 Data analysis

EMA data can be recorded multiple times throughout the day or as a retrospective daily diary (Shiffman, 2009). In this study both are used. Predictors were measured multiple times daily

and the dependent variable lapse was measured once a day, because it is not sensitive to recall bias. The data was imported in the program "R". In order to get an overview of the relevant data, subsets of the selected participants were separated from the total dataset. Furthermore variables, which were integrated in the analysis, were separated as well. First of all the descriptive statistics were presented, including means, minimum value, maximum value, standard deviation, variance, extreme values and quantiles. Extreme values include all observations, which are one standard deviation above or below the mean value. In addition plots were established from all predictor variables so that all observations of the participant are presented separately.

Literature of EMA data indicated that time-related information regarding to lapses are valuable in order to indentify patterns of alcohol use (Morgenstern, Kuerbis & Muench, 2014, Neal et al, 2006). According to Rozensky (1974), the most appropriate way for EMA methods and designs are through illustrative examples. Therefore it is chosen to use plots for analysis. In addition the most common design to examine EMA data is to use time-based assessments in order capture patterns around lapses. Because it is necessary to explore prospective influences of lapse, the focus will be on the observations on weeks before lapses occur. The weeks before lapses were chosen as the focus, because it will be helpful to identify patterns at time prior to lapses. It ensures that all important information will be identified. In order to identify patterns of predictors and lapses, plots were conducted. Week means will be compared with long term means. Long term means include all observations of the whole time of the experiment (100 days). In the analysis means of 100 days will be compared to the mean weeks and day mean. In order to integrate important patterns, data of single days are also relevant. Mean values of particular days were described if it had additional benefit for the analysis, which means that patterns of particular days were identified.

Additionally exit interviews were analyzed. After the 100 days of the experiment participants had an interview. They were asked to describe their experiences of the last 100 days. They discussed their definitions of the variables and their normal way of filling in the questionnaire. In order to analyze the exit interviews a codebook was used. The examiner followed a schema during the interviews. All variables were discussed separately. The codebook was written in a deductive way, which means that all variables were also analyzed separately. The codebook consists of five codes, namely stress, self-efficacy, affect, craving and lapse.

3 Results

In the following result section every participant will be analyzed separately. First the descriptive statistics will be specified and explained. After that the weeks before lapses will be described in more detail. Finally the exit interviews of the participant will be presented. At the end data of each of the participants will be concluded.

3.1 ID429

3.1.1 Descriptive statistics

The participant recorded 4 lapses during the hundred days of the experiment. Although the participant reported a relatively low average stress level of 1.69 (SD=1.7) over the full 100 days, in about 10% of all 330 values ID429 reported peak values of more than a standard deviation above this average. Furthermore *self-efficacy* is remarkable high. Equally to stress there is huge range, namely from minimum 0 to maximum 10. Out of 330 observations, 28 observations are below the value of the standard deviation. Interestingly 19.6 % of all affect observations and 20,2% of all energy observations are extreme values. It underlines the variability of the participant's affect (65 and 67). The feeling of *craving* in the 100 days of the experiment also ranges from 0 to 10. In comparing to the other variables, craving has a higher standard deviation, which explains the 56 extreme values that are spotted.

Table 2 *Descriptive Statistics ID429*

	Observations	Mean	Min	Max	Quantile	Numbers extreme values
Stress	330	1.69 (1.68)	0	9	0,2,3	36
Self-efficacy	330	8.12(1.95)	0	10	8,8,9.75	28
Affect	331	14.12 (10.83)	-47	50	9,13,19	65
Affect(Energy)	331	11.36 (16.17)	-45	45	9,14,21	67
Craving	327	1.58 (2.78)	0	10	0,0,3	56

3.1.2 Time related lapse analysis

In the following: stress, affect, self-efficacy and craving will be discussed seven days before a lapse until three days after a lapse. The week before the first lapse the Participant's average stress level increases from average 1.69 to 2.2 (Figure 7). Furthermore the stress level decreases after the lapse to 0.8. In the week before the second lapse the participant reported a slightly lower stress level (1.35) than on average (1.69). After the lapse, the stress level rises.

Before the third lapse, stress in total and stress a week ago (1.47) do not differ from each other. The week before the fourth lapse the average stress level was 3, which means that stress is significantly higher comparing to general stress (1.69). During three of four lapses stress mean is higher on the day of the lapse than stress mean in general.

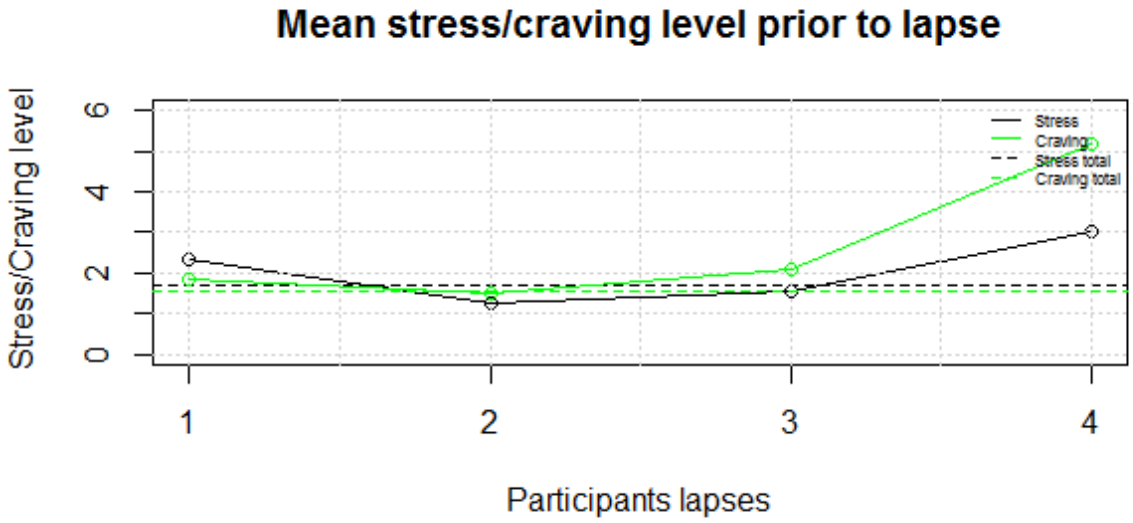
Self efficacy the week before the first lapse is 7.32 and therefore significantly lower than the average self-efficacy level (8.12). The first lapse is characterized by a decrease in *self efficacy* during the day of the lapse (Figure 9). Self efficacy decreased the day of the lapse from 8 to 3 and rose to 8 directly after the lapse. The same pattern is identified the week before the second lapse. Self-efficacy is slightly lower than the average the week before the lapse (7.15). Self-efficacy is significantly low on the day of the lapse (0), which means that the participant felt unable to resist alcohol. There are only 6 days between the first and the second lapse. Without counting the observations of the first lapse to the week before the second lapse, self efficacy is still slightly lower than the average (7.43). The week before the third lapse, self efficacy ranges from 0 (not able to resist) to 10 (easy to resist). Nevertheless the average self-efficacy the week before the lapse is nearly the same as the general average self-efficacy level during the 100 days of the experiment (8.2 and 8.12). However there is a decline in self-efficacy on the day of lapse. After the lapse, self-efficacy increases again. Furthermore it is significantly lower (5.75) the week before the forth lapse than the average self-efficacy level (8.12). Again self efficacy is especially low on the day of the lapse.

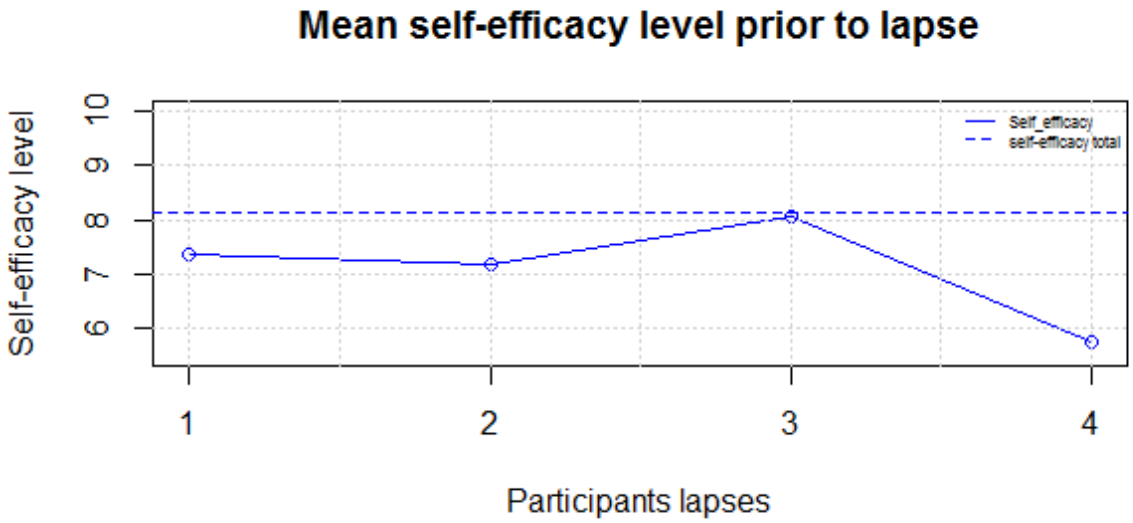
There are minimal differences regarding to *affect* in general and affect during the week before the lapse. However affect increases the day before the first lapse (Figure 11). During the week before the second lapse affect is slightly higher than the average (19.28). Before the third lapse there are no significant differences in affect and no remarkable day patterns to see. Before the forth lapse affect is 3.38 more positive than the average affect level (17.5). Furthermore the amount of energy does not differ significantly from the general energy level during the week before the first lapse. Energy in general and during the week of the second lapse does not differ, but the range is relatively high from -30 to 30 (Figure 13). Energy increases immediately before the second lapse and decreases again after the lapse. The week before the third lapse energy is higher comparing to the average (17.5).

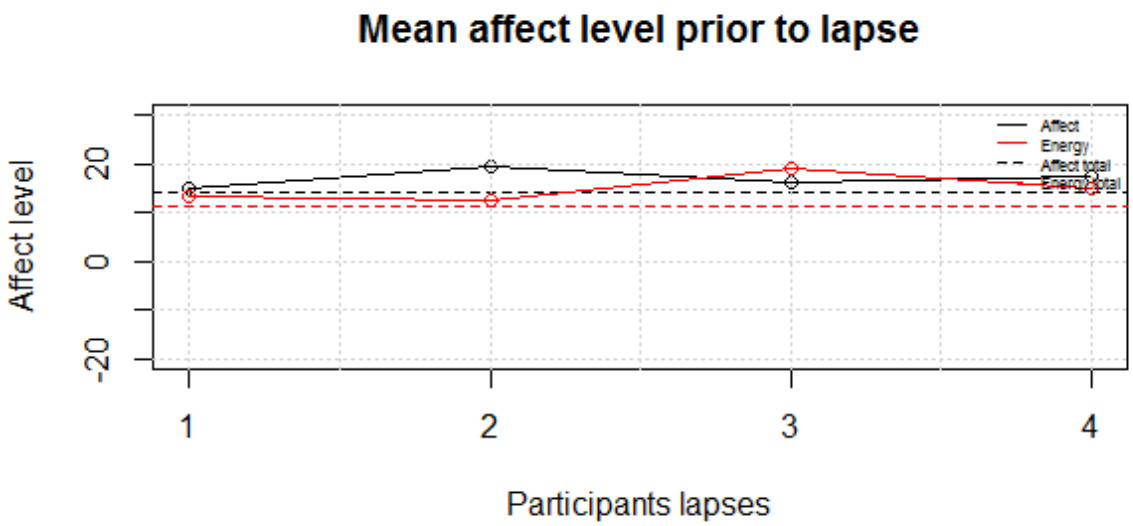
The weeks before the first three lapses there is no difference between *craving* before the lapse and general craving (Figure 2). The craving level the week before the forth lapse is significant higher than the average level (5.17). A remarkable pattern is that craving increases immediately the day when lapses occur (Figure 15). Furthermore craving decreases to the

minimum (0) after all lapses, this means that ID429 felt no craving after the lapses (Figure 15).

Figure 2 *Mean levels of predictors during the weeks prior to lapses in comparison to total mean levels of ID429*







3.1.3 Exit interview

According to ID429 the desired effect of drinking is the absence of feelings, such as stress. Although the participant reported that the experiment did not affect drinking behavior itself, it helped to get more conscious of own behavior, because the questionnaires asked about drinking behavior. The participant said that the threshold of drinking was higher. According to ID429 the decline in drinking is caused by an increased awareness of own feelings and drinking behavior. The participant reported that stress and craving are often connected with each other, which means that craving is higher when the participant felt stressed. By looking at the EMA data there are identical patterns of stress and craving. For example in the week of the third lapse, there is a peak in stress as well as in craving. According to ID429 craving can be divided into two types, one caused by stressed and one caused by reward seeking. If stress was high, craving also increased. However if affect was stated positive, craving increased as well, because of reward seeking. For example when the participant said that drinking can also caused by satisfaction and achievements. Then drinking is seen as a reward. If stress is high, the participant reported to drink more than if it is caused by reward seeking. Besides, the feeling of low energy is seen as an influential factor regarding to drinking. Being low in energy operates as a depressed attitude. If the participant felt physical active, chance of having a lapse is lower according to ID429. In addition ID429 said that self-efficacy is especially low when being alone. According to the participant the decrease in self-efficacy can be explained by not having any distraction when being alone. The questions are seen as feedback, which helped to get conscious about inner self and drinking behavior.

3.1.4 Conclusion ID429

Participant ID429 reported four lapses. The data show that stress, craving and self-efficacy are predominantly positive, which means that the mean levels of stress and craving are low and mean levels of self-efficacy are high. There are also several extreme values, which underline the fact that the participant had some periods of high stress and craving or low self-efficacy. The data show, that the participant recorded low self-efficacy on the day of each lapse. A similar pattern is occurred in craving, but not in affect and stress. In the interview the participant reported a connection between stress and craving and also affect and craving. According to ID429 there are two types of craving, one caused by stress and one caused by reward seeking. This is not shown in the data, but van be seen as an explanation of the data. The participant not only started drinking because of craving or stress, but also because of being satisfied. It is also remarkable that the data often show no craving (Figure 17).

3.2 ID590

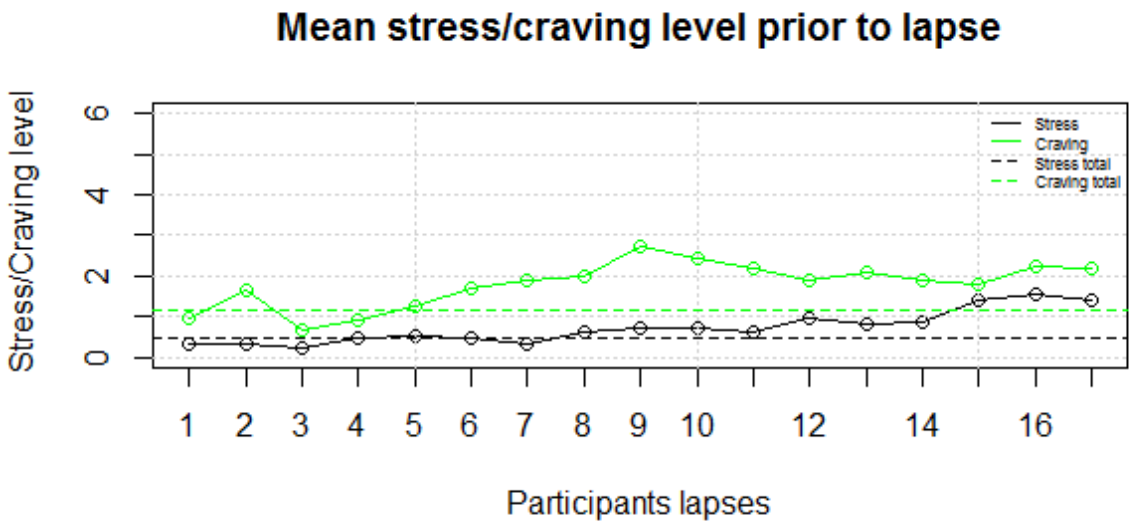
3.2.1 Descriptive statistics

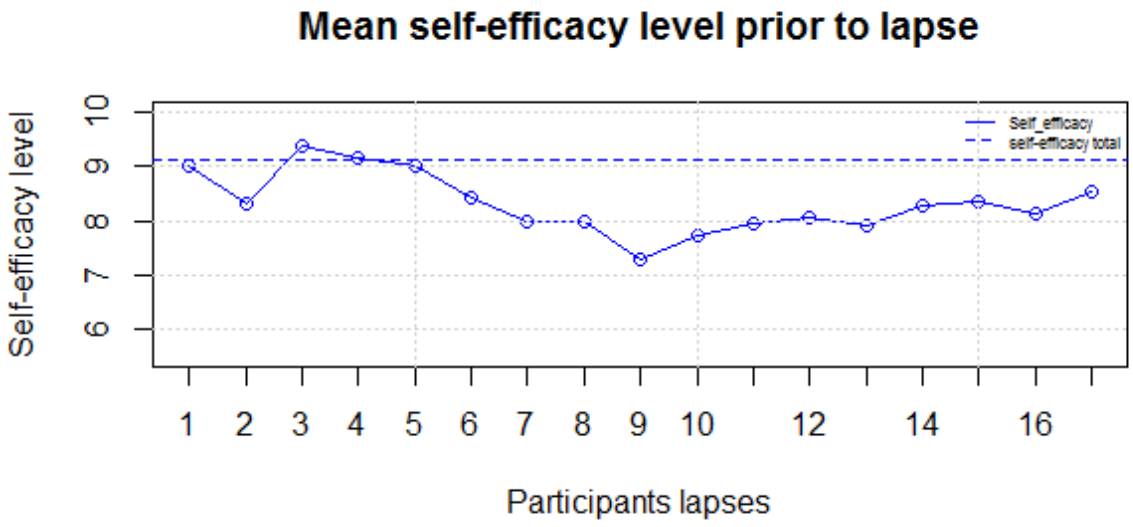
Participant ID590 reported 17 lapses during the hundred days of the experiment. The low level of *stress*, which is 0.49 (SD= 1.35) on average is notable. The range of stress goes from 0 to 6 whereby the maximum of 6 also highlights the notable low mean value of stress. *Self-efficacy* is high on average but there is a range from minimal 0 to maximal 10. The participant mostly reported the maximum self efficacy (10), but after one month there are several extreme values (Table 4, Figure 14). The number of extreme values of affect and energy is remarkable. It indicated a high variability of these variables. Interestingly in the first month of the experiment energy was particularly low (Figure 16). Furthermore there is a low level of craving but it ranges from 0 to 10, which spots that there are 66 extreme values.

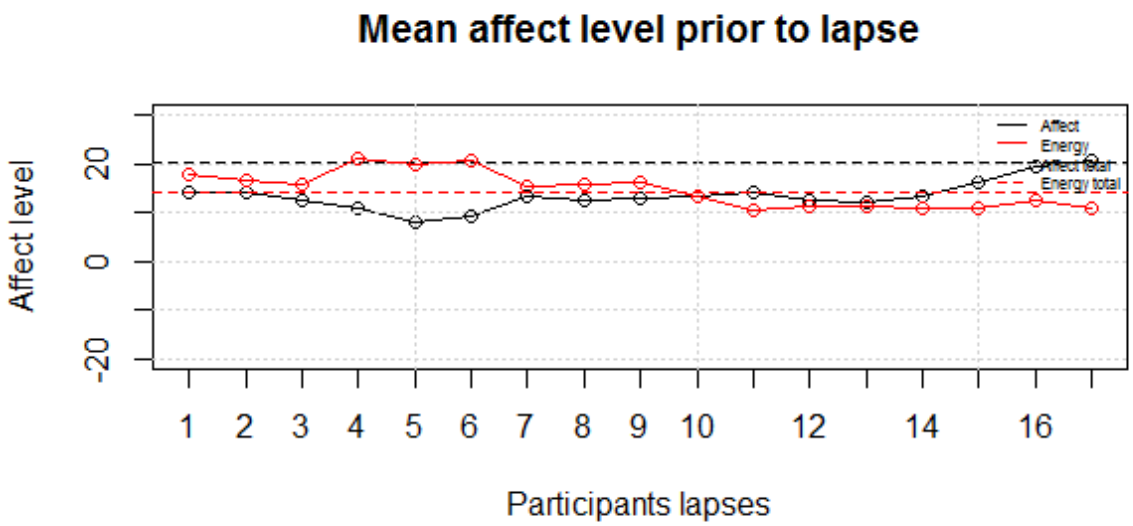
Table 4 *Descriptive statistics ID590*

	Observations	Mean	Min	Max	Quantile	Numbers extreme values
Stress	442	0.49 (1.35)	0	6	0,0,0	45
Self-efficacy	442	9.11 (2.51)	0	10	10,10,10	43
Affect	442	20.42 (17.01)	-21	50	4,17,36	205
Affect(Energy)	442	14 (15.07)	-37	50	6,16,24	107
Craving	441	1.17 (2.28)	0	10	0,0,0	66

Figure 3 *Mean levels of predictors during the weeks prior to lapses in comparison to total mean levels of ID590*







3.2.2 Time related lapse analysis

To get a closer look the weeks before lapses will be explained in the following. In the week of the first lapse, the participant reported no *stress* (Stress=0), except the day of the lapse (Figure 17). During this day, stress rises to 5, which is close to the maximum recorded stress level of 6. Then stress falls to zero directly after the lapse. In the week of the second lapse, the participant recorded no stress, except two peaks, one peak two days before the lapse and one day before. On the day of lapse and the days after the lapse stress is zero. The same pattern as of the first two lapses is identified during the week before the third lapse. There is no stress, except the day where the lapse occurs. Between the third and the forth lapse are only 4 days, which means that the week before the forth lapse is characterized by 2 peaks, one on the day of the third lapse. Furthermore there is another peak of stress during the day of the forth lapse. There are several weeks with more than one lapse. It is notable that stress increases on the day of 12 out of 17 lapses. . Figure 3 shows the mean stress level and the mean stress level the week before each lapse. Regarding to stress there is no week pattern identified, but there is a pattern regarding to the day when lapses occur (Figure 17).

The day before the first lapse is also characterized by a decrease in *self-efficacy* (Figure 19). There is also a decrease of self-efficacy six days before the lapse. In the week of the second lapse there are three local minima, in which one of them is due to the day of the lapse. Moreover the day of the third lapse is characterized by a decrease in self efficacy from the maximum of 10 to the minimum of 0. During the week of the forth lapse there is one minimal turning point, which is due to the third lapse. Furthermore, there is a decrease in self-efficacy from 10 to 6 the day of the lapse. Interestingly, in all cases of lapse there is a

decrease of self-efficacy the day of the lapse and in 10 out of 17 lapses, it decreases to the minimal value of zero. Figure 3 also highlights the previous findings. It is notable that self-efficacy level is lower the week before lapses than the general level. Furthermore there are 43 extreme values, where self-efficacy is remarkable low.

Affect is in average slightly negative during the week before the first lapse than affect in general (Figure 21). In addition there is variability within the day of the first lapse, because affect ranges from 3 to 48. There is also a variability of affect the week before the second lapse. Here it is remarkable that affect ranges from 0 to 50 within the day of the lapse. The same pattern is identified in the week before the third lapse. During the week before the forth lapse the mean is still below the average affect. On the day of the lapse affect ranges from 0 to 28. In 16 out of 17 weeks before lapses affect is lower than affect in general. Frequently affect is significant lower the weeks before a lapse. The variability of energy is not as extreme as in affect. The mean level of energy the weeks before lapses do not significantly differ from the general average. Whereas affect is more negative the weeks before lapses than on average, there is no significant difference in energy (Figure 3, 23).

In the week before the first lapse, *craving* has one peak six days before the first lapse and one day before the first lapse (Figure 25). The week before the second lapse is characterized by three peaks, which go up to the maximum of 10. Again there is a peak on the day of the lapse. Craving is nearly absent the week before the third lapse, except the day of the lapse, here craving goes up to 10. Peaks of craving of the forth lapse are due to the third lapse and the forth lapse. Similarly to self-efficacy, craving is higher the week before lapses than the general craving level. It is remarkable that craving had significant peaks the on the days of all lapses (Figure 25).

3.2.3 Exit interview

The participant had 16 weeks of group discussions within the organization Tactus-Verslavingszorg. After that there are several lapses. At one point ID590 started drinking with friends, especially during the weekends. Interestingly the overall goal was to be sober during the 16 weeks of the group treatment, which was achieved. Although the participant reported 17 lapses, ID590 seems to be satisfied and proud, because the goal was achieved. Sometimes ID590 planned to drink with friends, but after that it was difficult to stop, for example if there are some remains of the last day, the participant reported to be inclined to continue drinking. The participant reported not to be a lonely drinker, who drinks because of anger or worry. According to that drinking with friends is caused by sociability. ID590 reported not to drink at

home when being alone. The participant reported a positive affect most of the time. This is also recognizable in the data, because the participant recorded the most positive affect of all participants. However the participant identified a connection between stress and affect. If stress increases, affect gets negative, which in turn may lead to lapse. Furthermore he reported in the interview a connection between stress and drinking. If the participant stopped drinking for a longer time, stress decreased as well. Moreover ID590 said, if stress level is high, the chance of drinking increases as well. In conclusion drinking increases stress. The participant reported craving many times during the experiment. Craving is characterized as restlessness. If craving was high, it was difficult to resist alcohol. Then it is necessary to search diversion, for example to go out with the dog. This illustrated the connection between craving and self-efficacy. In general term reported self-efficacy of the participant was high. Interestingly the participant specified achievements instead of failures. The Participant's targeted goal was to drink nothing during the experiment. Although there are 17 recorded lapses the participant said to be satisfied, because the self-appointed goal was to stop drinking alcohol during the 16 weeks of the group discussions. It is not clear if the participant changed the goal, which was set in advanced. The participant stated that it would be better if he achieved not to drink during the whole time of the experiment, but the self-set goal at the beginning was to resist alcohol during the weeks of group discussions.

3.2.4 Conclusion ID590

Participant ID590 reported 17 Lapses. The mean level of stress and self-efficacy was more positive than mean levels of Participant ID429, although ID590 recorded significantly more lapses than ID429. The data also indicate a low craving level. In the exit interview the participant said that drinking is mostly not caused by a negative feeling, such as worry, it is caused by sociability. In general the participant reported to have a positive affect. Nevertheless there are several extreme negative values regarding to affect (103), which indicate that the participant also had periods of negative affect. The participant reported that affect is also influenced by other variables such as stress. This could also be an explanation for affect variability. Furthermore there is a connection between stress and drinking. If ID590 did not drink for a longer time, stress decreases. Besides if craving is high, the ability of resisting alcohol decreases, which underlines the connection between self-efficacy and craving. In general terms the participant felt able to resist alcohol. During the first interview, ID590 set the goal to drink nothing, but at the end of the experiment the participant reported

another goal, which was being sober for 16 weeks. Obviously the participant changed the goal during the experiment.

3.3 ID624

3.3.1 Descriptive statistics

Participant ID624 reported five lapses. The average *stress* level is remarkable low. Furthermore the quantiles shows that 75 % of the all data are equal to zero. The mean self-efficacy level is attached to 9.51 with a standard deviation of 1.34. The minimal level of self-efficacy is 5 and the maximum 10. Whereas the participant reported a more positive *affect* (mean= 28.33, sd=22.23), the amount of energy is not remarkable positive (mean=2.66, sd= 27.64). Conspicuously the range between positive and negative affect is relatively high given the slightly high standard deviations, which means that ID624 had a negative affect at one or multiple times of the experiment. The high standard deviation underlines this finding. Furthermore there are several extreme values regarding to affect (72) and energy (130). Beyond, the average *craving* level is low. Craving levels range from minimal 0 to maximal 10. It is remarkable that 75% of all values are equal to zero. Furthermore there are 54 extreme values. In conclusion the participant reported remarkable low level of stress and craving and a high level of self-efficacy. Furthermore there is a relatively positive affect, but in average the participant felt not high in energy (Table 6).

Table 6 *Descriptive Statistics ID624*

	Observations	Mean	Min	Max	Quantile	Number extreme values
Stress	331	0.72 (1.66)	0	7	0,0,0	57
Self-efficacy	331	9.51 (1.34)	5	10	10,10,10	42
Affect	320	28.33(22.23)	-50	50	10,37,44	72
Affect (Energy)	320	2.66 (27.64)	-50	45	-12,2,24.25	130
Craving	329	0.81 (1.85)	0	10	0,0,0	54

3.3.2 Time related lapse analysis

The week before the first lapse is characterized by relatively low *stress* in average and a number of peaks where stress is above 3 up to 7 (Figure 27). It is notable that stress gets higher on the day of the lapse than on average. In general the average stress the week ago is

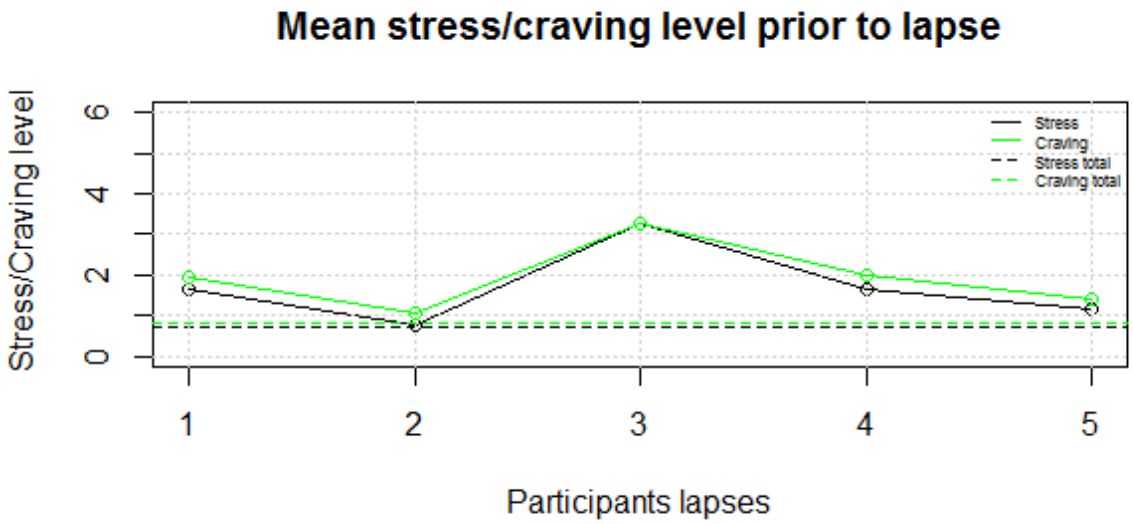
1.67, which does not differ significantly from the average stress level. Besides the standard deviation is high, which underlines the previous findings, that stress has some peaks in the course of the week before lapse. The week before the second lapse the average stress is slightly lower than the general stress level on average. The mean of stress during this week is 0.76. Again there are many observations where the participant recorded zero stress, but there are also some peaks which go up to 5. The day before the lapse, there is a fluctuation (from 0 to 3 to 0 to 5) in stress. The average stress level a week before the third lapse is significant higher than the average stress level (3.29). Within the day of the lapse, stress decreases from 5 to 0. The average stress level the week before the forth lapse is higher than the general stress level (1.64). Again stress is significantly higher the day of the lapse than the days without lapses. The participant has three lapses in one week, so that the week before the fifth lapse includes two other lapses. Here the average stress level is higher than the general stress level. Furthermore there is variability of stress the day of the lapse. In conclusion stress level the day before all five lapses conspicuous, regarding to a high level or variability.

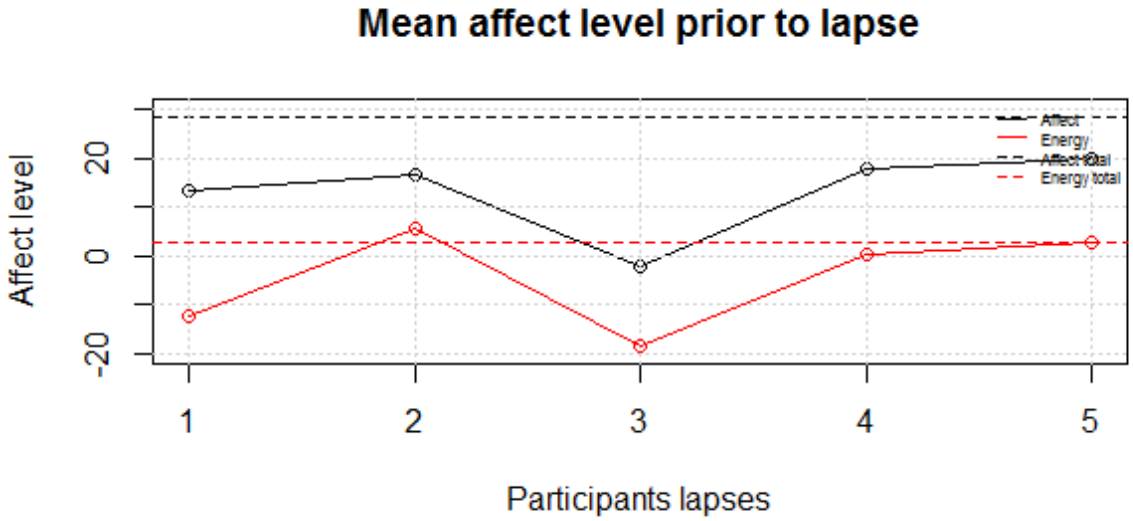
The participant reported a high level of *self-efficacy* within the hundred days (Figure 28). The minimum level of self-efficacy is 5 and the maximum 10. In the week before the first lapse self-efficacy level is lower than average self-efficacy, namely 8.48, which is although relatively high (Figure 29). Interestingly self-efficacy ranges from 10 to 5 during the day before the lapse, which is the minimum and maximum of ID624's reported self-efficacy. A similar pattern is identified the week before the second lapse. Self-efficacy level is lower than on average and the variability is high within the day of the lapse. The week before the third lapse there is a remarkable difference between self-efficacy levels. The average self-efficacy level is 6.43. For three days, which include the two days before the lapse, ID624 felt not able to resist alcohol. Besides average self-efficacy level is lower the week before the fifth and sixth lapse. The day of both lapses is characterized by high variability and a range from minimum to maximum self-efficacy.

The average *affect* the weeks before the lapses are more negative than general reported affect level (Figure 4). Two days before the first lapse affect gets to its minimum point. The same pattern is to see one day before the second lapse (Figure 31). Here affect is more negative than the average. The participant reported the week before the third lapse significantly negative affect and it is also notable that affect is relatively stable over the week. There is not as much fluctuation as noticed before previous lapses. Moreover the participant reported low level of energy before the third lapse (Figure33). ID624 reported on average lower energy the weeks before a lapse than in general. . In general affect as well as energy is

highly fluctuating the day before all lapses. Furthermore *craving* the weeks before a lapse is always higher than the average craving level (Figure 4). During the week before the first lapse craving is higher on average and there is variability on the day of the lapse (Figure 35). It is notable that craving decreases immediately after the second lapse and stays zero for the next three days. The average craving level before the third lapse is significantly higher than on average (3.29 in comparison to 0.81). Figure 4 shows, that the independent variables stress and craving are invariably equal of higher than the average, which means the participant reported an increased level of stress and craving. Furthermore self-efficacy level and affect are reported more negative, which is similar to the findings of the other variables. Moreover there is a connection between affect and energy. Moreover affect the week before the lapses is more negative than general affect. The week before the third lapse is conspicuous, because all variables are significantly negative (Figure 35).

Figure 4 *Mean levels of predictors during the weeks prior to lapses in comparison to total mean levels of ID624*





3.3.3 Exit interview

In the exit interview the participant stated that is was difficult to identify stress while answering the question. ID624 was inclined to report no stress, although the feeling of stress was present. After answering the question of stress, the participant felt stress, but already answered the question. This illustrated the low level of stress on average. Furthermore stress is defined as two different types, namely hyper or melancholic. These are the two most extreme types of stress. The participant's affect was mostly positive. However there was often a feeling of low energy, especially when being morbid. Moreover craving was difficult to identify according to the participant. Craving occurs because of restlessness or reward seeking. If the participant was personally satisfied, there was a "nice" kind of craving. If

craving is caused by tension, drinking is seen as emotional numbing. Interestingly the participant estimates that the questions were answered mostly in the middle, which means that stress, self-efficacy, affect and craving were mostly not extremely high or low. Indeed the data show, that ID624 reported significantly high level of self-efficacy and low level of stress and craving. This finding is conforming to the comment, that stress and craving are difficult to identify. Interestingly the participant reported that every value above zero regarding to craving is seen as craving. Therefore the low craving level on average (0.81) does not mean that the participant had little craving during the whole time of the experiment, but that there is a low tolerance regarding to craving. The participant stated that stress was often caused by work. The experiment helped to get conscious about craving. Drinking is not seen as a decision from self, it overtakes the participant. In the view of the future, the participant suggests it would be helpful if feedback is available. Feedback could be a weekly overview of all variables.

3.3.4 Conclusion ID624

The Participant ID624 reported 5 lapses. It is remarkable that mean levels of stress, craving and affect are low and that self-efficacy level is high. At many times craving and stress were 0 and self-efficacy was 10 (Figure 20, 21, 24). However there are several extreme values. Most of the time stress is recorded to 0, but directly after answering the question, participant got conscious about stress. Moreover there are two types of Stress, one caused by being morbid and one caused by being hyper. Craving is described as restlessness or as reward seeking. Interestingly participant ID429 connect craving with reward seeking as well. The participant reported often being low in energy. It was difficult for the participant to identify stress and craving. In the exit interview ID624 said that he recorded all variables in the middle. However the data represents something else, namely remarkable positive values in stress, self-efficacy, affect and craving. Furthermore it is important to note that every value above 0 is seen as high craving. It is remarkable that quantitative data and qualitative data are different. It seems that the participant has difficulties not only to identify he variables, but also to estimate own values. Moreover ID624 reported to fill in a 5 for craving, although the data show that the participant usually recorded zero craving (Table 6). There is a false estimation of the denoted data.

3.4 ID923

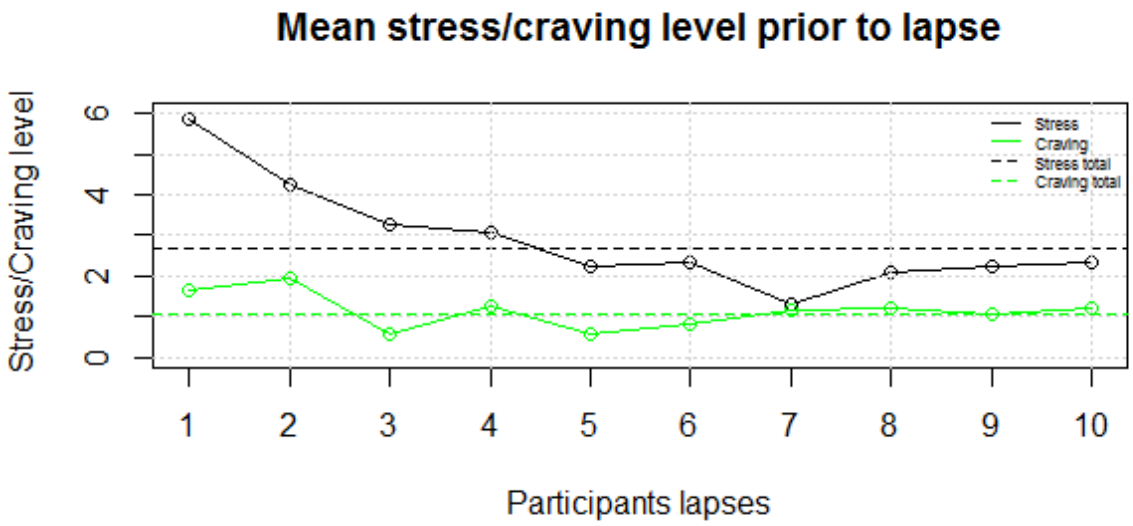
3.4.1 Descriptive statistics

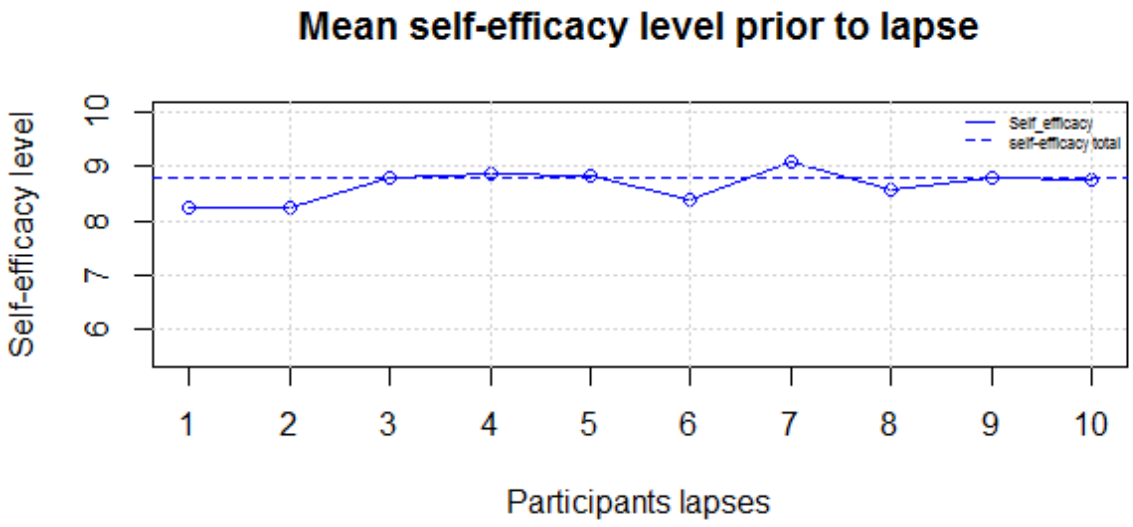
Participant ID923 recorded 10 lapses during the hundred days of the experiment. In comparison to other participants, ID923 rarely reported zero *stress*. It is also remarkable that the participant has 107 extreme values regarding to stress, which is nearly 25% of all observations.This indicates variability in stress. On average *self-efficacy* is high (mean=8.76, sd =1.10). Self-efficacy ranges from 0 to 10. Furthermore 19% of the observations are extreme values. Another interesting finding is identified in *affect*. Whereas the means of stress, self-efficacy and craving are in a more positive direction, which means that the participant feels low stress, low craving and high self-efficacy, the mean of affect and energy is around 0. It shows that the mean affect was not absolutely positive of negative, but in the middle (Table8). It is remarkable that 26% of all affect observations and 25% of all energy observations are extreme values. Besides *craving* is relatively low (1.08, sd =1.81). It ranges from minimal 0 to maximal 9. In comparison to other variables, craving report less extreme values.

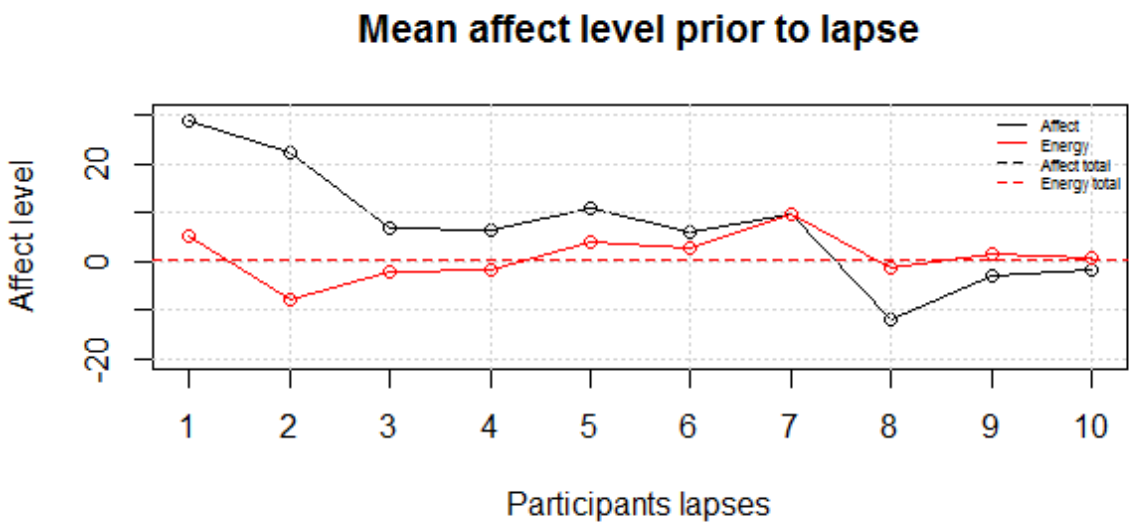
Table 8 *Descriptive Statistics ID923*

	Observations	Mean	Min	Max	Quantile	Number extreme values
Stress	429	2.69 (1.35)	0	8	2,2,3	107
Self-efficacy	429	8.76 (1.10)	1	10	9,9,9	80
Affect	428	0.07 (21.84)	-50	50	-3,1,5	111
Affect (Energy)	428	0.36 (14.31)	-39	49	3,0.5,4	106
Craving	428	1.08 (1.81)	0	9	0,0,2	36

Figure 5 *Mean levels of predictors during the weeks prior to lapses in comparison to total mean levels of ID923*







3.4.2 Time related lapse analysis

The first three days of alcohol consumption can be seen as reduced drinking instead of lapses, because the consumption fit to the participant's reported goal. ID923 aimed to drink only on a Friday or Saturday and at most two units of alcohol. The first drinking moment occurred 2 days after starting the experiment, therefore the analysis of weeks will be analyzed off the second drinking moment. The mean *stress* level the week before the second drinking moment is significantly higher than the average stress level (4.23 in comparison to 2.69). Stress ranges from 0 to 8 during the week before the second time the participant drank (Figure 37). Moreover stress is slightly higher the week before the third drinking moment (3.25). The day of the forth lapse is characterized by an increase of stress from 2 to 4. In the week before the fifth lapse, the mean stress level is slightly below the mean stress level in general. There is one day of low stress, followed by a day of increased stress. Again there is a slight increase in stress on the day of the lapse. The weeks before the other lapses can be described as relatively stable and low regarding to stress. Figure 5 shows that stress the week before a lapse is higher at the week of the first and the second lapse. There is no similar pattern identified for the following lapses. In addition *self-efficacy* seems to be relatively stable the weeks of the lapses (Figure 5, 39). The mean self-efficacy level is slightly lower the week before the second lapse than in general. Besides there is variability from 4 to 10 identified. The day of the lapse is characterized by a slight decrease in self-efficacy. Furthermore self-efficacy is relatively stable across the week before the third lapse, but there is a slight decrease in self-efficacy on the day of the lapse as well. It is notable that self-efficacy decreases from 9 to 1 during the day of the six lapses (Figure 39).

During the day of the first lapse, affect range from +40 to -40 (Figure 41). The mean level of affect the week before the second lapse does not differ from the affect level in general. In the week before the third lapse there is a minimum turning point two day, and a positive peak one day before the lapse. In addition affect seems to be increased on the day of the lapse. The week before the forth lapse shows the same pattern except the conspicuousness on the day of the lapse. The mean affect level the week before the fifth lapse is more positive than on average. The day of lapse is characterized by two peaks. Furthermore there is a remarkable difference the week before the eighth lapse. Here affect is more negative than affect in general (-11.92). Moreover there are no patterns regarding to energy (Figure 43).

The variability of *craving* during the week before the second lapse is significant, because the craving level fluctuate every day from zero up to six (Figure 45). Moreover craving increases during the day of the lapse. The mean of craving this week is slightly higher than craving during the whole experiment (1.94 in comparison to 1.08). In the week before the third lapse craving is more stable, but there is still a significant increase on the day of the lapse. In this week, craving is lower than on average. In the week before the forth lapse, craving seems to be stable, except the day of the lapse, because craving increases significantly. It is remarkable, that craving increases on every day of lapse (Figure 45).

3.4.3 Exit interview

Participant ID923 reported in the exit interview that there is a connection between stress and craving. The more stress the more the feeling of craving. One possibility to reduce stress is to rest when stress gets higher. The participant reported an increased stress level over time, because of more work. The data show less observation on the last part of the experiment. Potentially the reduction is caused by less time for filling in the questionnaire. Moreover there is a conspicuous definition of self-efficacy. Self-efficacy is not seen as the ability to resist, but drinking is seen as an own decision. For ID923 it is difficult to identify and estimate craving, because if the feeling of craving is high, the participant started drinking, so that craving disappears. Interestingly the participant recorded not to use stress above 5, although the data shows something else. A stress level of 5 was seen as a high stress level. A positive affect is defined as being enormously happy, which was not the case during the 100 days. In addition energy was always in the middle. Drinking in general is caused by sociability and it is dependent on the situation, for example to drink something with friends on a sunny day. The participant estimate the amount of drinking lapses of 3 or 4, although there were 10 reported lapses. Interestingly ID923 stated to perceive a special taste. When

experiencing this taste, the participant knows that craving starts soon. Furthermore there are bodily responses such as an increased heart rate when the participant starts drinking.

3.4.4 Conclusion ID923

Participant ID923 had 10 lapses, whereby three have to be seen as drinking moments instead of lapses, because they fit to the goal to only drink at most two entities on a Friday or Saturday. Interestingly ID923 estimate a number of lapses of 3 or 4, although there were 10 lapses. ID923 reported more stress and craving and lower self-efficacy than the others. Rarely ID923 reported no stress and full self-efficacy. The interview shows that recording craving is also seen as difficult, because if craving is high the participant started drinking, in order to reduce craving. For the participant a stress level of 5 is remarkable high. This is also shown in the data, because the participant recorded rarely high level of stress. On the other hand, stress is still higher than in other participants In the exit interview it is stated that stress increased with time, because of more work. This is not shown in the data, but there are more missing values at the end of the experiment, which could be due to work more than before. Another interesting finding is that self-efficacy is not defined as the ability to resist drinking alcohol, but it is an own decision. Presumably the participant rate therefore lapses not as failures. According to the participant, drinking is dependent on the situation and most of the time caused by sociability, which is similar to participant ID590. In the exit interview the participant describe a positive affect as being enormously happy, which was not the case during the experiment. The data underline this statement, because in comparison to other participants, ID923 reported the most negative affect and energy level. Furthermore it is remarkable, that craving is higher on the day of each lapse.

3.5 Results across individuals

After analyzing qualitative, as well as quantitative data it can be concluded that all participants recorded lapses. Three of four participants wanted to be abstinent during the whole experiment. One participant wished to drink only on Friday's and Saturday's. All of them violated their abstinence.

Furthermore the data show that there is indeed an effect of almost all predictors regarding to lapses. In 22 of the 36 total relapses recorded, stress was higher the week before a lapse than stress in general (61.1%). It is also conspicuous that self-efficacy the week before a lapse is significantly lower than self-efficacy in general. Self-efficacy is lower the week

before a lapse in 80.6% of all lapses. Moreover affect is more negative the week before the lapse than affect in general in 24 of 36 lapses (66.7%). The same pattern is identified regarding to craving. In 26 of 36 lapses craving was higher the week before the lapse than the craving level in general (77.8%). Only energy seems to be slightly higher the week before a lapse. Here in 15 of 36 cases energy is lower than in general (41.7%).

Another interesting pattern is identified relating to the day of lapse. Stress is higher on the day of lapses in 24 of 36 cases (66.7%). Moreover self-efficacy is lower the day of lapses in 31of 36 lapses (86.1%). Interestingly, craving the day of lapses is always higher than craving level in general (100%). Affect on the day of lapses is lower in 18 of 36 cases (50%). Furthermore the energy level is exactly the same regarding to energy the week before lapses. Again in 15 of 36 cases, energy is lower than energy in general (41.7%).

It is also notable that participants reported in the interviews not only a connection between predictors and lapses, but also connections between predictors. In order to underline these statements each individual's correlation between all predictors were analysed. For two participants there was a weak correlation regarding to stress and self-efficacy identified. In addition to this, one participant recorded a weak correlation between stress and self-efficacy as well (Table 13). Moreover there are no correlations between one of the variables with craving. For that reason, craving can be seen as a predictor rather than a mediator. For analyzing a correlation it is necessary that both variables are of the same length. However there were different numbers of observations. Therefore it was chosen to leave out some observation, so that the variables are of the same length (Table 13).

It is also notable that the participant recorded positive levels of stress, self-efficacy, affect and craving. Participants may have a similar conservative scoring of stress, self-efficacy, affect and craving. Often qualitative and quantitative data are not fully coinciding, because they said in the interviews that they experience, for example stress frequently, although the data show low levels of stress. One explanation may be false estimations of own emotional state. Another possibility is that participants tend to answer socially acceptable. Participants reported in their respective interviews, that after answering their questionnaire they became aware of their stress, craving etc.

4 Discussion

This study aimed to identify patterns across the predictors stress, affect, self-efficacy and craving regarding to lapses. By means of a mixed method EMA- qualitative design, the research question can be confirmed. Indeed the long-term EMA study shows relationships between chosen predictors and drinking lapses, regarding to the week before lapses. Interestingly data show patterns of variables on the day of lapses. All variables in this EMA study appeared to have some predictive ability, when looking at the weeks prior to lapses across the four individuals. This predictive pattern seems even stronger when focusing on the days prior to lapses. Comparing the different predictors, craving, self-efficacy, and stress appeared the most consistent. In the following the research questions will be discussed separately.

The first research question covers stress and whether there is a pattern regarding to lapses. According to the qualitative analysis all participants found that stress plays an important role. Furthermore the data also showed, that stress increases before a lapse. Stress is a complex factor, because there are different sources of stress. It is notable, that stress is not only higher during the weeks prior to lapses, but also hours before a lapse. According to Keyes, Hatzenbuehler, Grant and Hasin (2012) there are several stresses, which can cause and influence drinking behavior. One stressor is discussed as general life stressors such as work related stress. One participant reported an increased stress level, because of a new job. Increased pressure was described as stress. Other participants also reported that they drink, because drinking reduces stress. Furthermore the data shows that most of the participants reported a slight decrease in stress after a lapse. Drinking inhibits the feeling of stress. There is a connection between stress and drinking behavior, because alcohol has the ability to reduce anxiety and stress (Becker, 2012). Problem drinkers expect alcohol to relieve tension, stress engendered negative emotions and to promote relaxation (Sillaber & Henniger, 2004).

Furthermore most of the participants reported significant decreases in self-efficacy the week before lapses as well as on the day of a lapse. The results of EMA data and the interviews fit to the literature. Self-efficacy is seen as a prospective predictor of lapse. The finding that confidence in one's own ability influences lapse is consistent with cognitive-behavioral literature (Holt, Litt, Conney, 2012). Moreover there are oftentimes negative levels of self-efficacy on the day of a lapse, which also underscores the connection between Self-efficacy and lapse (Velicer, Diclemente, Rossi, Prochaska, 1990). In many studies self-efficacy was identified as a key factor associated with drinking lapse (Holt et al, 2012). Inability to cope is a particularly high risk factor, because individuals who implement

ineffective coping strategies seem to be more likely to use alcohol in order to deal with high risk situations. In addition to this literature shows that better coping mechanisms over time are related to less frequent drinking. Because literature showed the importance of self-efficacy, coping strategy training is integrated in several treatments (Witkiewitz & Masyn, 2008). According to Maibach and Murphy (1995), the construct of self-efficacy needs to be tailored to specific domains of functioning and to specific populations. The current study differs from others, because self-efficacy is seen as a current state instead of a general expectation. There are different levels of generalized self-efficacy, included past experiences and attribution of success (Sherer et al., 1982). It may be a limitation, because self-efficacy is measured in a different way than in previous studies.

Another interesting finding is that affect multiple extreme values, which underscores a huge variability. Literature dealing with affect and alcohol addiction identified a relationship between alcohol and affect. Bowen, Block and Beatz (2008) conducted an experiment to identify connections between affect and alcoholism. It shows that alcohol dependent individuals reported higher variability of affect than a control group of non-alcohol dependent individuals. Furthermore there is a connection between negative affect and drinking behavior (Cooney et al , 1997). Similar to stress, alcohol dependent individuals use alcohol in order to mitigate negative affect. In contrast affect variability can be caused by the amount of different possible sources of affect, such as joy, pride, happiness. Two out of four participants indicate that craving occurs when they are satisfied with themselves. Then drinking is seen as a reward (Bowen, Block, Beatz, 2008).

Literature as well as the results of this paper detect the connection of craving and relapse. Craving seems to play a central role regarding to relapse. Alcohol use seems to be mediated by craving level (Fatseas, Serre, Alexandre, Debrabant, Auriacombe, Swendsen, 2015, Law, Gullo, Daglish, Kavanagh, Feeney, Young, & Connor, 2016). The results show, that craving is a prospective factor regarding to lapse, but is not identified as a mediator between predictors and lapses. Craving as a predictor of lapse is supported by previous research studies (Shiffman, 1997). In the literature craving is oftentimes illustrated as a subjective experience. This finding is also identified in the qualitative analysis, which shows the different origins of craving and different ways to deal with craving. In addition to this craving can also be described through a cognitive processing model. According to this model, craving represents the activation of non-automatic processes. There are ”cognitive markers”, that’s associated with alcohol craving and use (Tiffany & Conklin, 2000). One participant perceived a special taste before the feeling of craving. This taste may be an example of such a

non-automatic process, which lead to alcohol craving and use. Tiffany and Conklin (2000) describe craving as a factor, which can occur spontaneously, without consciousness. This underlines the finding, that craving is always higher on days of lapses. This means, that craving plays a significant role at hours before a lapse.In addition to the connections between predictors and lapses, there are also connections between predictors identified. The EMA data as well as the interviews show a relationship between stress and craving. According to Higley, Crane, Spadoni, Quello, Goodell and Mason (2011), stress related craving is associated with a greater risk of relapse. They use personalized guided imagery to create stress. An enhancement in craving was found. In addition exposure to negative affect cues also lead to an increased craving level (Higley, Crane, Spadoni, Quello, Goodell & Mason, 2011). Moreover McKay (2011) supports the link between negative affect or negative emotional state with stronger craving response and in turn increased likelihood of relapse. There are several explanations for the relationship between negative affect, craving and alcohol use. Learning based models demonstrate that drinking is temporarily able to inhibit painful emotions. After that negative emotions trigger the desire for alcohol. This in turn leads to an increased craving and alcohol use in order to reduce negative affect. According to Shiffman (1989) EMA is especially useful for lapse analysis, because it is possible to identify "background processes" such as influences between possible predictors. The interviews underline these findings, because participant also report that drinking is caused by the desire to reduce stress or negative affect. Furthermore individuals who are unable to use effective coping strategies are more likely to use alcohol as a strategy to cope with negative affect and high risk situations (Witkiewitz & Masyn, 2008). There are weak and moderate connection identified regarding to self-efficacy and stress and self-efficacy and craving. There were no correlations between other variables.

Furthermore there are several additional findings, which were not asked in the research question. Participants reported in general two different causes of drinking. The first one is drinking because of reward-seeking. They indicate that craving gets higher when they are satisfied with themselves. The amygdala is the part of the brain which is responsible for emotions and feeling. If alcohol dependent people are satisfied with themselves, which means that they have positive emotions, they seek reward. The reward of alcohol dependent individuals is oftentimes drinking (Cooper, Robinson & Mazei-Robinson, 2017). Another cause of drinking is sociability. Participants reported that they drink to be sociable. This finding is confirmed by literature. For example Ludwig (1972) identified sociability as a cause of drinking, because of the pleasurable effect of alcohol. Another factor, which

influences drinking alcohol, is situation-based. The situation in which alcohol is offered is a crucial factor. The participants also report, that drinking is situation-dependent .In addition to this participants reported difficulties to define and recognize stress, craving or self-efficacy. For one participant there are two different types of craving, namely stress and reward seeking. These findings can be explained by differences in individuals. Each participant may experience stress, self-efficacy or craving in another way (Sobell, Sobell, & VanderSpek, 1979). Another participant defines craving as restlessness in the brain, which is also suitable to previous findings, that chronic alcohol use influences bodily responses.

Previous literature has proven, that time prior to drinking lapses plays a significant role. Several studies showed, that negative affect and stress predict smoking lapses not for the following day, but within the lapse day itself (Gwaltney et al., 2005; Shiffman & Water, 2004).

In the following, several limitations as well as recommendations will be discussed. The discussion is based on the results of 4 participants, which is a small sample size to identify statistically significant patterns of relapse on group level. However the richness of the data, caused by the long duration of the experiment, the three hour interval of data entry and the weekly analysis of lapses is notable. Furthermore the EMA data are self-reported data. This could be a problem, because alcohol dependent individuals do often have a false estimation of their emotions and feelings (Sobell et al, 1979). For further research it is highly recommended to use EMA data, which also measures bodily responses in real time next to the self-reported data. Bodily responses such as heart rate, temperature and skin conductance will be used in order to overcome false estimation and self-reported errors. Furthermore it is recommended to focus in the future on hours before a lapse instead of weeks, because there were distinct patterns identified on the day of lapses. Day patterns of smoking relapse are proven in previous literature. Future studies are needed in order to identify patterns before drinking lapses.

5 Literature

Adamson, S. J., Sellman, J. D., & Frampton, C. M. (2009). Patient predictors of alcohol treatment outcome: a systematic review. *Journal of substance abuse treatment*, *36*(1), 75-86.

American Psychiatric Association (2000) Diagnostic and statistical manual of mental disorders, fourth edition, text revision. In: First M (ed), American Psychiatric Association, Washington, DC

Ayer, L. A., Harder, V. S., Rose, G. L., & Helzer, J. E. (2011). Drinking and stress: an examination of sex and stressor differences using IVR-based daily data. *Drug & Alcohol Dependence*, *115*(3), 205-212.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational psychologist*, *28*(2), 117-148.

Bartholomew,L.K, Parcel,G.S, Kok,G, Gottlieb,N.H, Fernandez,M.E (2011). *Planning Health Promotion Programs: An Intervention Mapping Approach*. San Francisco: Jossey-Bass, A Wiley Imprint

Becker, H. C. (2012). Effects of alcohol dependence and withdrawal on stress responsiveness and alcohol consumption. *Alcohol research: current reviews*, *34*(4), 448.

Bergkvist, L., & Rossiter, J. R. (2007). The predictive validity of multiple-item versus single-item measures of the same constructs. *Journal of marketing research*, *44*(2), 175-184.

Bischof, G., Rumpf, H. J., Meyer, C., Hapke, U., & John, U. (2005). Gender differences in temptation to drink, self-efficacy to abstain and coping behavior in treated alcohol-dependent individuals: Controlling for severity of dependence. *Addiction Research & Theory*, *13*(2), 129-136.

Bowen, R., Block, G., & Baetz, M. (2008). Affect and attention variability in women with alcohol dependence: a preliminary investigation. *The American journal on addictions*, *17*(1), 77-81.

Brady, K. T., & Sonne, S. C. (1999). The role of stress in alcohol use, alcoholism treatment, and relapse. *Alcohol Research & Health*, *23*(4), 263-263.

Breese, G. R., Chu, K., Dayas, C. V., Funk, D., Knapp, D. J., Koob, G. F., ... & Sinha, R. (2005). Stress enhancement of craving during sobriety: a risk for relapse. *Alcoholism: Clinical and Experimental Research*, *29*(2), 185-195.

Brown, S. A., Vik, P. W., Patterson, T. L., Grant, I., & Schuckit, M. A. (1995). Stress, vulnerability and adult alcohol relapse. *Journal of studies on alcohol*, *56*(5), 538-545.

Carlsson, A. M. (1983). Assessment of chronic pain. I. Aspects of the reliability and validity of the visual analogue scale. *Pain*, *16*(1), 87-101.

Collins, R. L., Kashdan, T. B., & Gollnisch, G. (2003). The feasibility of using cellular phones to collect ecological momentary assessment data: application to alcohol consumption. *Experimental and clinical psychopharmacology*, *11*(1), 73

Cooney, N. L., Litt, M. D., Morse, P. A., Bauer, L. O., & Gaupp, L. (1997). Alcohol cue reactivity, negative-affect reactivity, and relapse in treated alcoholic men. *Journal of abnormal psychology*, *106*(2), 243.

Cooney, N. L., Litt, M. D., Cooney, J. L., Pilkey, D. T., Steinburg, H. R., & Oncken, C. A. (2007). Alcohol and tobacco cessation in alcohol-dependent smokers: Analysis of real-time reports. *Psychology of Addictive Behaviors*, *21*(3), 277.

Cooper, S., Robison, A. J., & Mazei-Robison, M. S. (2017). Reward Circuitry in Addiction. *Neurotherapeutics*, 1-11.

Fatseas, M., Serre, F., Alexandre, J. M., Debrabant, R., Auriacombe, M., & Swendsen, J. (2015). Craving and substance use among patients with alcohol, tobacco, cannabis or heroin addiction: A comparison of substance-and person-specific cues. *Addiction*, *110*(6), 1035-1042.

Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. *International journal of qualitative methods*, *5*(1), 80-92.

Flannery, B. A., Poole, S. A., Gallop, R. J., & Volpicelli, J. R. (2003). Alcohol craving predicts drinking during treatment: an analysis of three assessment instruments. *Journal of studies on alcohol*, *64*(1), 120-126.

Fox, H. C., Bergquist, K. L., Hong, K. I., & Sinha, R. (2007). Stress-induced and alcohol cue-induced craving in recently abstinent alcohol-dependent individuals. *Alcoholism: Clinical and Experimental Research*, *31*(3), 395-403.

Fuller, R. K. (1997). Definition and diagnosis of relapse to drinking. *Liver Transplantation*, *3*(3), 258-262.

Gwaltney, C. J., Shiffman, S., Balabanis, M. H., & Paty, J. A. (2005). Dynamic self-efficacy and outcome expectancies: prediction of smoking lapse and relapse. *Journal of abnormal psychology*, *114*(4), 661.

Hardt, J., & Rutter, M. (2004). Validity of adult retrospective reports of adverse childhood experiences: review of the evidence. *Journal of child psychology and psychiatry*, *45*(2), 260-273.

Heinrichs, S. C., & Koob, G. F. (2004). Corticotropin-releasing factor in brain: a role in activation, arousal, and affect regulation. *Journal of Pharmacology and Experimental Therapeutics*, *311*(2), 427-440.

Higley, A. E., Crane, N. A., Spadoni, A. D., Quello, S. B., Goodell, V., & Mason, B. J. (2011). Craving in response to stress induction in a human laboratory paradigm predicts treatment outcome in alcohol-dependent individuals. *Psychopharmacology*, *218*(1), 121.

Hodgins, D. C., el-Guebaly, N., & Armstrong, S. (1995). Prospective and retrospective reports of affect states before relapse to substance use. *Journal of consulting and clinical psychology*, *63*(3), 400.

Holt, L. J., Litt, M. D., & Cooney, N. L. (2012). Prospective analysis of early lapse to drinking and smoking among individuals in concurrent alcohol and tobacco treatment. *Psychology of Addictive Behaviors*, *26*(3), 561

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, *33*(7), 14-26.

Keyes, K. M., Hatzenbuehler, M. L., Grant, B. F., & Hasin, D. S. (2012). Stress and alcohol: epidemiologic evidence. *Alcohol research: Current reviews*, *34*(4), 391.

Kosten, T. R., & O'Connor, P. G. (2003). Management of drug and alcohol withdrawal. *N Engl J Med*, *2003*(348), 1786-1795.

Law, B., Gullo, M. J., Daglish, M., Kavanagh, D. J., Feeney, G. F., Young, R. M., & Connor, J. P. (2016). Craving mediates stress in predicting lapse during alcohol dependence treatment. *Alcoholism: Clinical and Experimental Research*, *40*(5), 1058-1064.

Liu, S., Wang, M., Zhan, Y., & Shi, J. (2009). Daily work stress and alcohol use: testing the cross-level moderation effects of neuroticism and job involvement. *Personnel Psychology*, *62*(3), 575-597.

Locke, E. A., & Latham, G. P. (1990). Work motivation: The high performance cycle. *Work motivation*, 3-25.

Ludwig, A. M. (1972). On and off the wagon: Reasons for drinking and abstaining by alcoholics. *Quarterly Journal of Studies on Alcohol*.

Ludwig, A. M., & Wikler, A. (1974). " Craving" and relapse to drink. *Quarterly journal of studies on alcohol*.

Lukasiewicz, M., Fareng, M., Benyamina, A., Blecha, L., Reynaud, M., & Falissard, B. (2007). Ecological momentary assessment in addiction. *Expert review of neurotherapeutics*, *7*(8), 939-950.

Maibach, E., & Murphy, D. A. (1995). Self-efficacy in health promotion research and practice: conceptualization and measurement. *Health education research*, *10*(1), 37-50.

McKay, J. R. (2011). Negative affect, craving, and alcohol relapse: can treatment interrupt the process?. *Current psychiatry reports*, *13*(6), 431-433

Miller, N. J., DeCicco, T. L., Fox, P. J., & McCourt, K. (2015). Evaluating anxiety, depression and dream imagery in men recovering from substance abuse. *International Journal of Dream Research*.

Miller, K. J., McCrady, B. S., Abrams, D. B., & Labouvie, E. W. (1994). Taking an individualized approach to the assessment of self-efficacy and the prediction of alcoholic relapse. *Journal of Psychopathology and Behavioral Assessment*, *16*(2), 111-120.

Neal, D. J., Fromme, K., Boca, F. K., Parks, K. A., King, L. P., Pardi, A. M., ... & Corbin, W. R. (2006). Capturing the moment: Innovative approaches to daily alcohol assessment. *Alcoholism: Clinical and experimental research*, *30*(2), 282-291.

Rodd, Z. A., Anstrom, K. K., Knapp, D. J., Racz, I., Zimmer, A., Serra, S., ... & Colombo, G. (2005). Factors mediating alcohol craving and relapse: stress, compulsivity, and genetics. *Alcoholism: Clinical and Experimental Research*, *29*(7), 1325-1333.

Rohsenow, D. J., & Monti, P. M. (1999). Does urge to drink predict relapse after treatment?. *Alcohol Research and Health*, *23*(3), 225-232.

Rozensky, R. H. (1974). The effect of timing of self-monitoring behavior on reducing cigarette consumption. *Journal of Behavior Therapy and Experimental Psychiatry*, *5*(3-4), 301-303.

Russell, J. A., & Pratt, G. (1980). A description of the affective quality attributed to environments. *Journal of personality and social psychology*, *38*(2), 311.

Shiffman, S., Balabanis, M. H., Paty, J. A., Engberg, J., Gwaltney, C. J., Liu, K. S., ... & Paton, S. M. (2000). Dynamic effects of self-efficacy on smoking lapse and relapse. *Health Psychology*, *19*(4), 315.

Shiffman, S. (2009). Ecological momentary assessment (EMA) in studies of substance use. *Psychological assessment*, *21*(4), 486.

Shiffman, S. (1989). Conceptual issues in the study of relapse. *Relapse and addictive Behavior.* 149-179

Shiffman, S., & Waters, A. J. (2004). Negative affect and smoking lapses: a prospective analysis. *Journal of consulting and clinical psychology*, *72*(2), 192.

Sherer, M., Maddux, J. E., Mercandante, B., Prentice-Dunn, S., Jacobs, B., & Rogers, R. W. (1982). The self-efficacy scale: Construction and validation. *Psychological reports*, *51*(2), 663-671.

Sillaber, I., & Henniger, M. S. (2004). Stress and alcohol drinking. *Annals of medicine*, *36*(8), 596-605.

Sinha, R. (2007). The role of stress in addiction relapse. *Current psychiatry reports*, *9*(5), 388-395.

Sinha, R. (2012). How does stress lead to risk of alcohol relapse?. *Alcohol research: current reviews*, *34*(4), 432.

Sinha, R., Fox, H. C., Hong, K. A., Bergquist, K., Bhagwagar, Z., & Siedlarz, K. M. (2009). Enhanced negative emotion and alcohol craving, and altered physiological responses following stress and cue exposure in alcohol dependent individuals. *Neuropsychopharmacology: official publication of the American College of Neuropsychopharmacology*, *34*(5), 1198.

Sobell, M. B., Sobell, L. C., & VanderSpek, R. (1979). Relationship between clinical judgment, self-report, and breath-analysis measures of intoxication in alcoholics. *Journal of Consulting and Clinical Psychology*, *47*(1), 204.

Strecher, V. J., McEvoy DeVellis, B., Becker, M. H., & Rosenstock, I. M. (1986). The role of self-efficacy in achieving health behavior change. *Health education quarterly*, *13*(1), 73-92.

Strowig, A. B. (2000). Relapse determinants reported by men treated for alcohol addiction: the prominence of depressed affect. *Journal of substance abuse treatment*, *19*(4), 469-474.

Stichting Trimbos Instituut (2017) Retrieved from: https://www.alcoholinfo.nl/publiek/cijfers

Sugarman, D. E., Kaufman, J. S., Trucco, E. M., Brown, J. C., & Greenfield, S. F. (2013). Predictors of drinking and functional outcomes for men and women following inpatient alcohol treatment. *The American journal on addictions*.

Thomas, R., Bremer, J., Terhanian, G., & Couper, M. P. (2007). Truth in measurement: Comparing web-based interview techniques. In *Proceedings of ESOMAR Congress*.

Tiffany, S. T., & Conklin, C. A. (2000). A cognitive processing model of alcohol craving and compulsive alcohol use. *Addiction*, *95*(8s2), 145-153.

Trucco, E. M., Connery, H. S., Griffin, M. L., & Greenfield, S. F. (2007). The Relationship of Self-Esteem and Self-Efficacy to Treatment Outcomes of Alcohol-Dependent Men and Women. *The American Journal on Addictions*, *16*(2), 85-92.

van Lier, H. G., Oberhagemann, M., Stroes, J. D., Enewoldsen, N. M., Pieterse, M. E., Schraagen, J. M. C., ... & Noordzij, M. L. (2017). Design decisions for a real time, alcohol craving study using physio-and psychological measures. In *International Conference on Persuasive Technology* (pp. 3-15). Springer, Cham

van Lier, H. G., Pieterse, M. E., Schraagen, J. M. C., Postel, M. G., Vollenbroek-Hutten, M. M., de Haan, H. A., & Noordzij, M. L. (2018). Identifying viable theoretical frameworks with essential parameters for real-time and real world alcohol craving research: a systematic review of craving models. *Addiction Research & Theory*, *26*(1), 35-5

Velicer, W. F., Diclemente, C. C., Rossi, J. S., & Prochaska, J. O. (1990). Relapse situations and self-efficacy: An integrative model. *Addictive behaviors*, *15*(3), 271-283.

6 Appendix

6.1 ID429

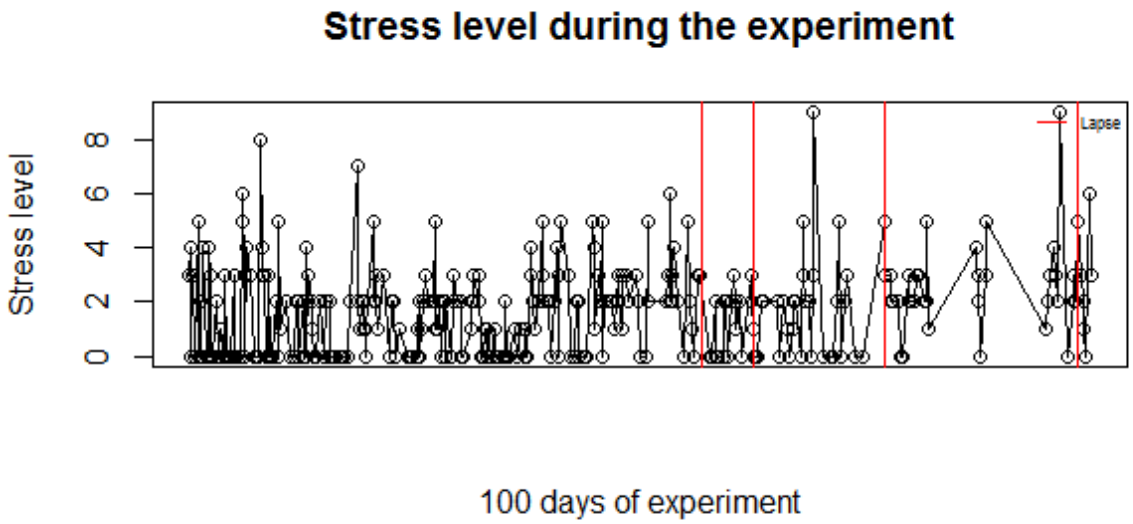
Lapses

Table 9 *Total number of lapses and amount of alcohol ID429*

Lapses	Units
1	3
2	1
3	5
4	2

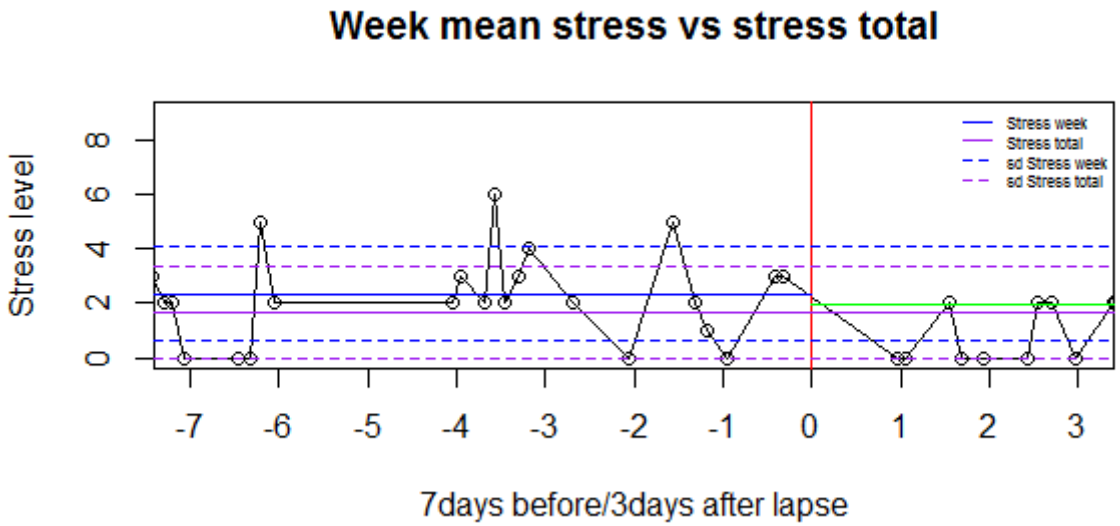
Stress

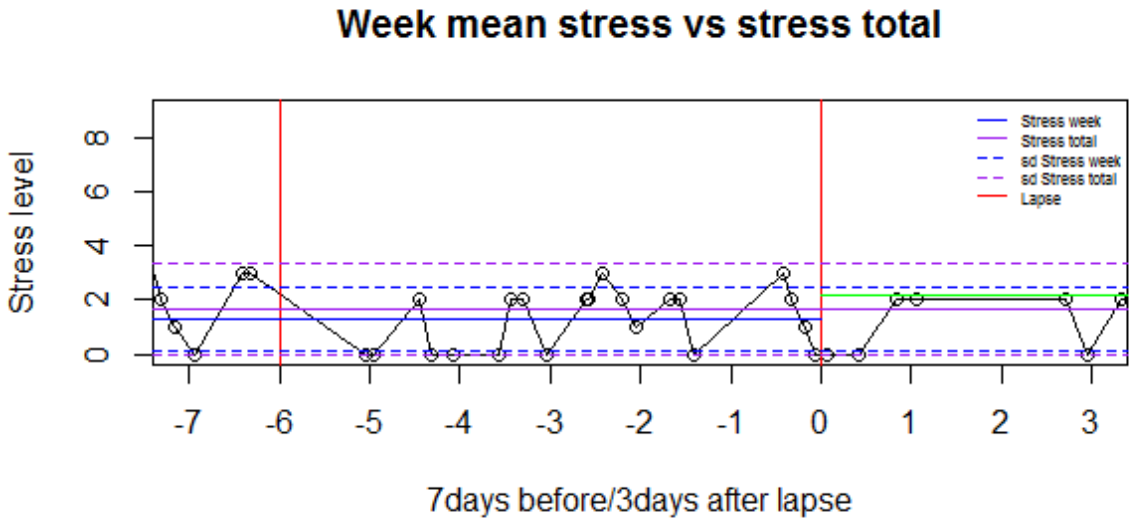
Figure 6 *Total number of all observation of stress during 100 days of the experiment and lapses of ID429*

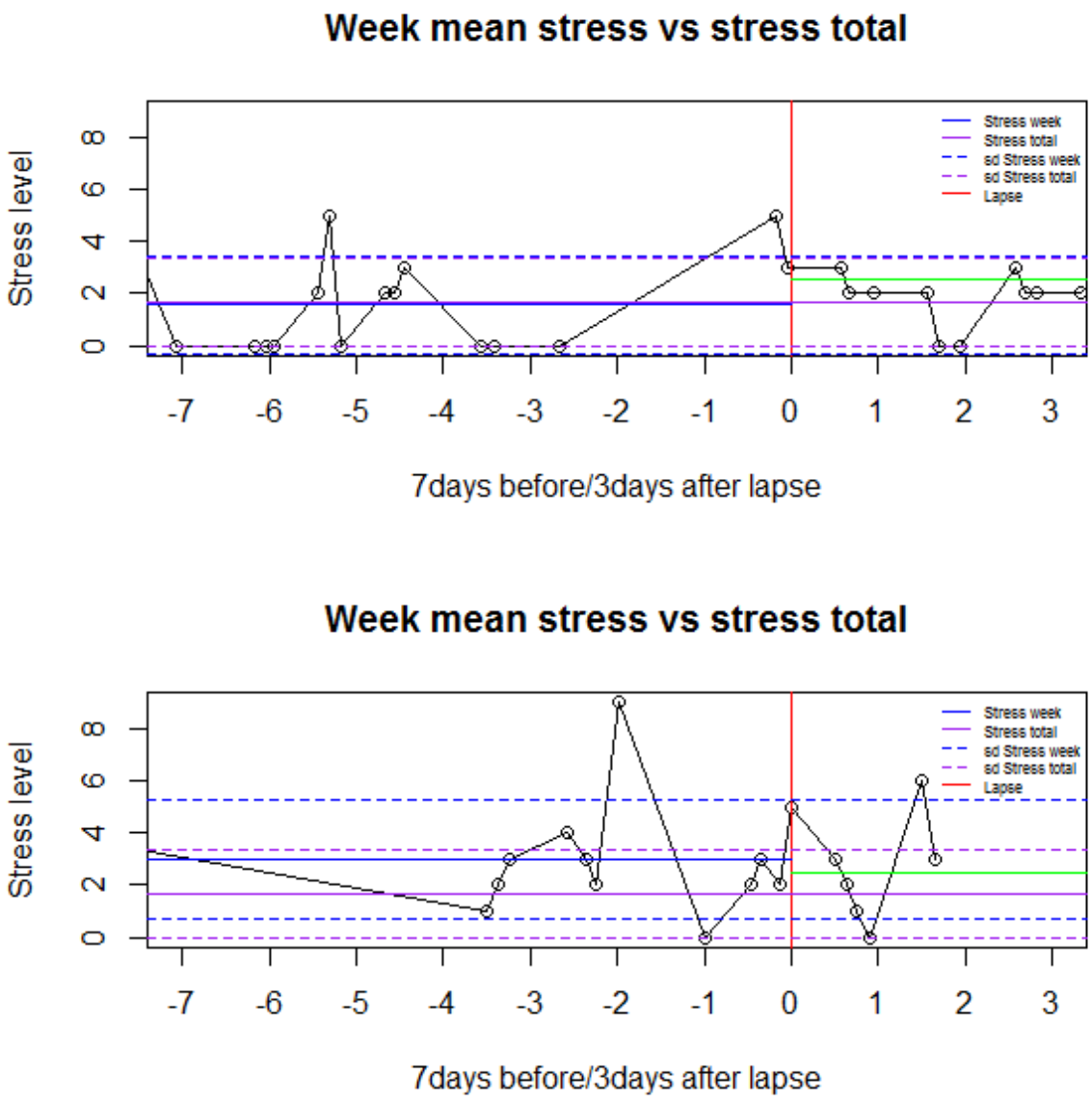


Stress levels during the weeks prior to lapses

Figure 7 *Stress level before and after lapse (0)*

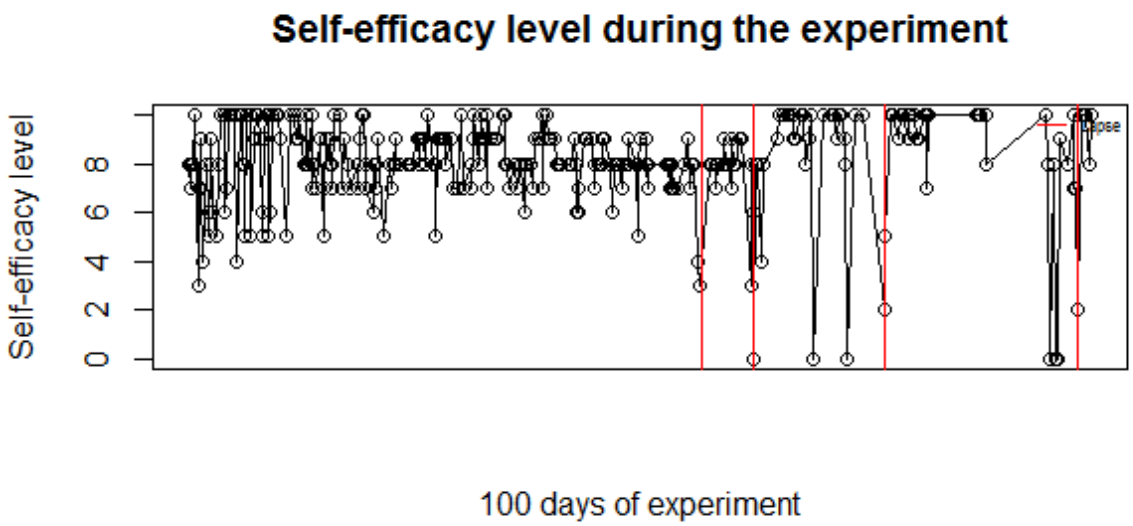

Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total


Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse



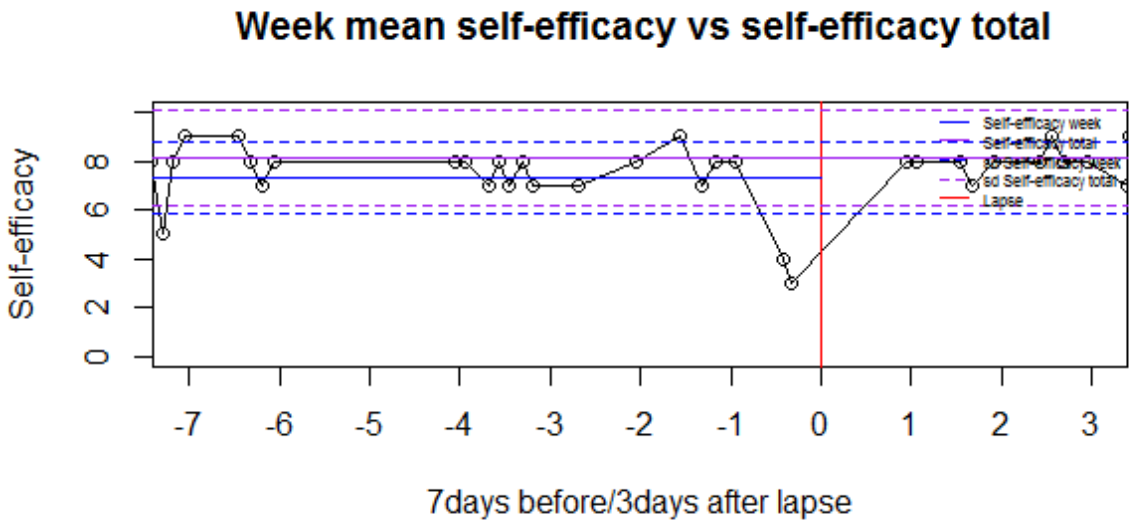
Self-efficacy

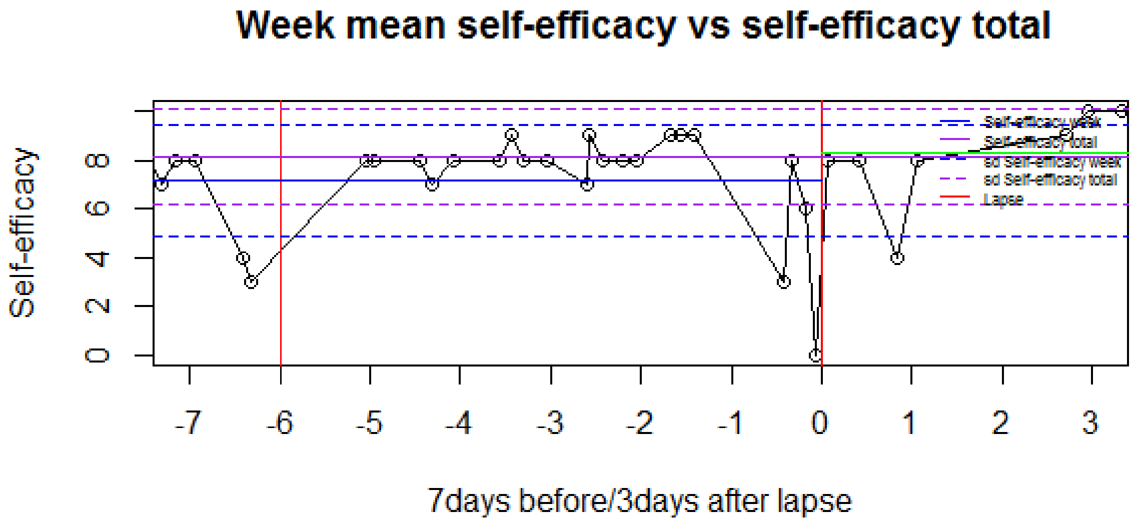
Figure 8 *Total number of all observation of self-efficacy during 100 days of the experiment and lapses of ID429*

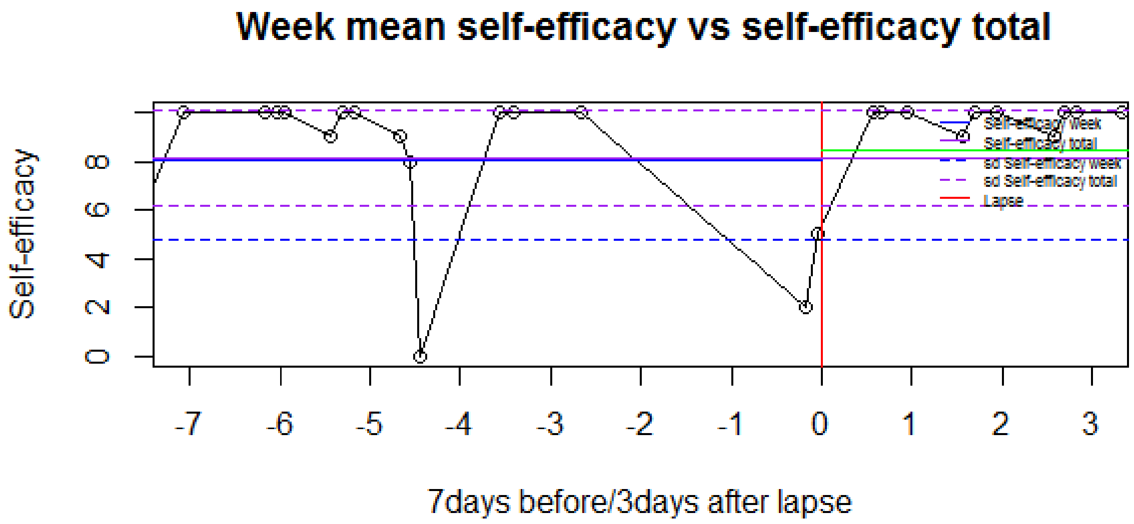


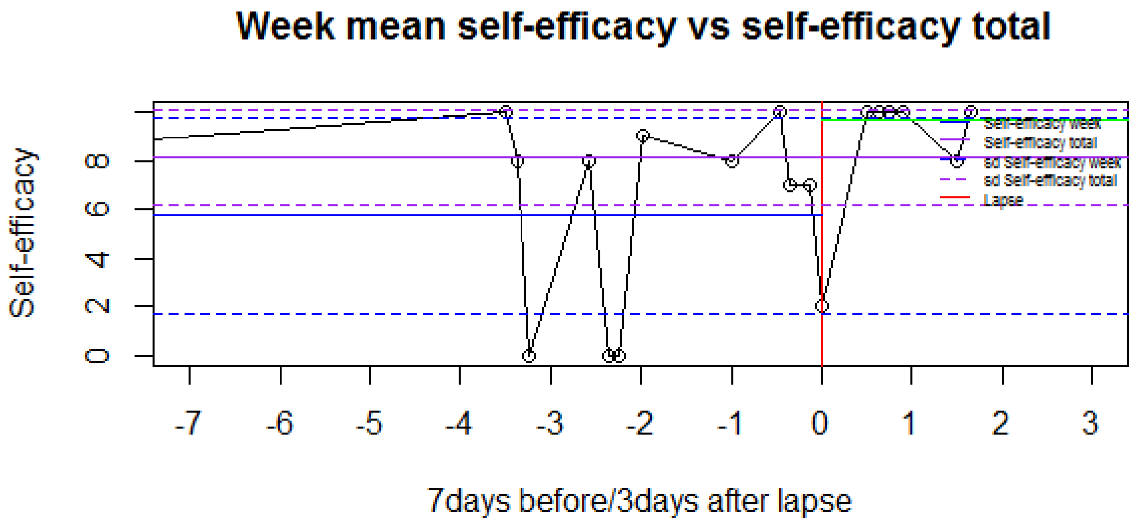
Self-efficacy levels during the weeks prior to lapses

Figure 9 *Self-efficacy level before and after lapse (0)*



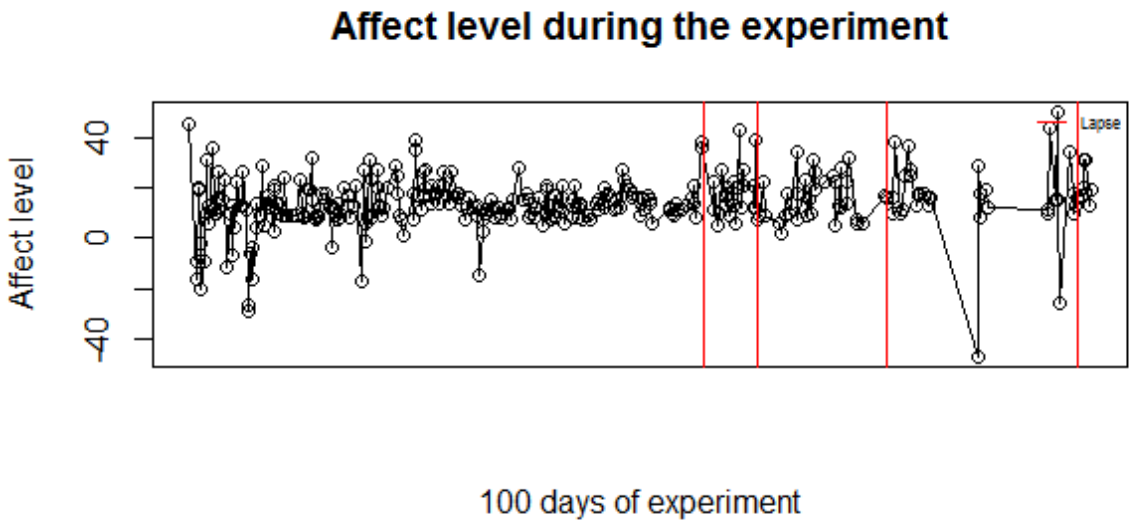

Week mean self-efficacy vs self-efficacy total
Self-efficacy
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

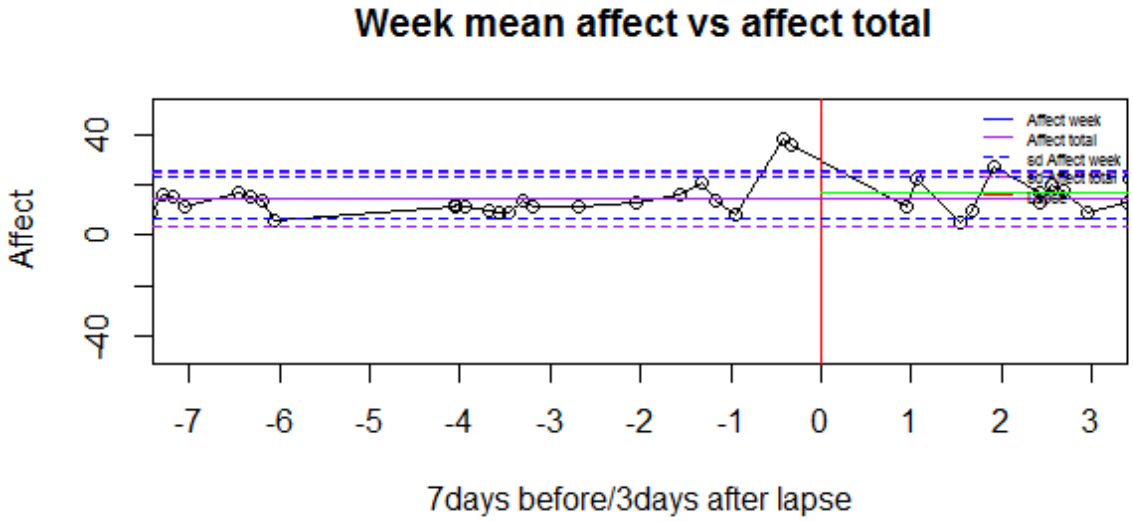
Affect

Figure10 *Total number of all observation of affect during 100 days of the experiment and lapses of ID429*

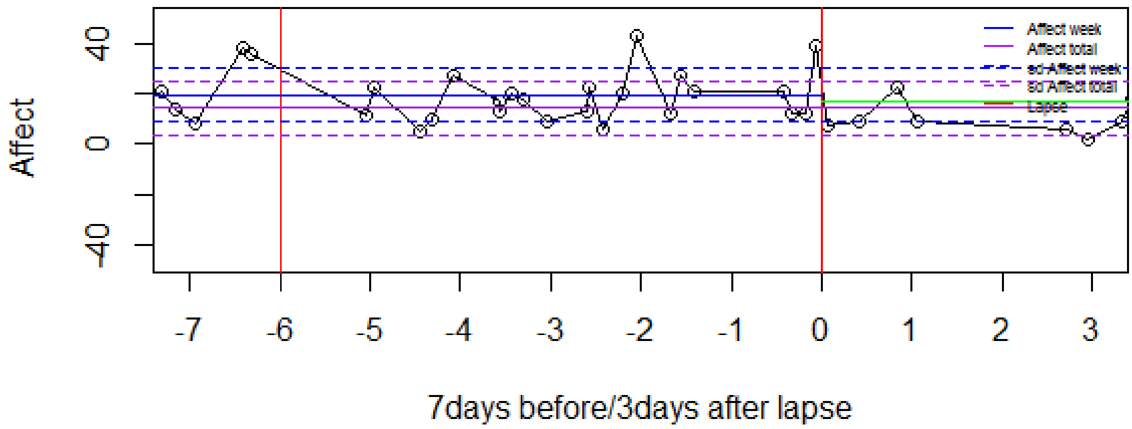


Affect levels during the weeks prior to lapses

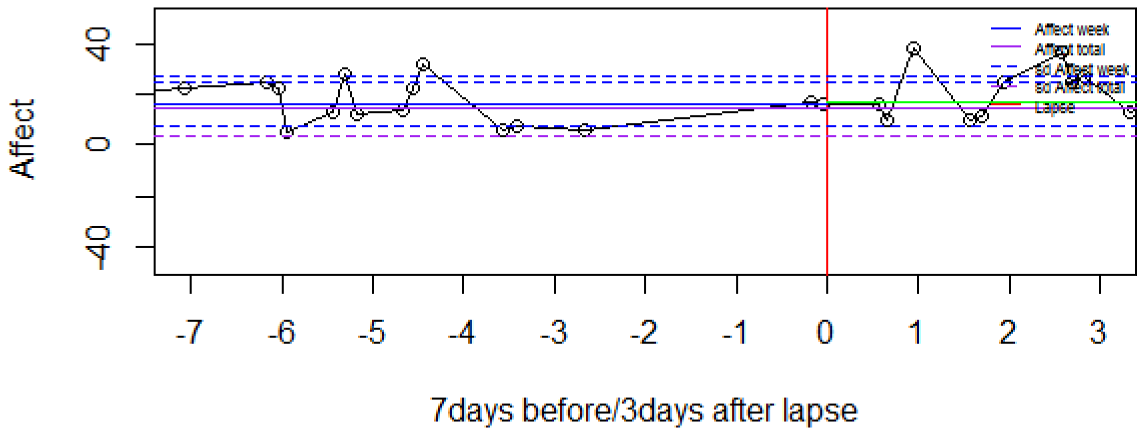
Figure 11 *Affect level before and after lapse (0)*



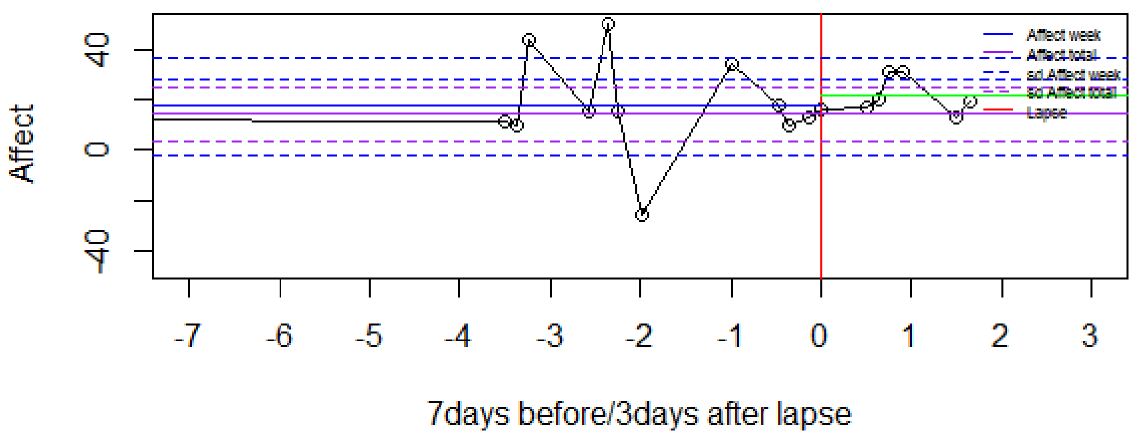
Week mean affect vs affect total



Week mean affect vs affect total

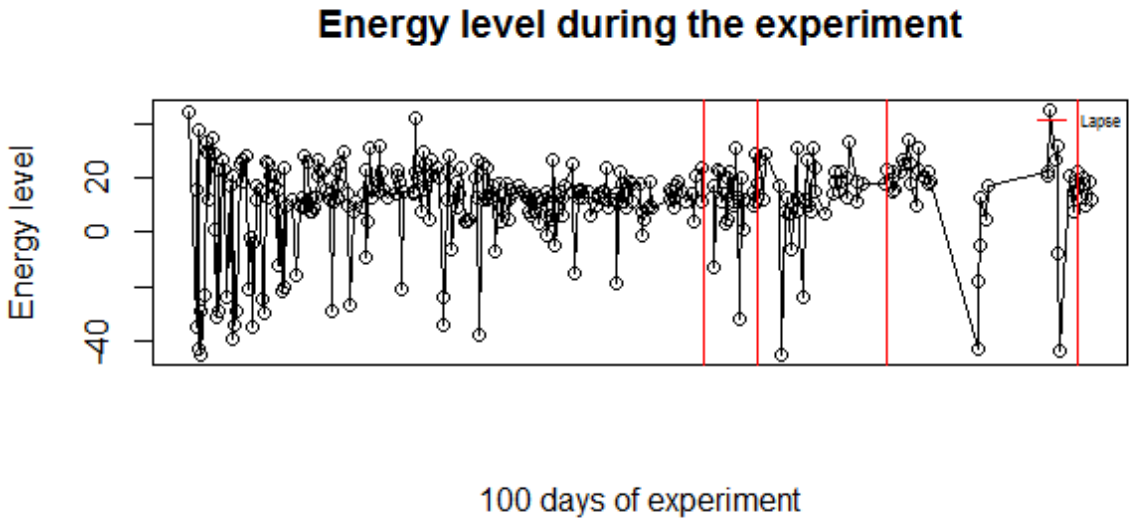


Week mean affect vs affect total



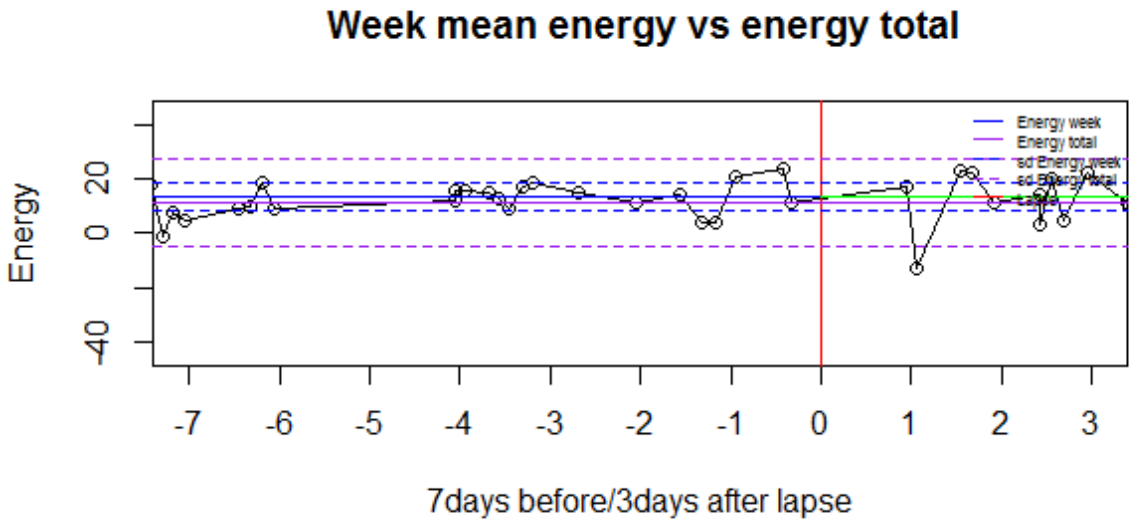
Energy

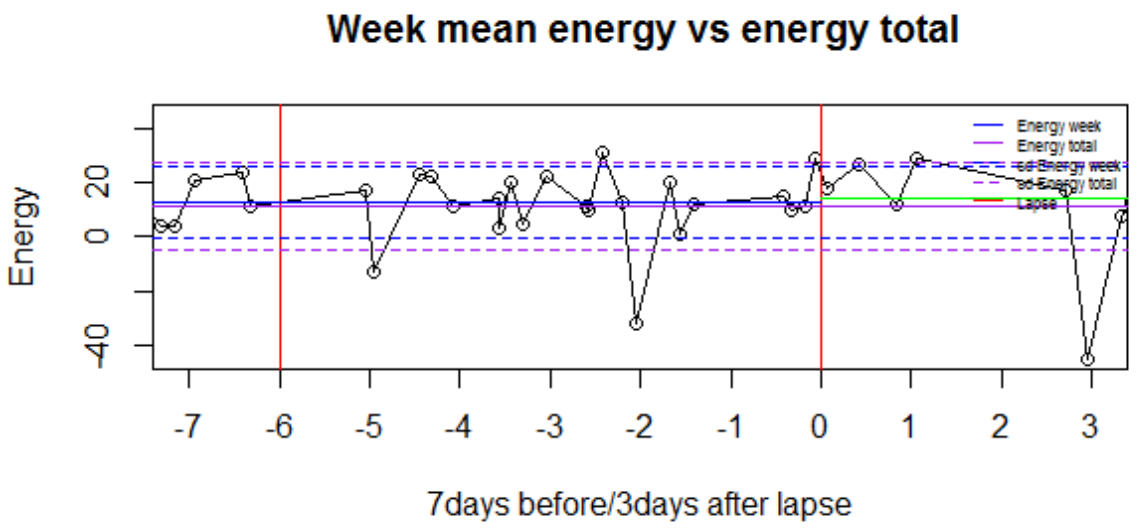
Figure12 *Total number of all observation of energy during 100 days of the experiment and lapses of ID429*

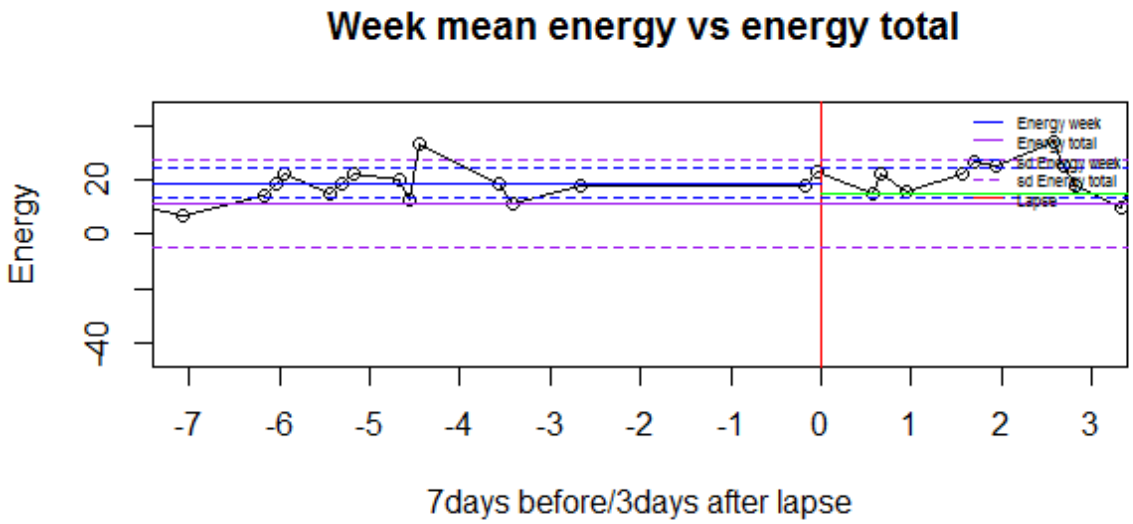


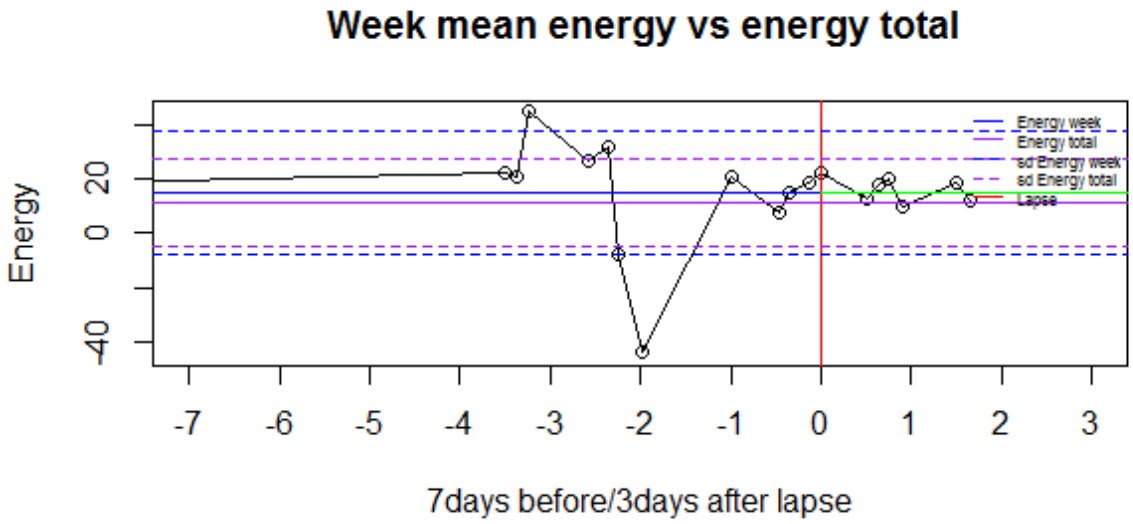
Energy levels during the weeks prior to lapses

Figure 13 *Energy level before and after lapse (0)*



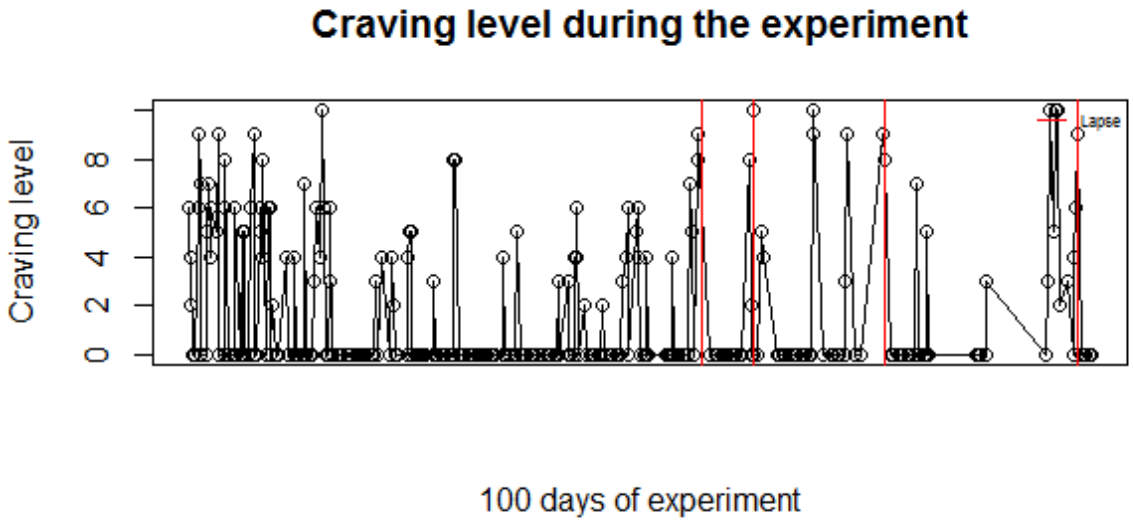

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse



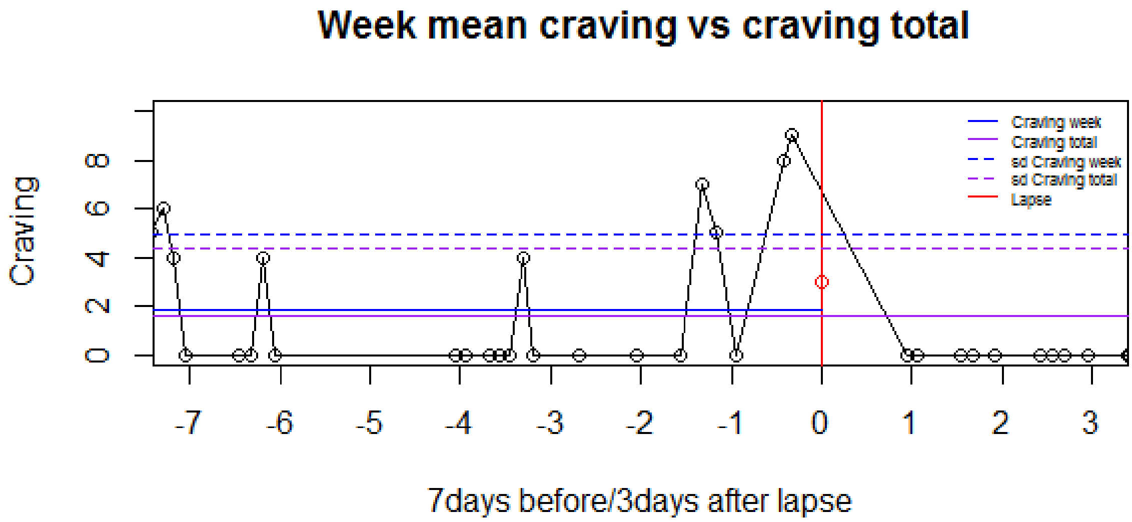
Craving

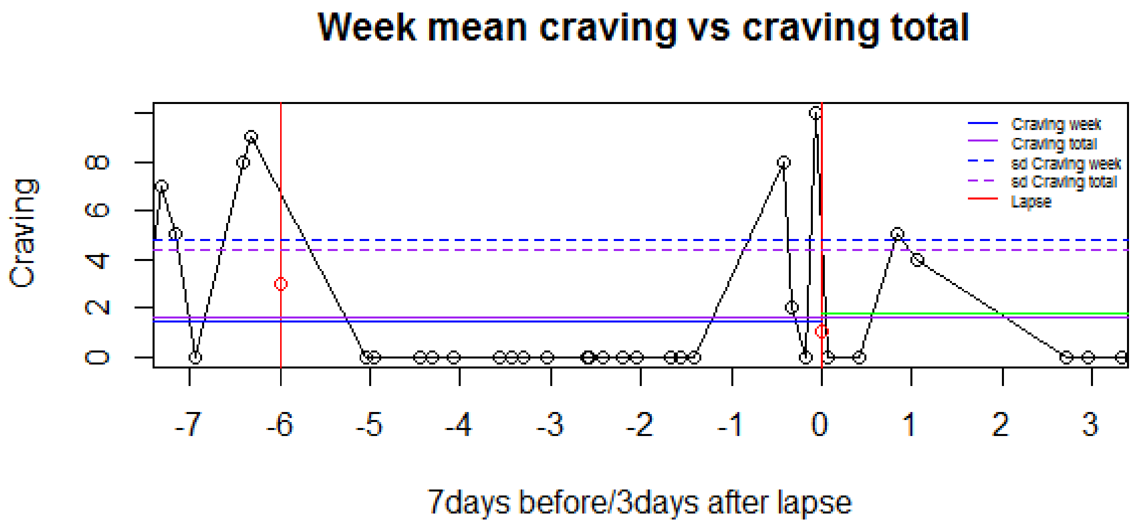
Figure 14*Total number of all observation of craving during 100 days of the experiment and lapses of ID429*

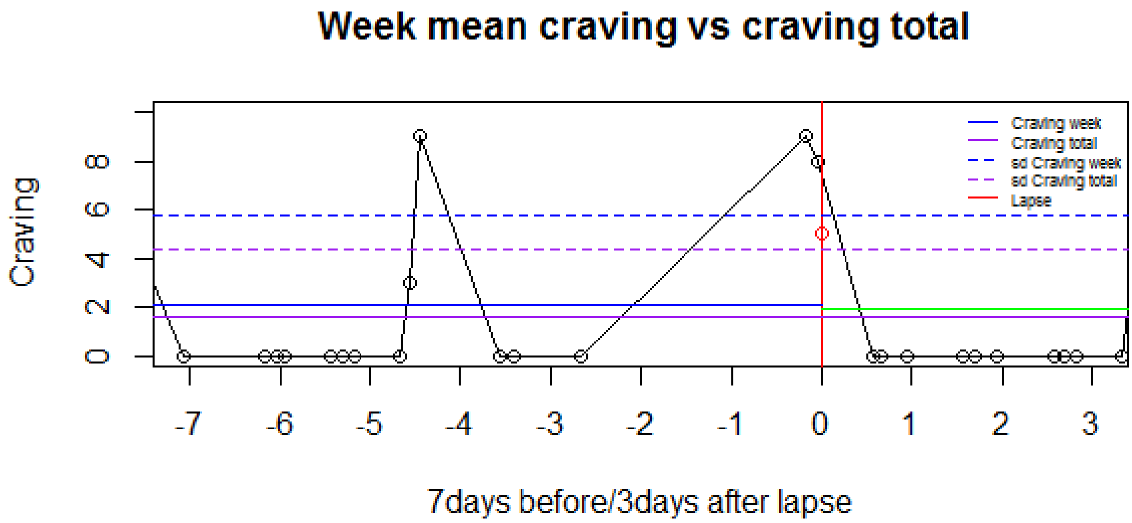


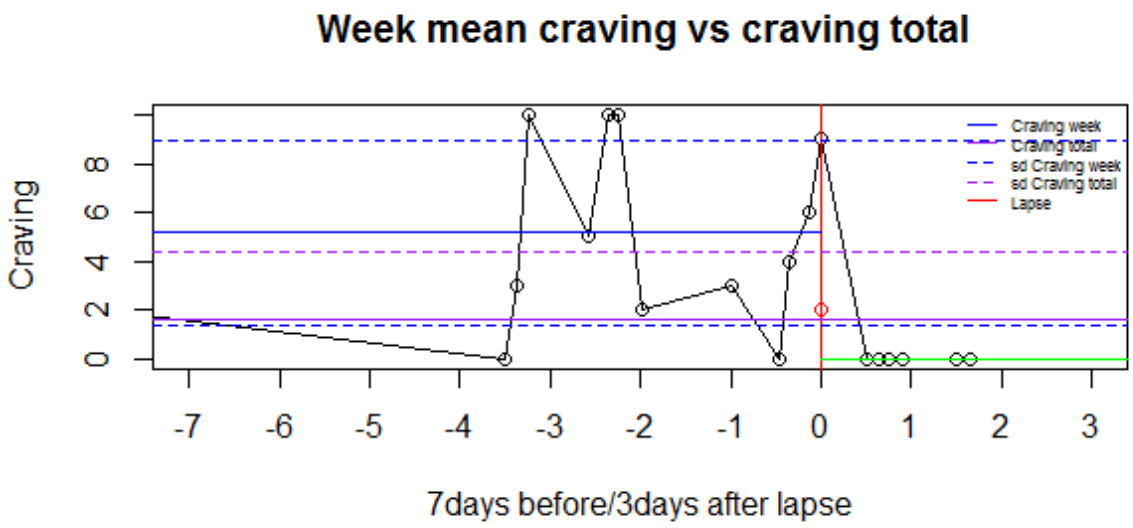
Craving levels during the weeks prior to lapses

Figure 15 *Craving level before and after lapse (0)*


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse



6.2 ID590

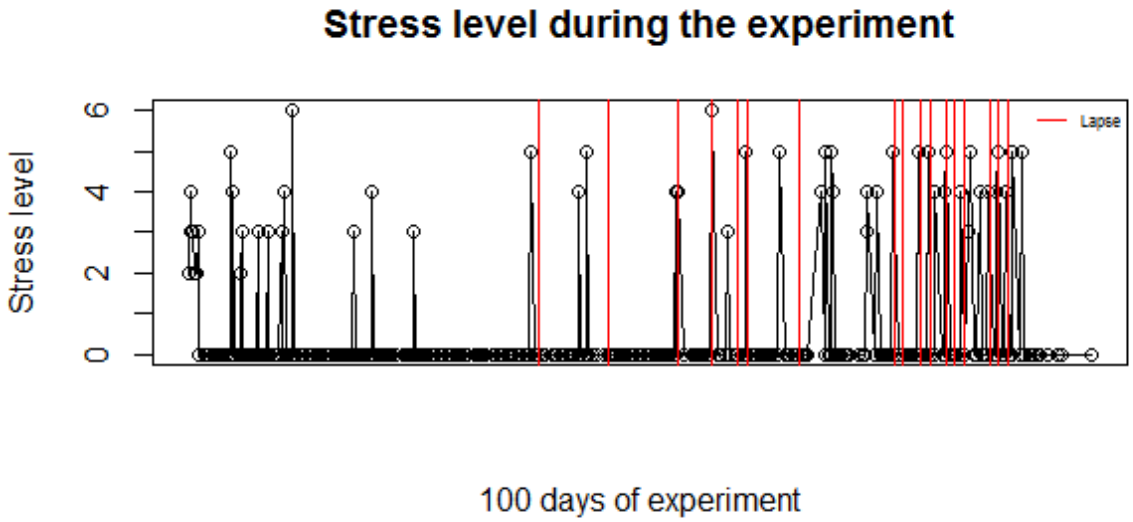
Lapses

Table 10 *Total number of lapses and amount of alcohol ID590*

Lapses	Units
1	6
2	20
3	8
4	10
5	10
6	6
7	5
8	6
9	8
10	8
11	1
12	8
13	4
14	6
15	10
16	6
17	8

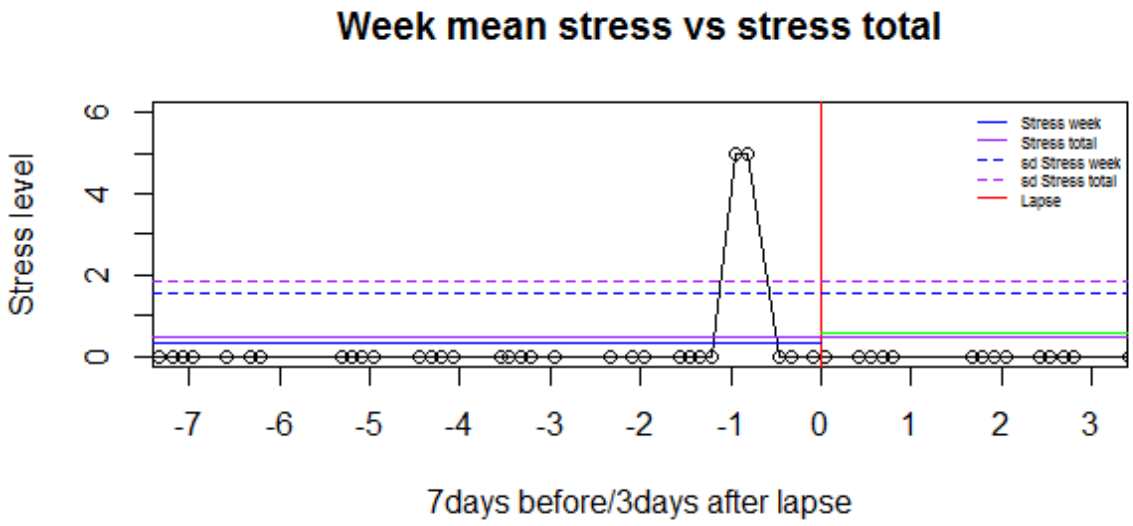
Stress

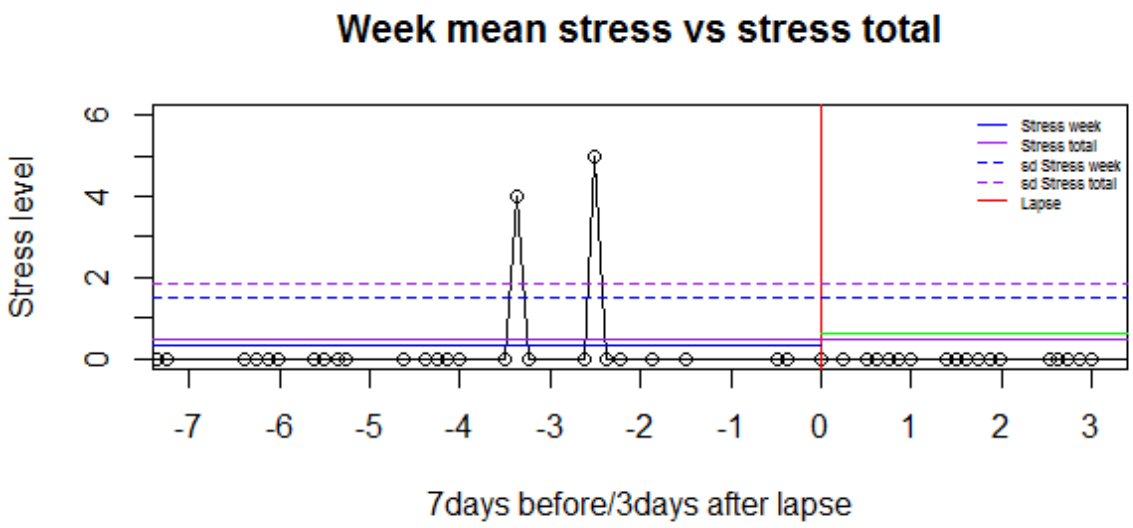
Figure 16 *Total number of all observation of stress during 100 days of the experiment and lapses of ID590*

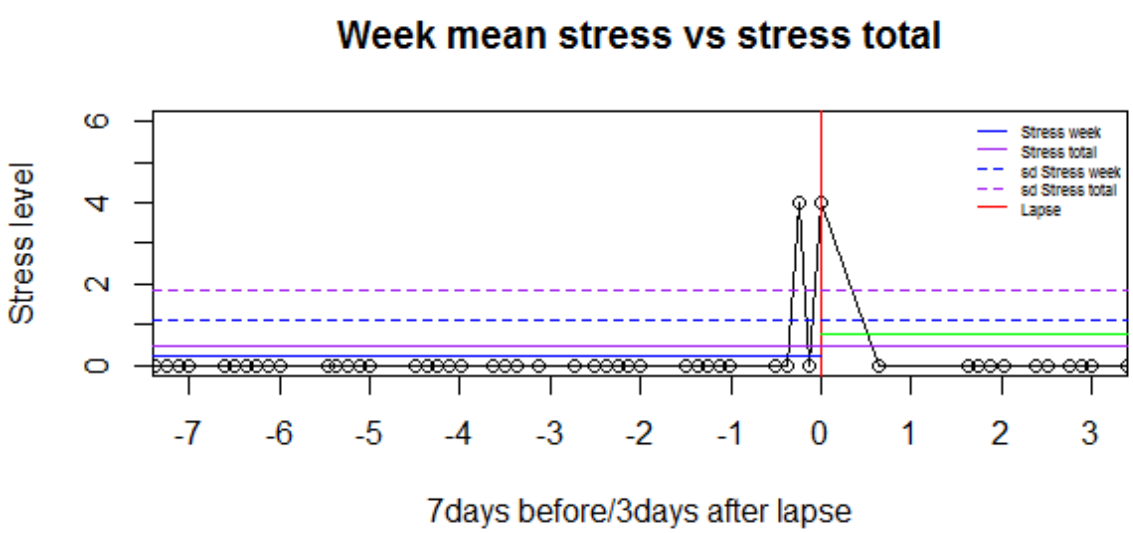


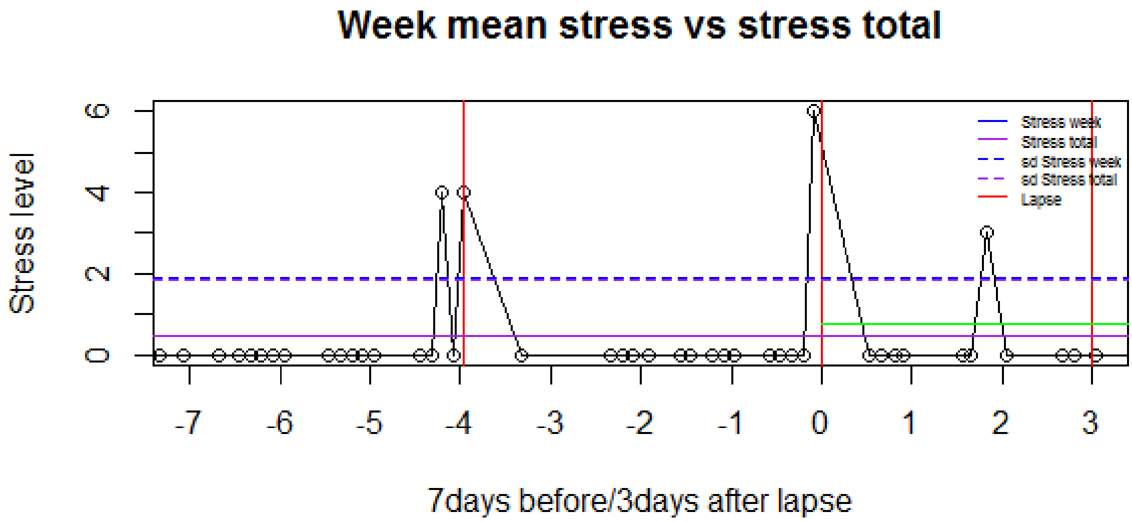
Stress levels during the weeks prior to lapses

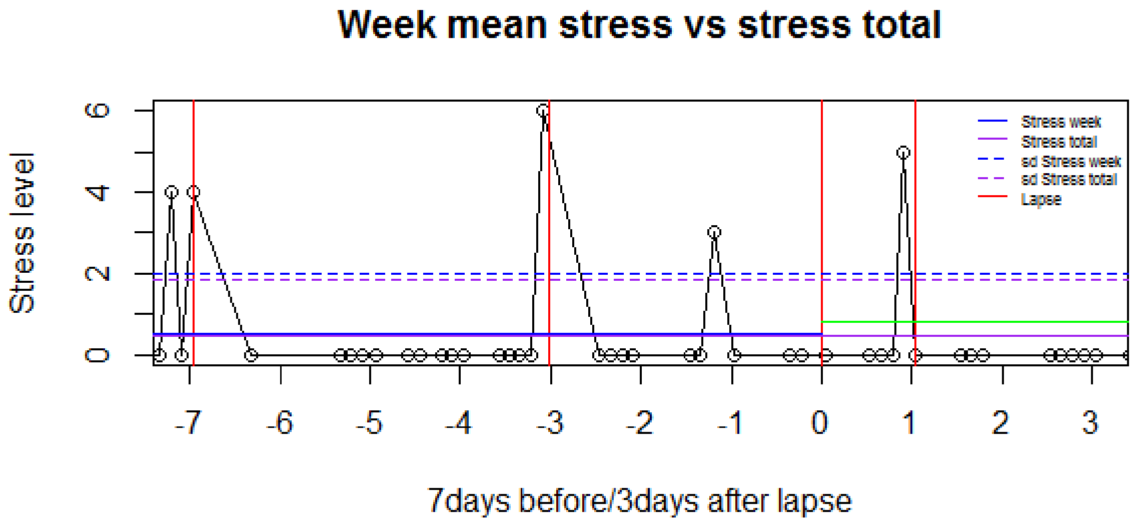
Figure 17 *Stress level before and after lapse (0)*

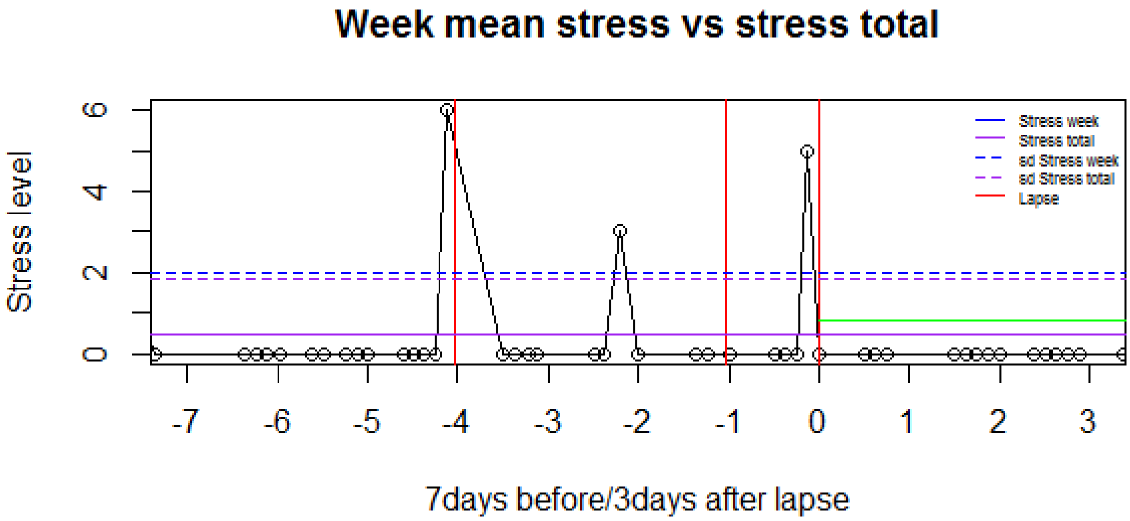


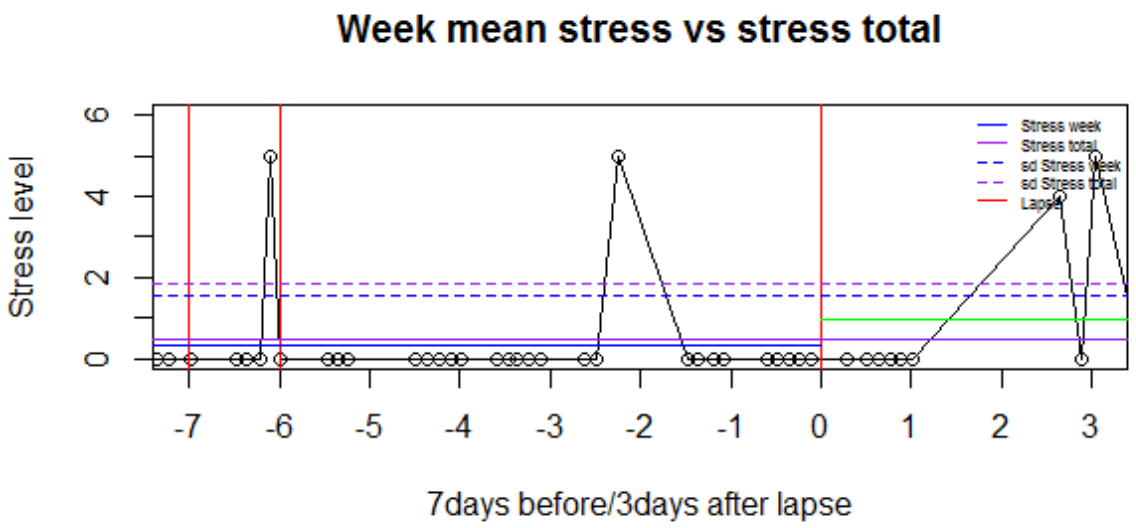

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

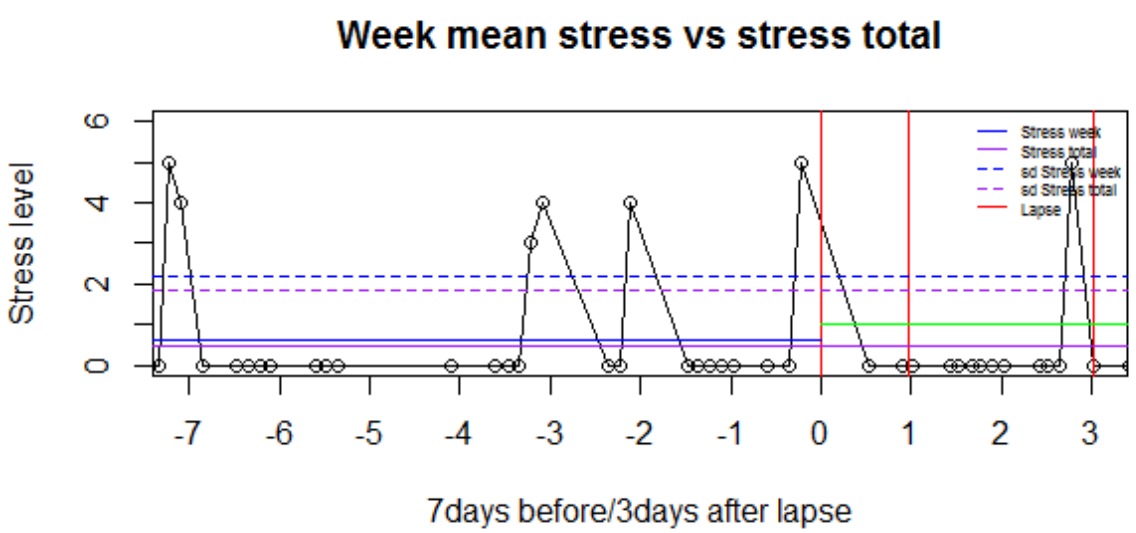

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

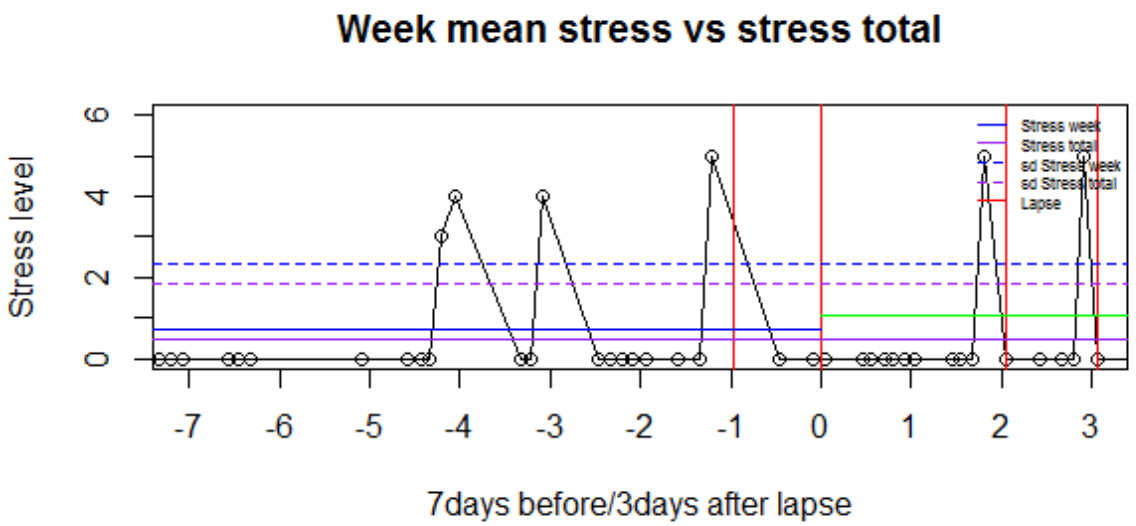

Week mean stress vs stress total
Stress week
Stress total
sd Stress week
sd Stress total
Lapse
Stress level
7days before/3days after lapse

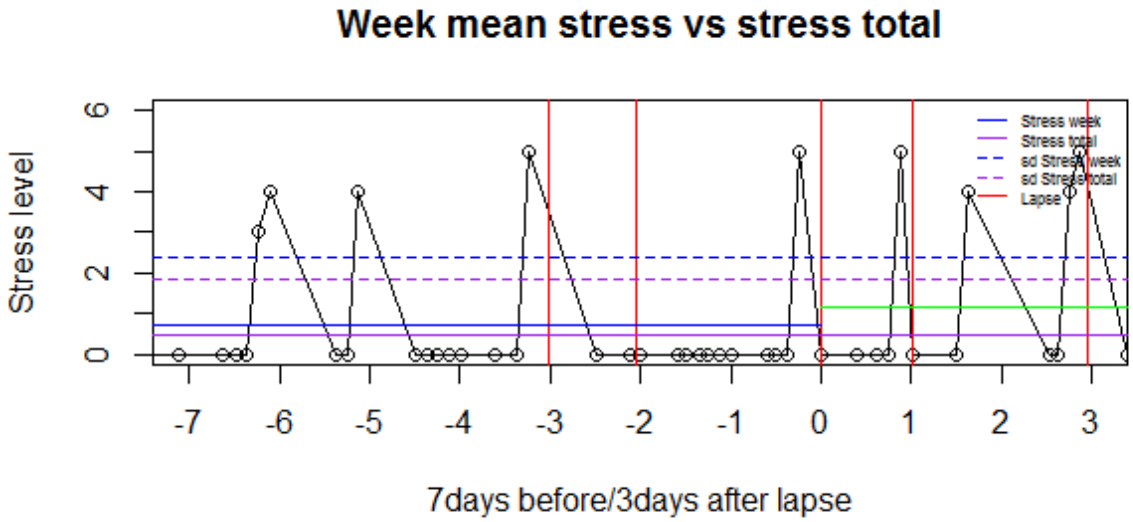

Week mean stress vs stress total
Stress week
Stress total
sd Stress week
sd Stress total
Lapse
Stress level
7days before/3days after lapse

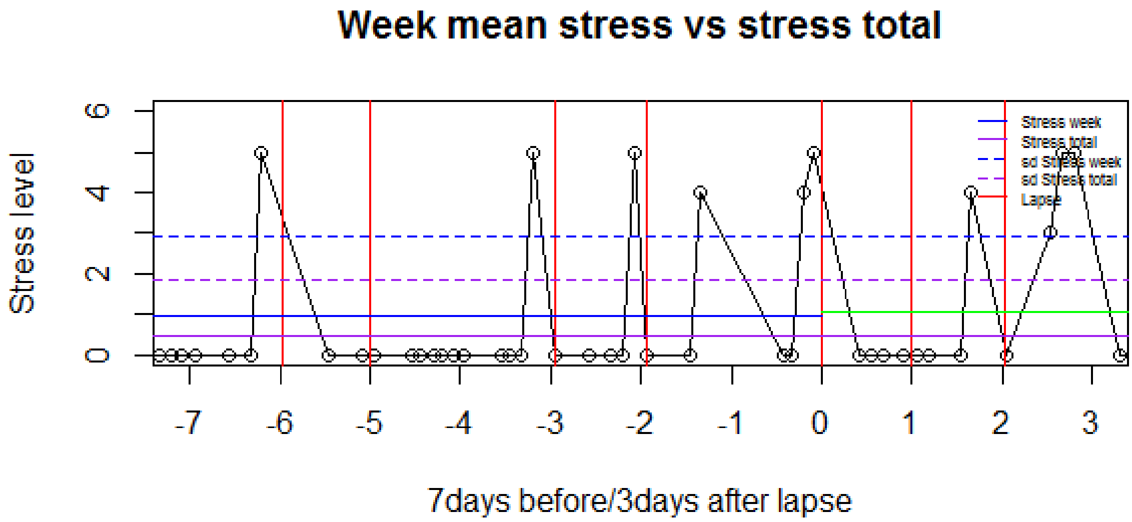

Week mean stress vs stress total
Stress week
Stress total
sd Stress week
sd Stress total
Lapse
Stress level
7days before/3days after lapse

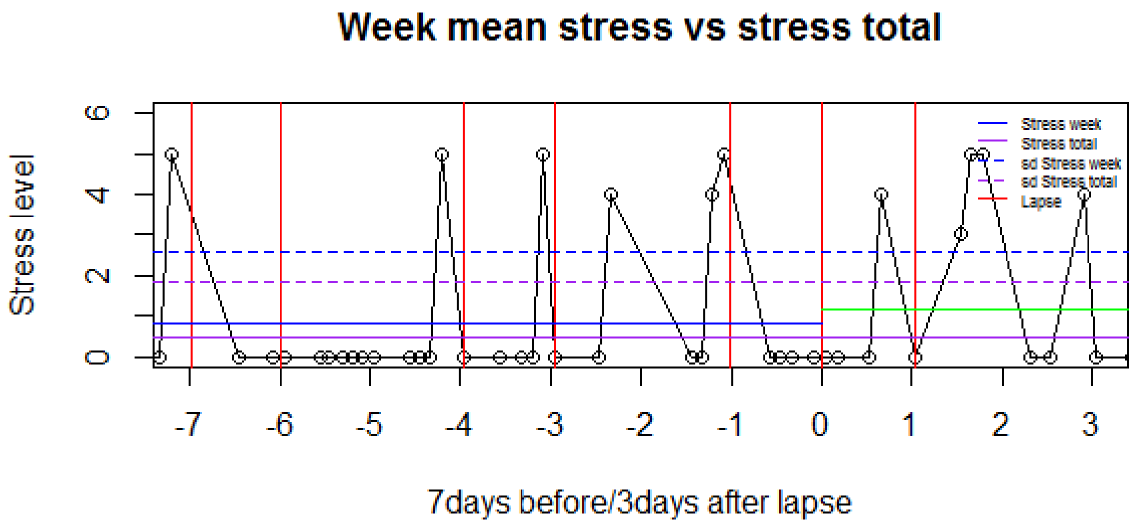

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

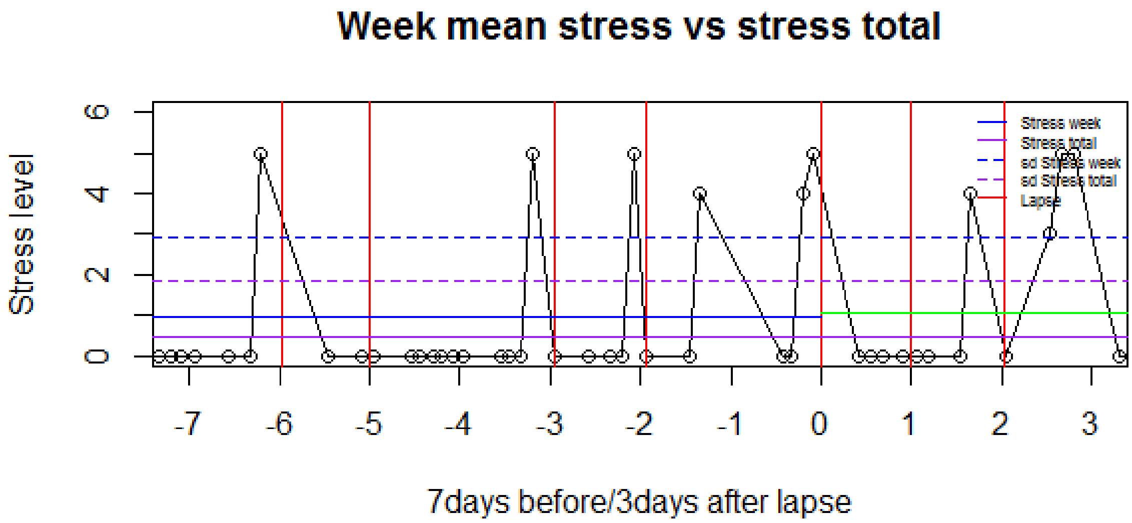

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

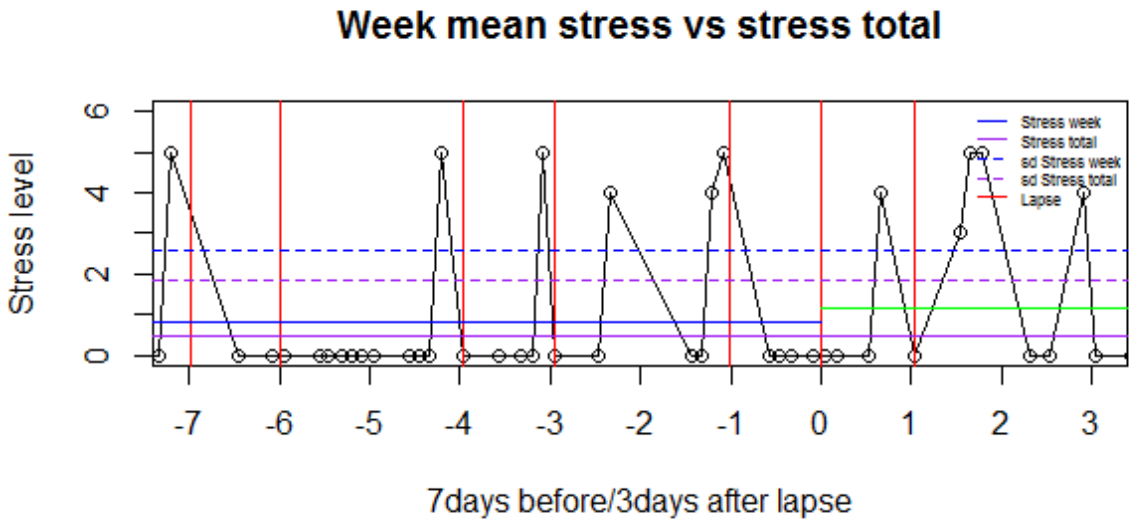

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

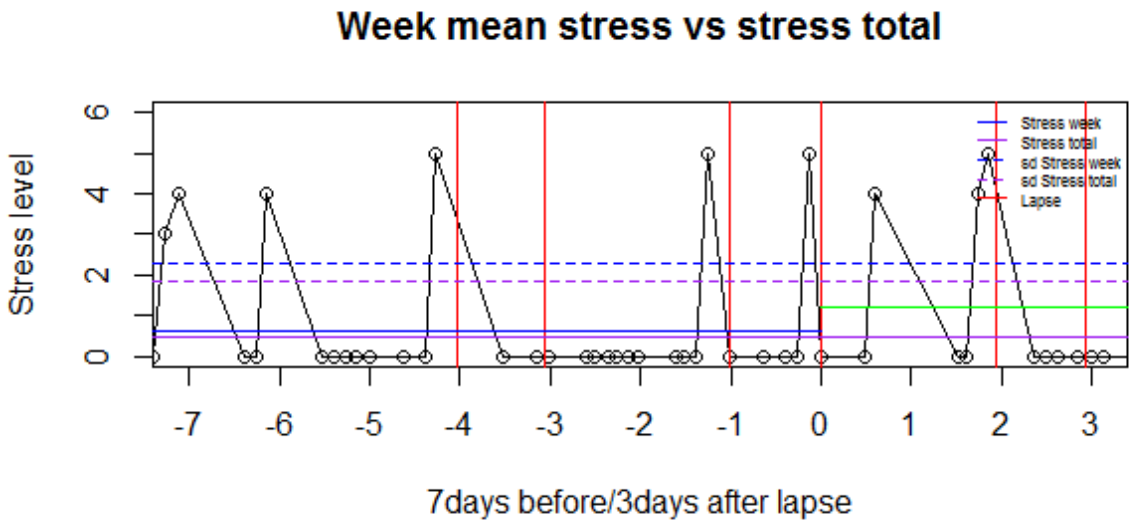

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

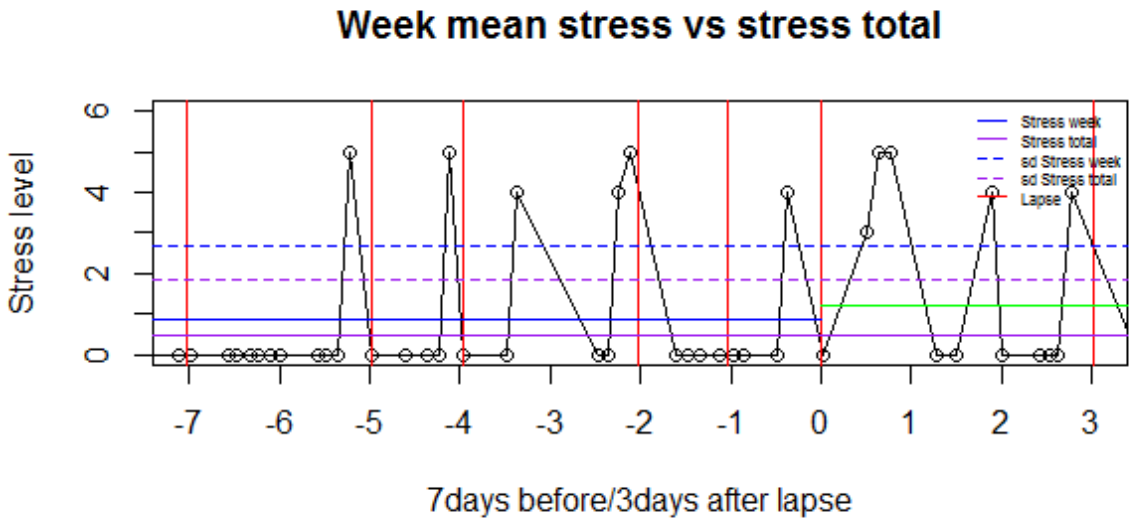

Week mean stress vs stress total
Stress level
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

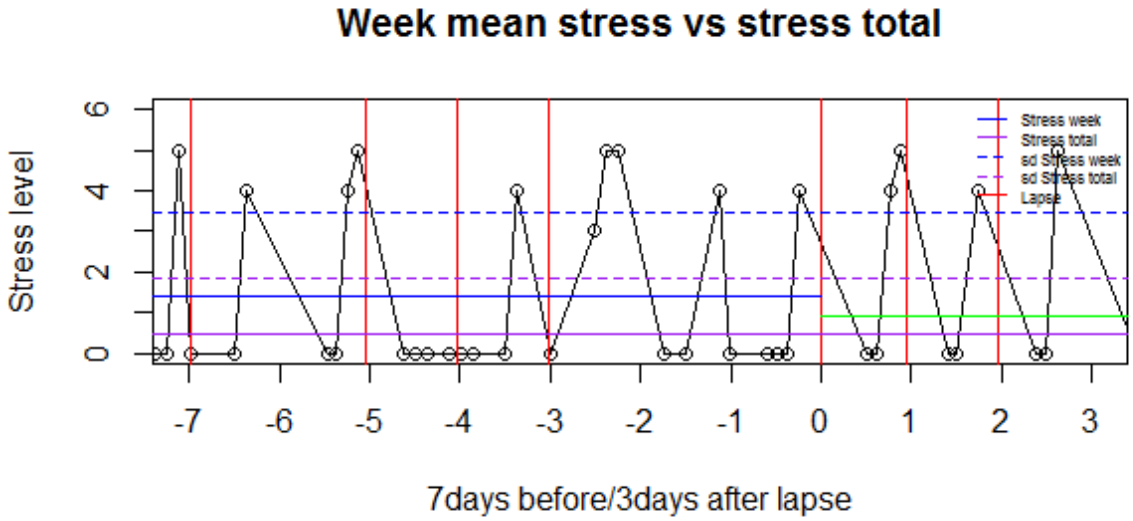

Week mean stress vs stress total
Stress level
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

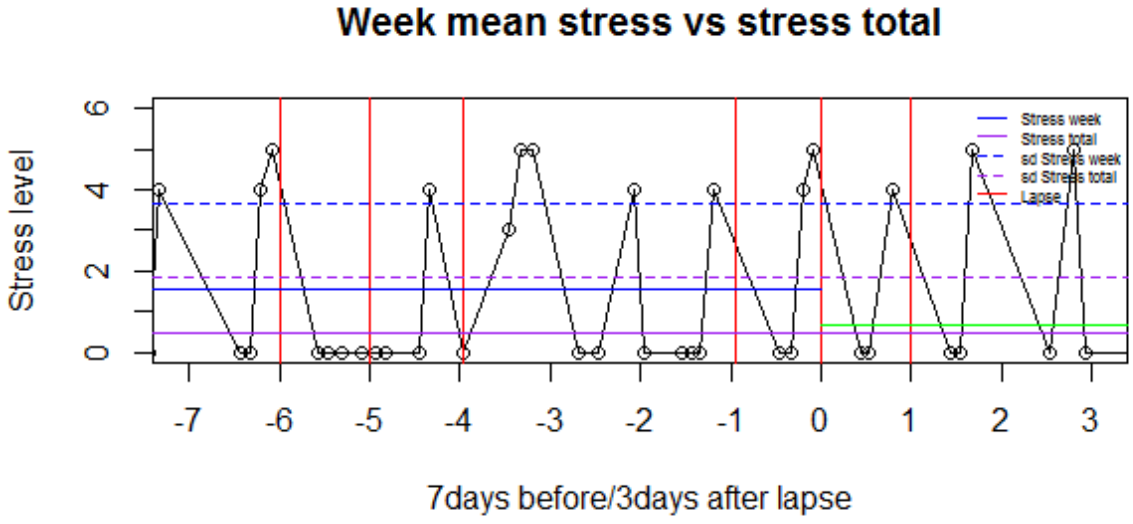

Week mean stress vs stress total
Stress level
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

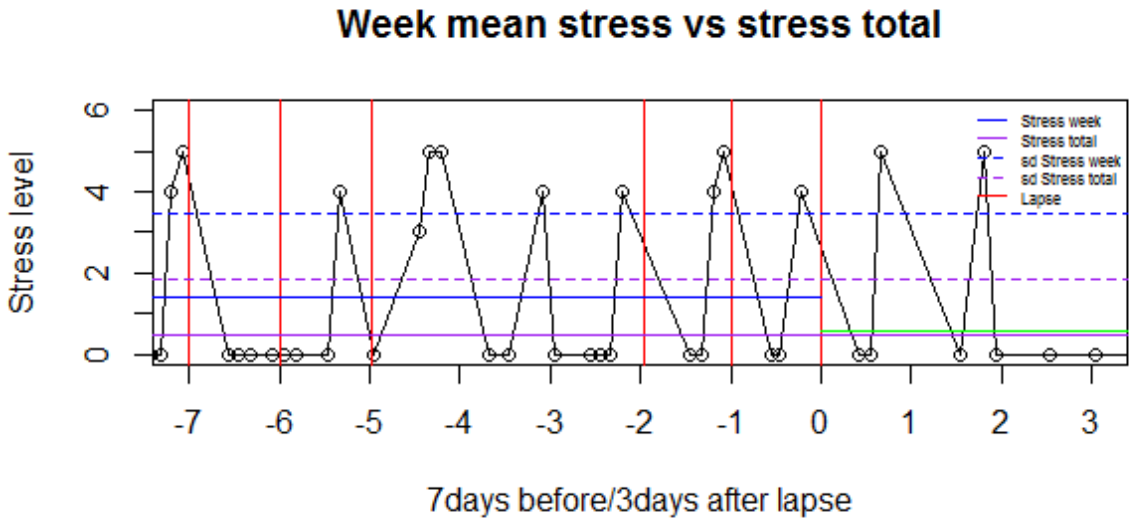

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

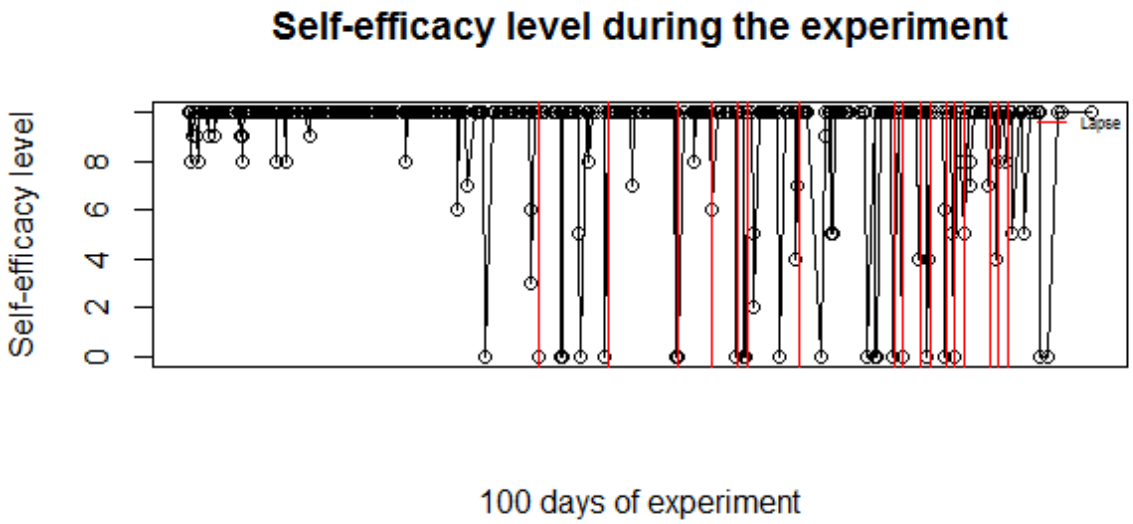

Week mean stress vs stress total
Stress level
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse



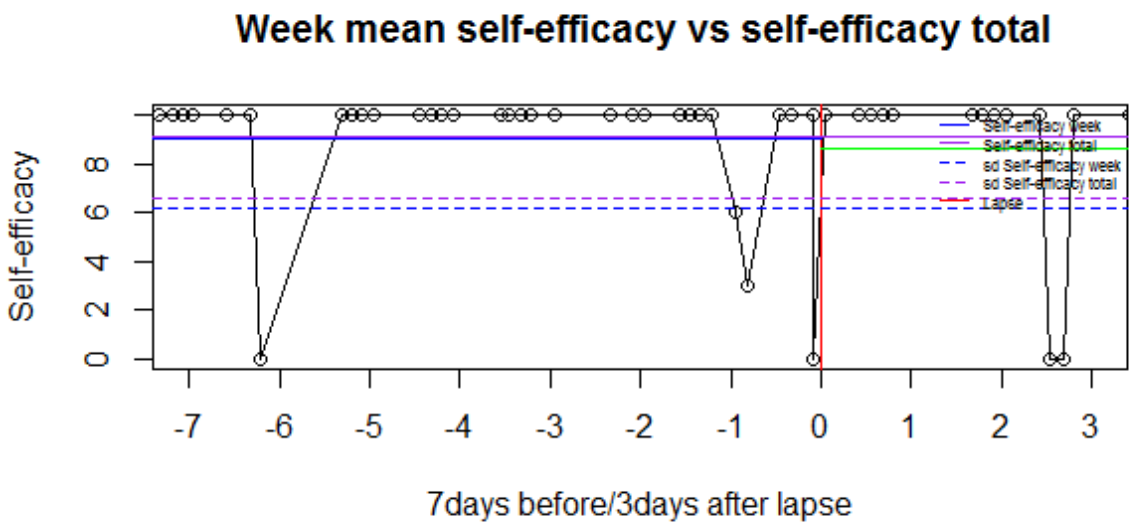
Self-efficacy

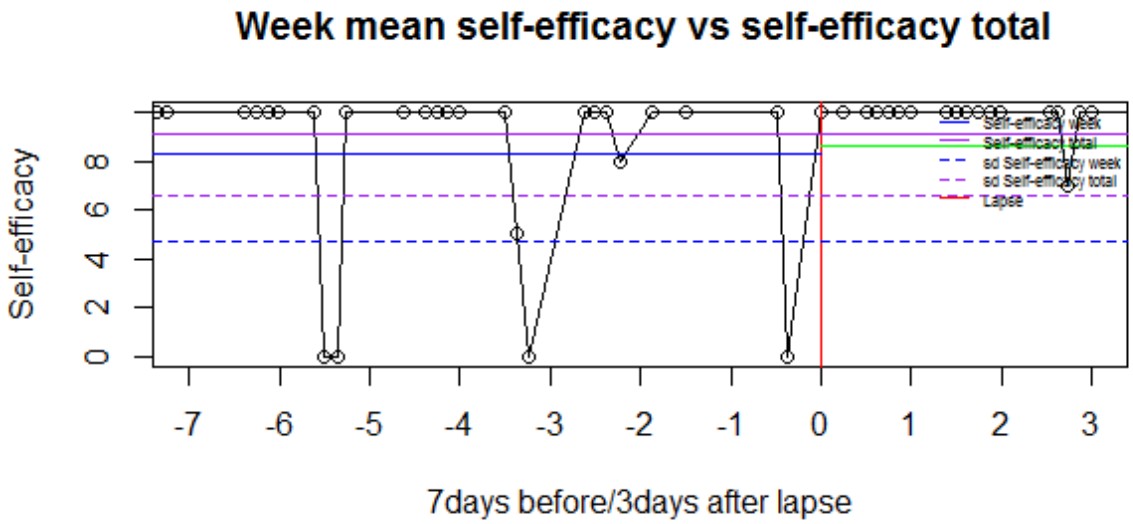
Figure 18 *Total number of all observation of self-efficacy during 100 days of the experiment and lapses of ID590*

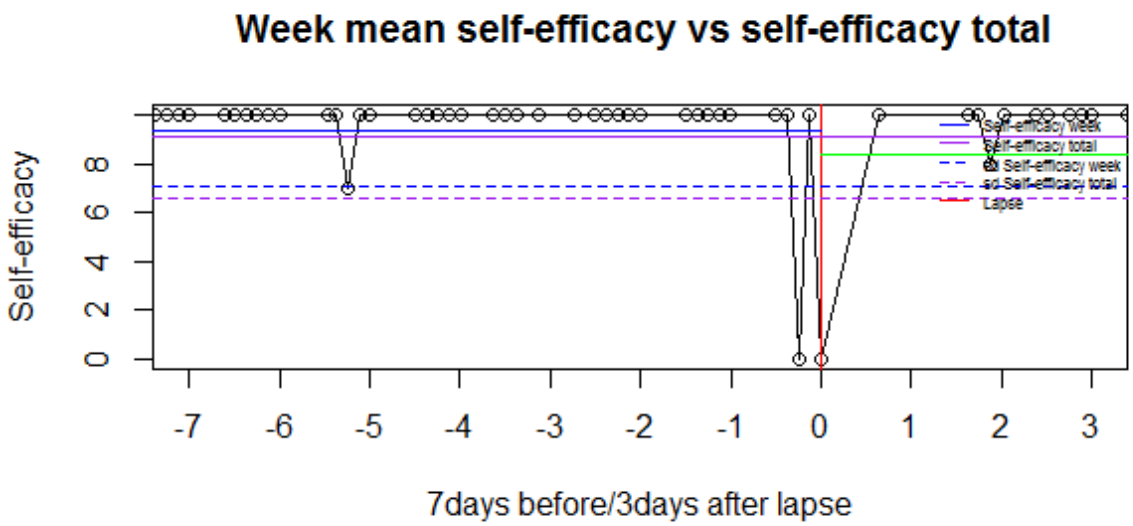


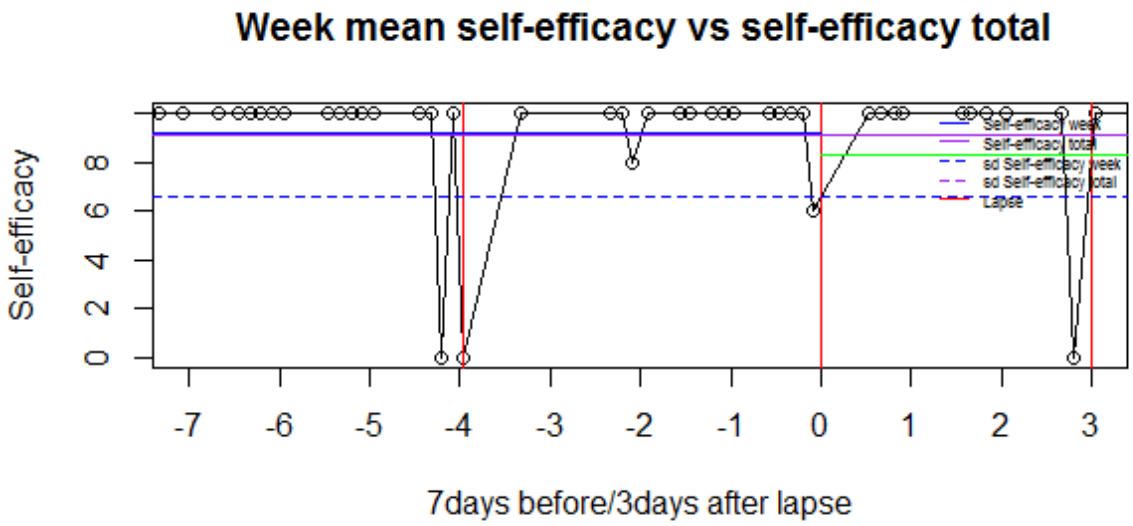
Self-efficacy level during the weeks prior to lapses

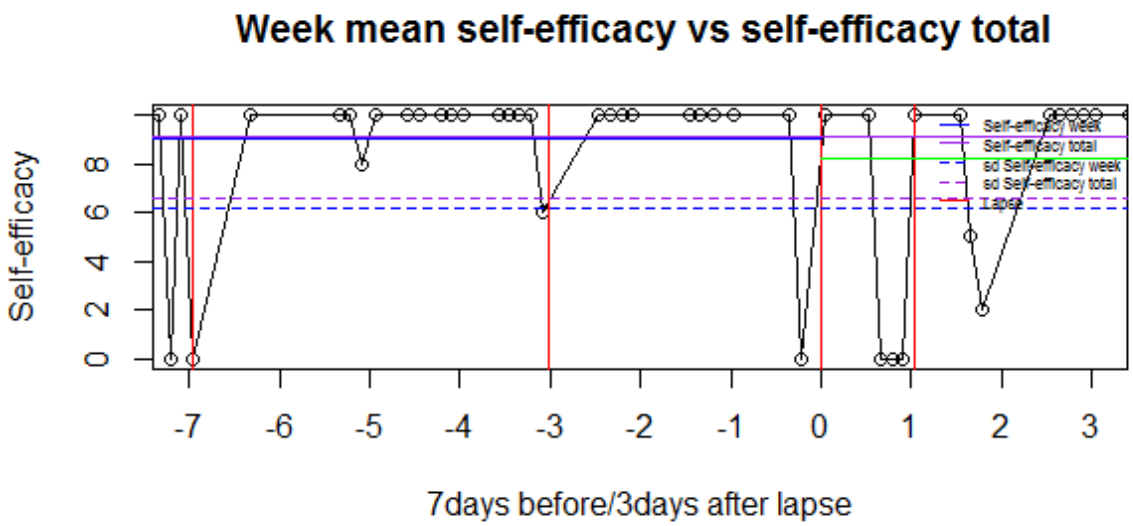
Figure 19 S*elf-efficacy level before and after lapse (0)*

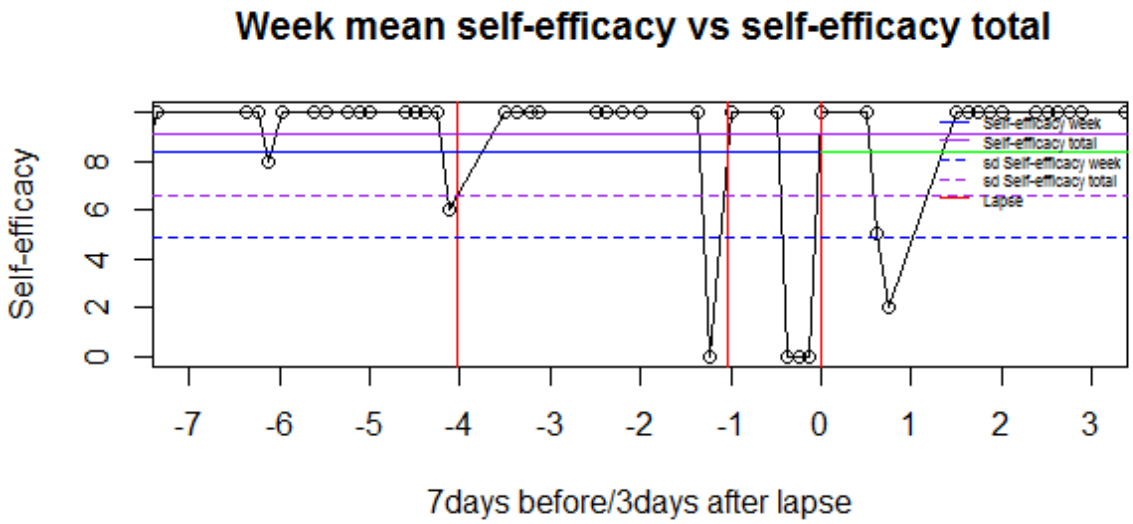

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

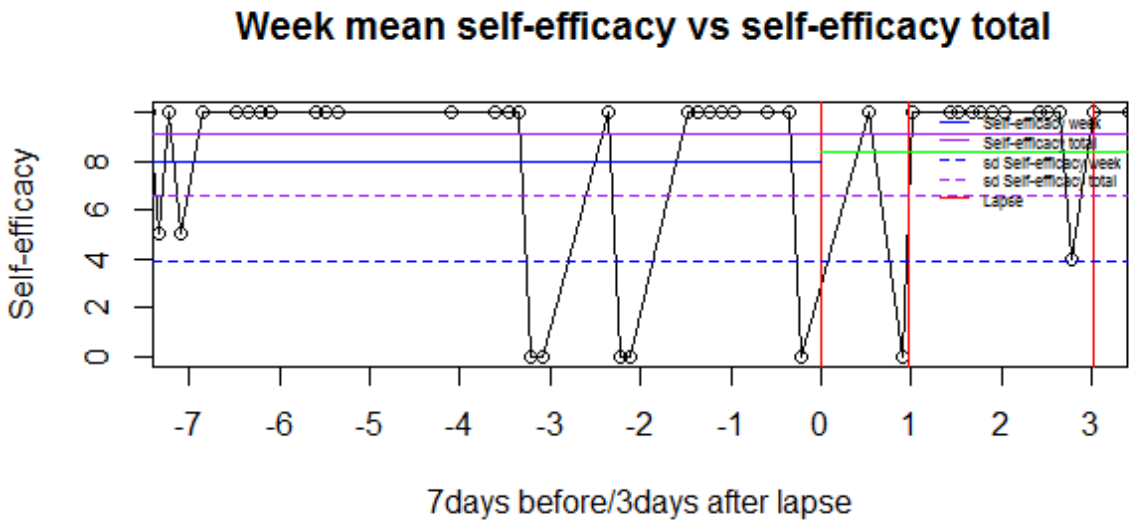

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

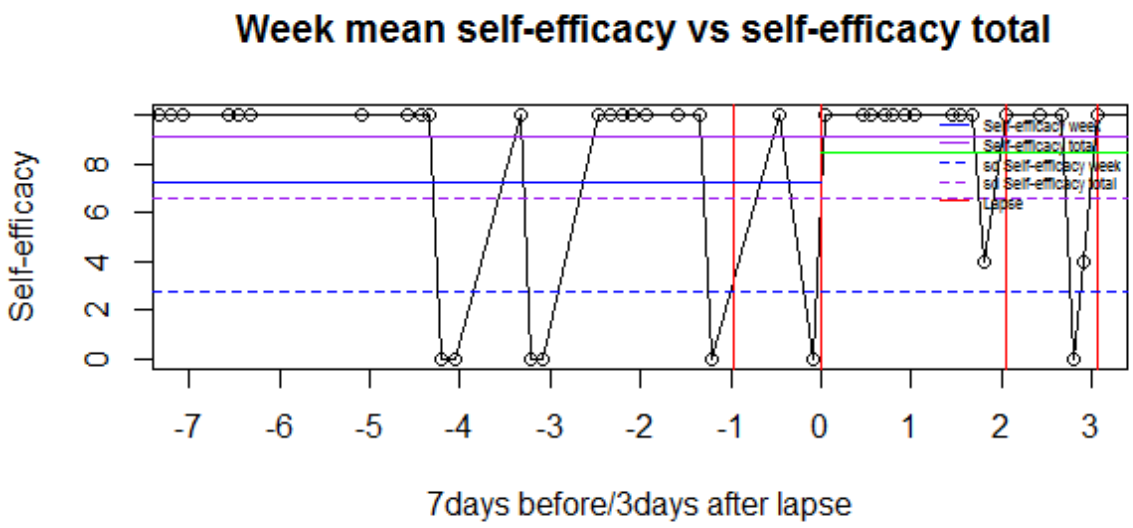

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

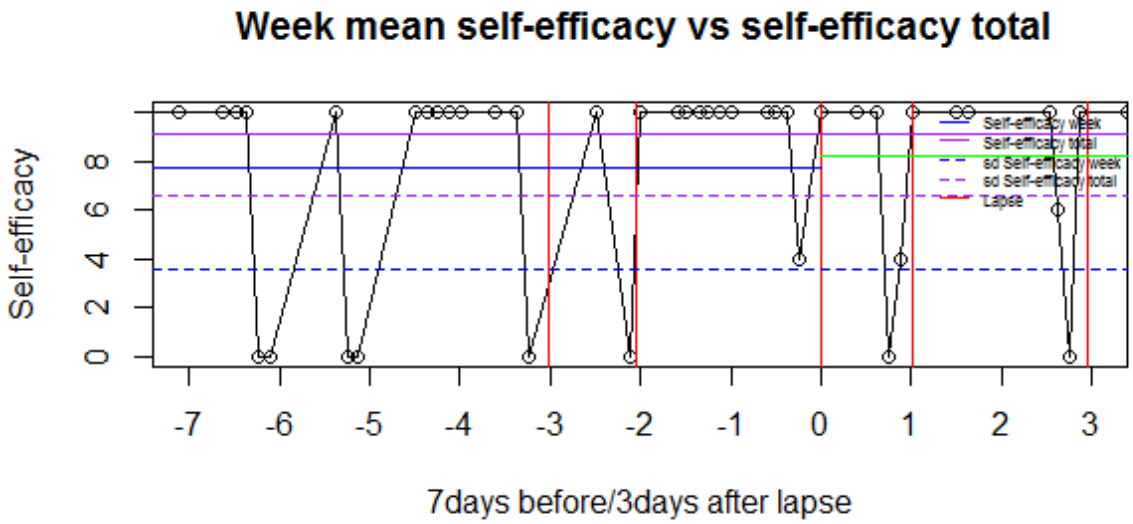

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

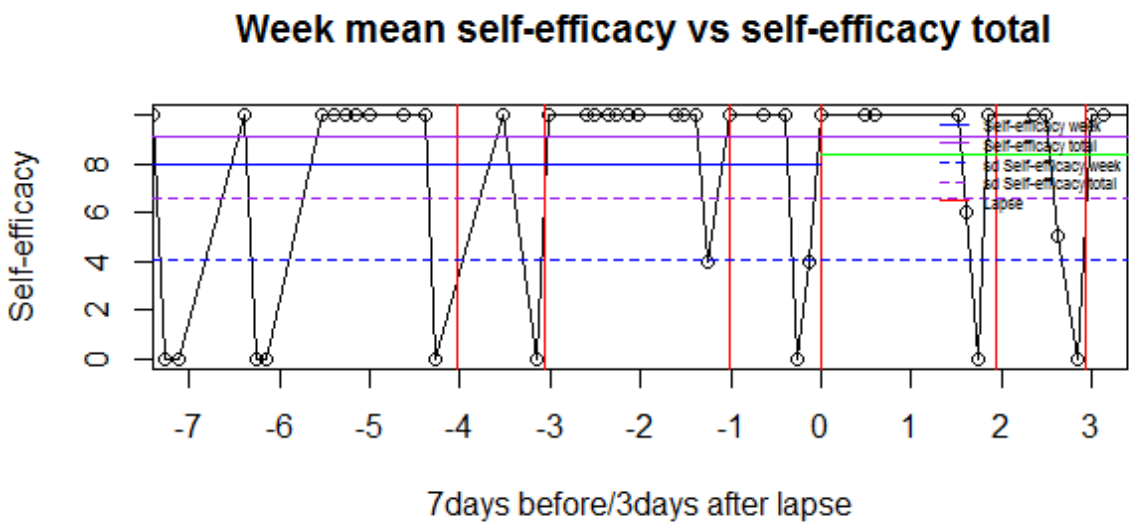

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

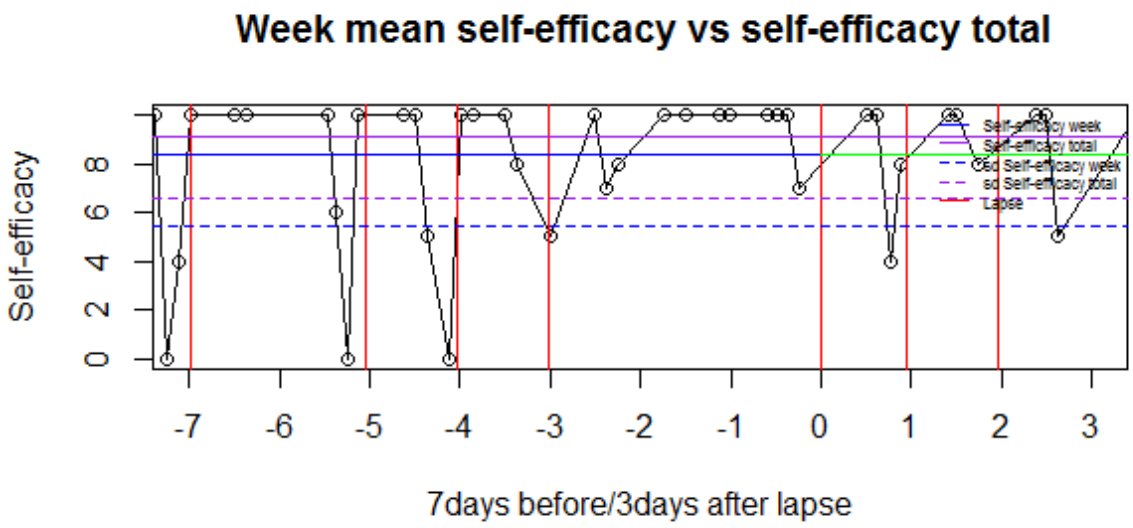

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

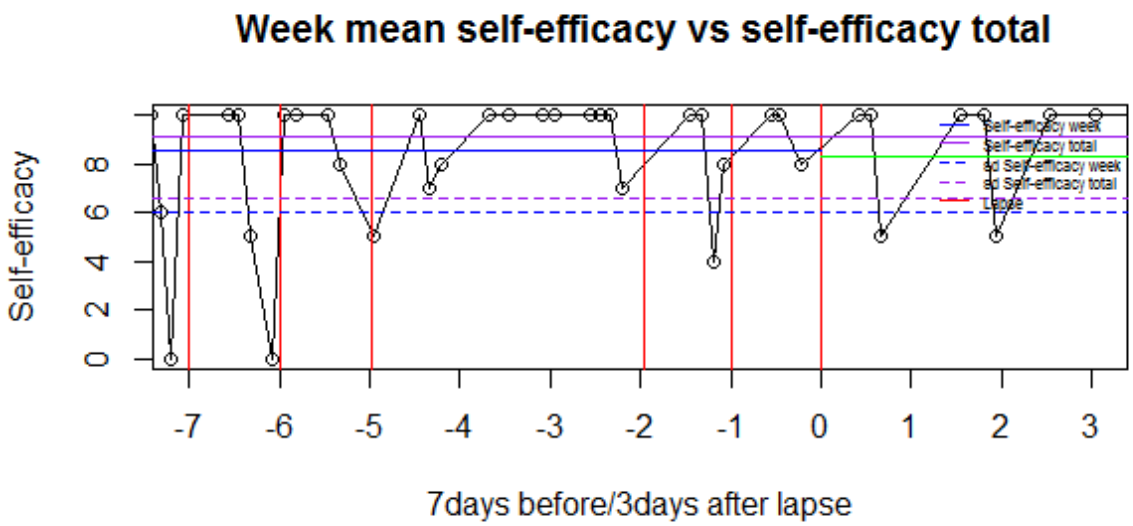

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

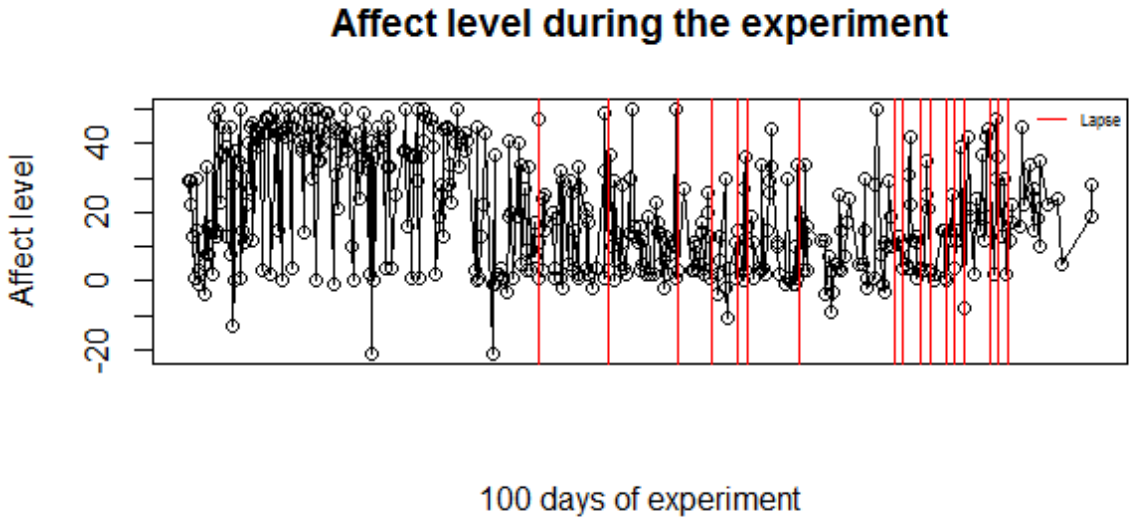

Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse



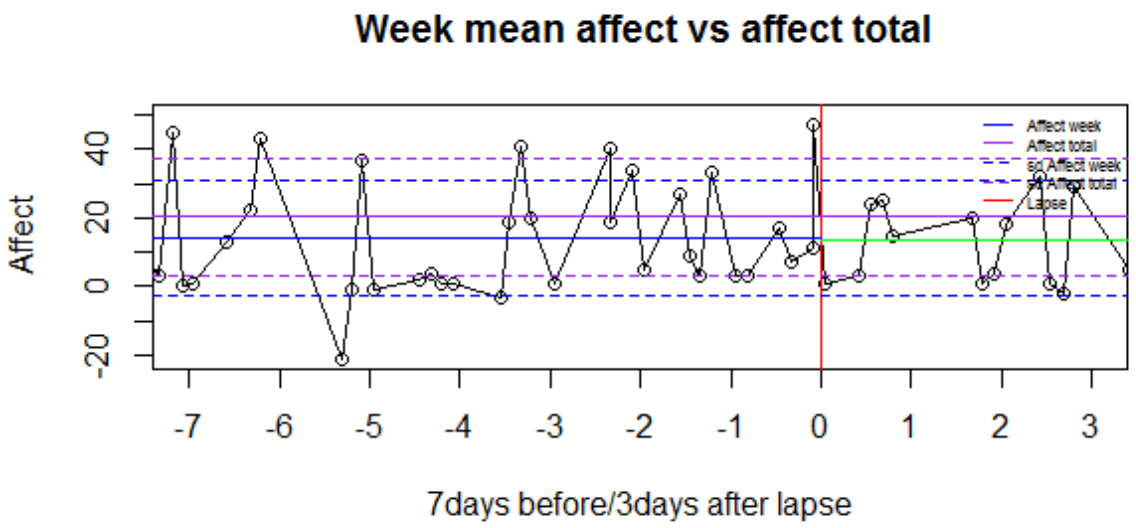
Affect

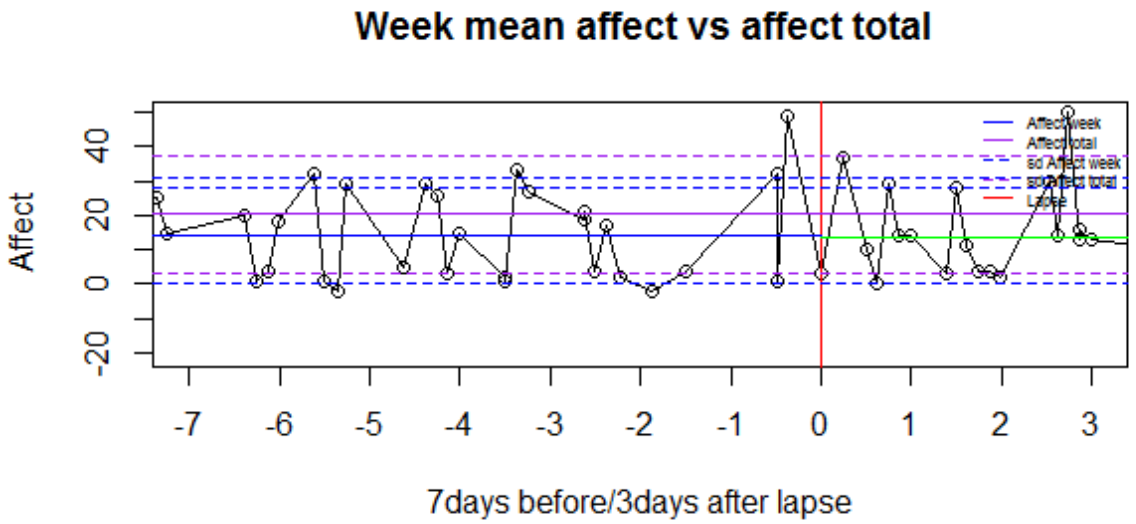
Figure 20 *Total number of all observation of affect during 100 days of the experiment and lapses of ID590*

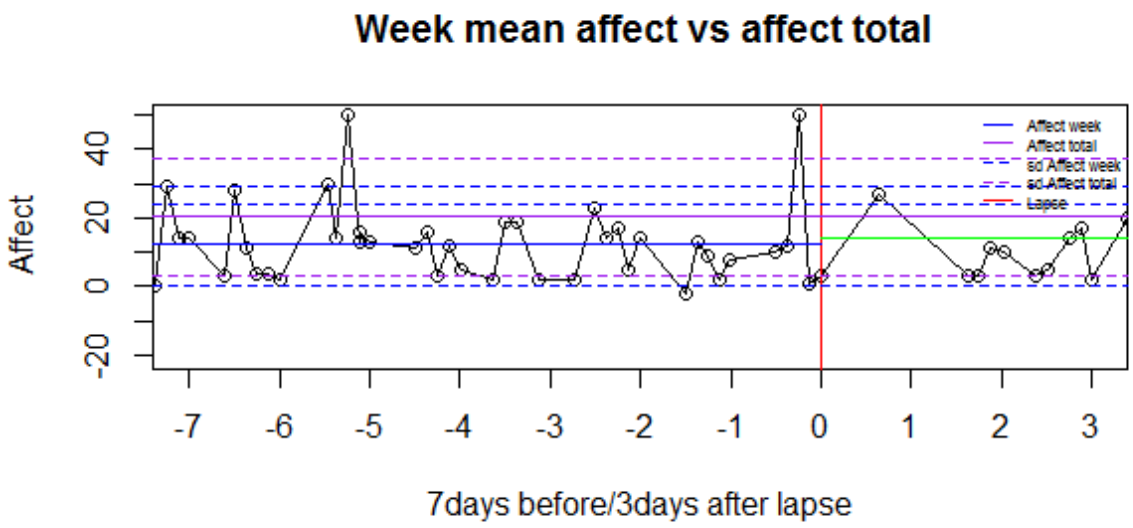


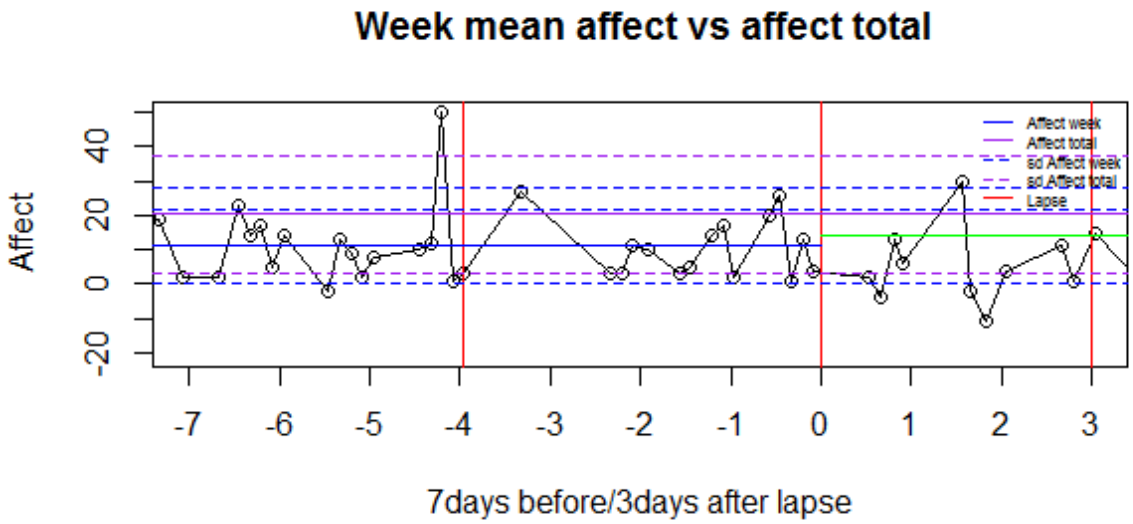
Affect levels during the weeks prior to lapses

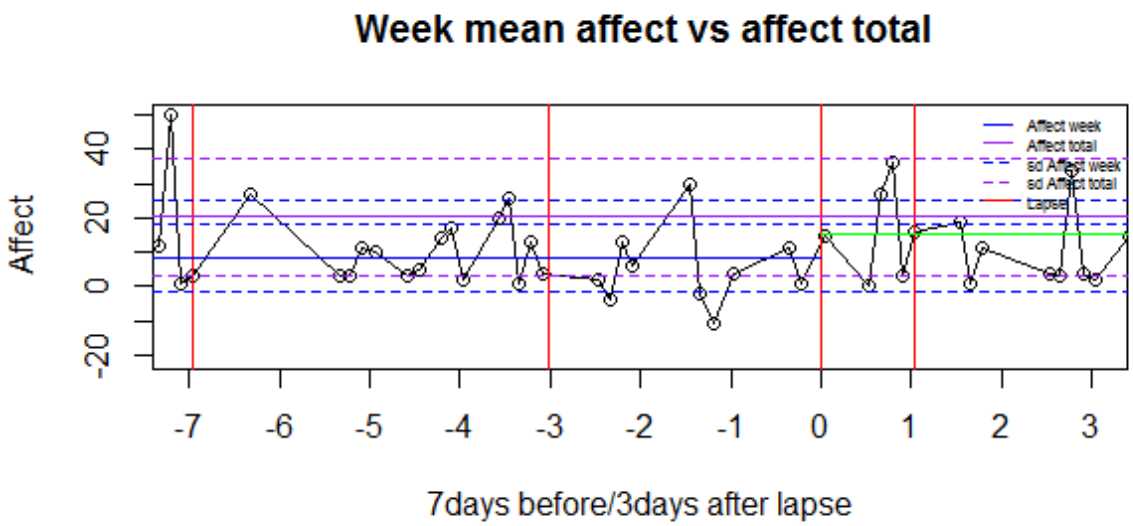
Figure 21 *Affect level before and after lapse (0)*

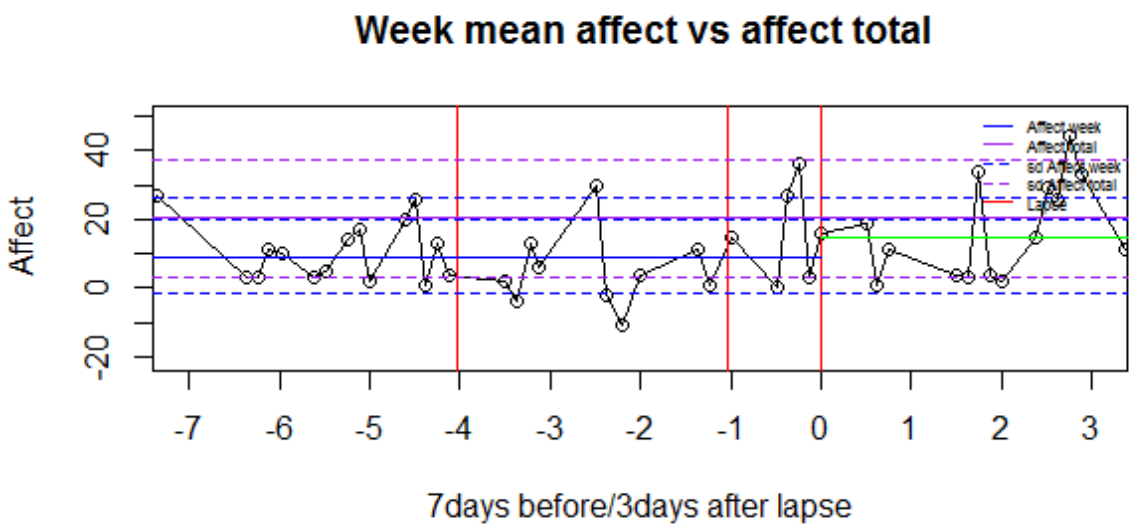

Week mean affect vs affect total
Affect
40
20
0
-20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

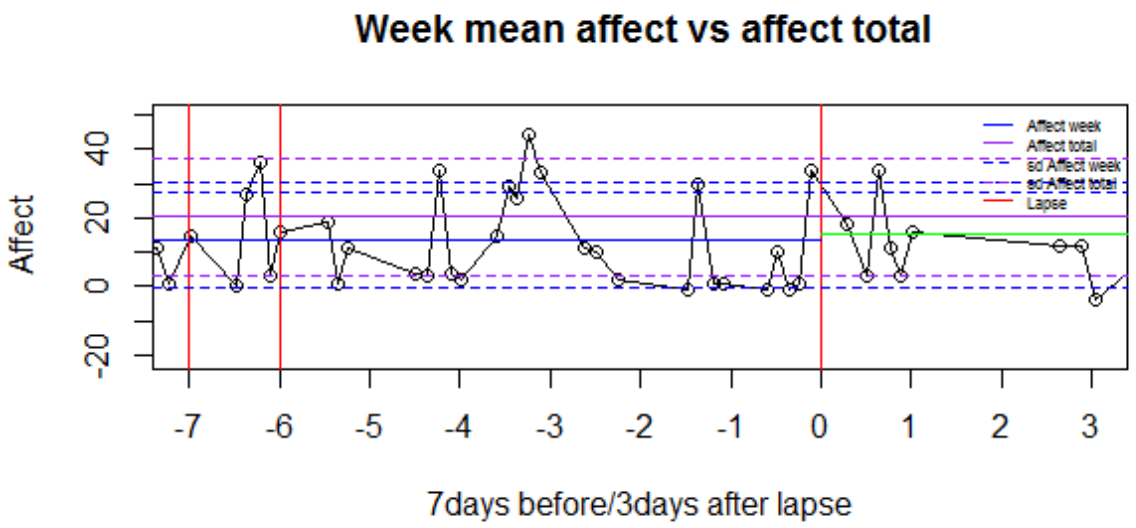

Week mean affect vs affect total
Affect
40
20
0
-20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

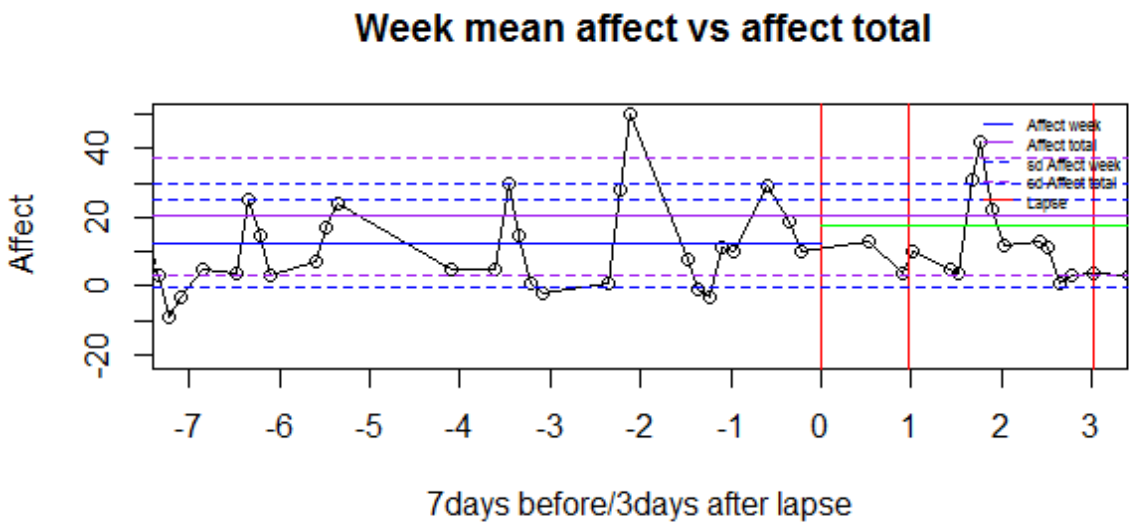

Week mean affect vs affect total
Affect week
Affect total
sd Affect week
sd Affect total
Lapse
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

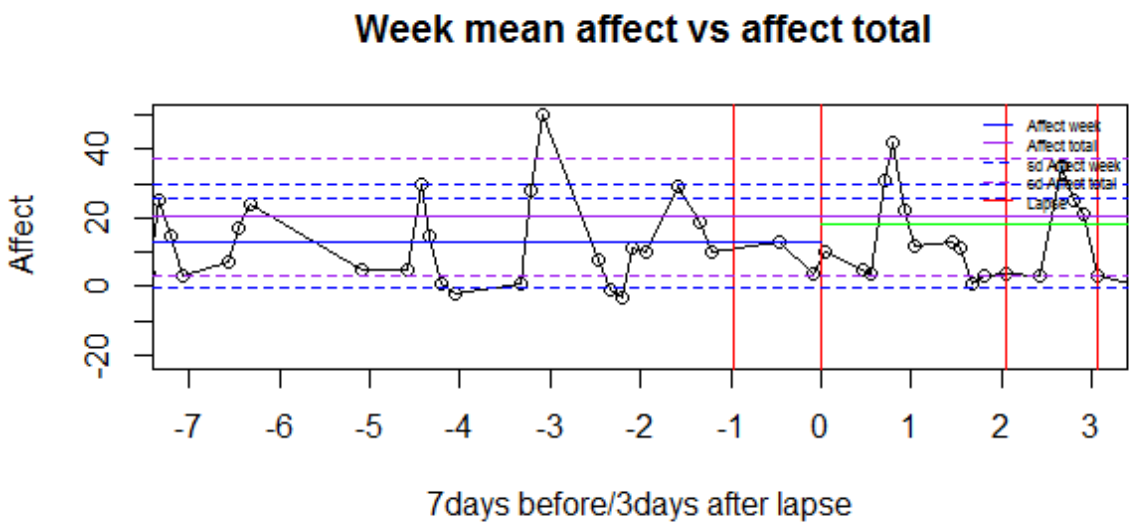

Week mean affect vs affect total
Affect week
Affect total
sd Affect week
sd Affect total
Lapse
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

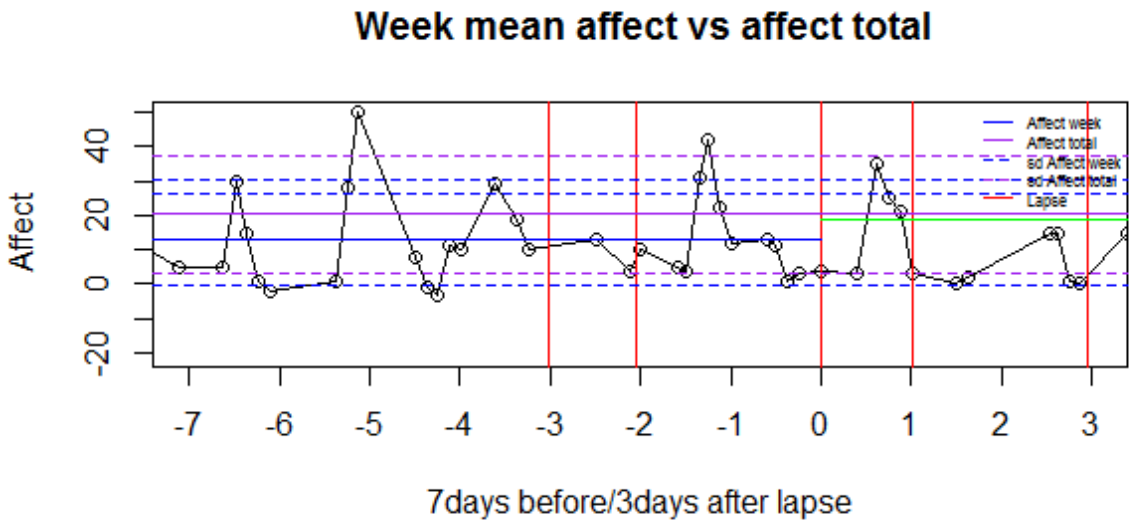

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

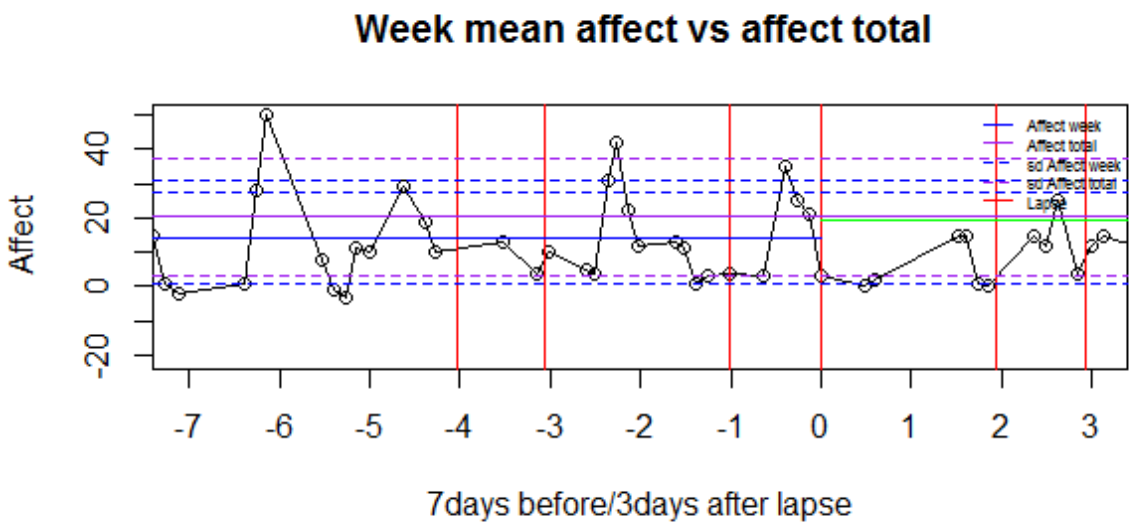

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

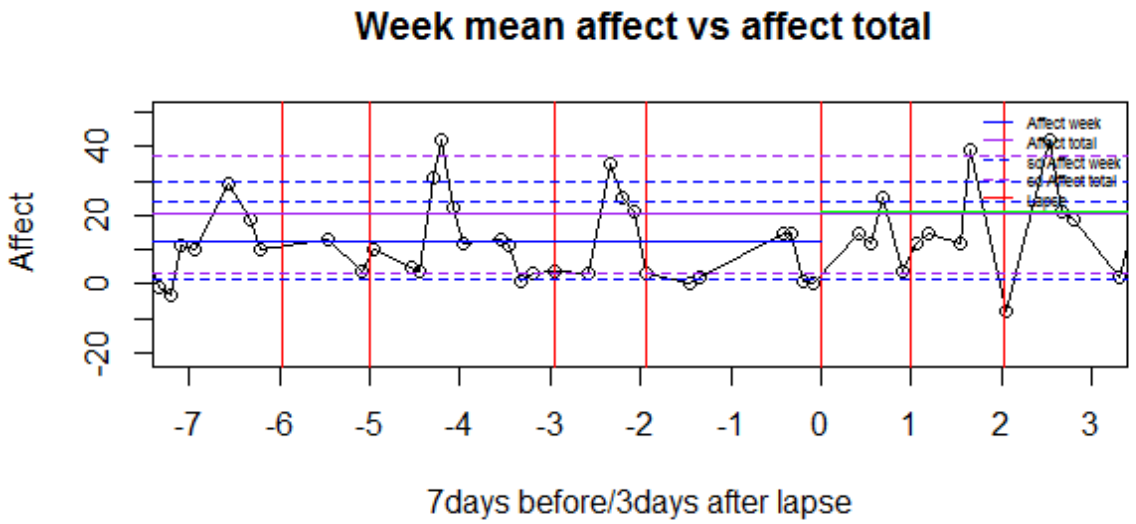

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

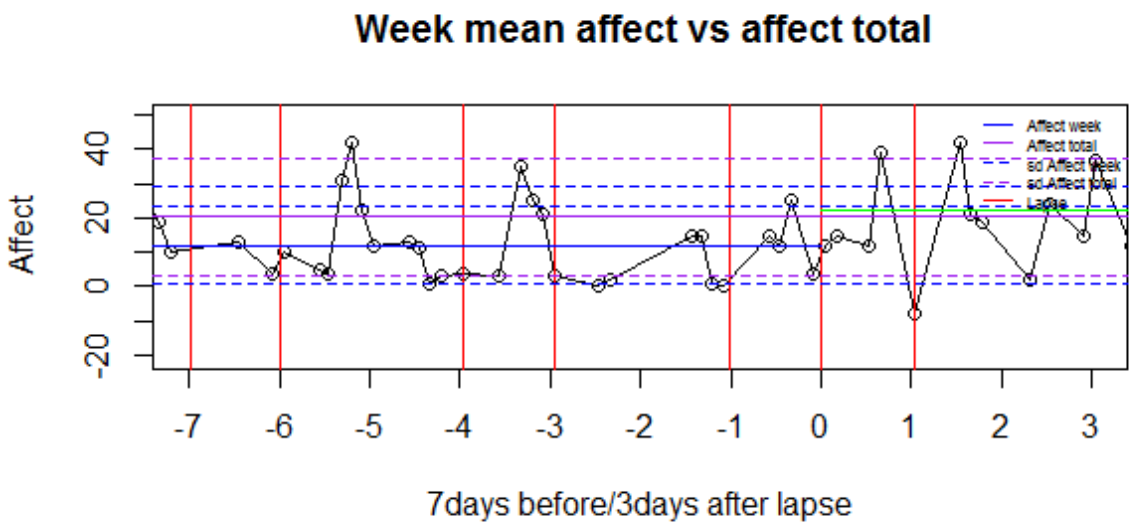

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

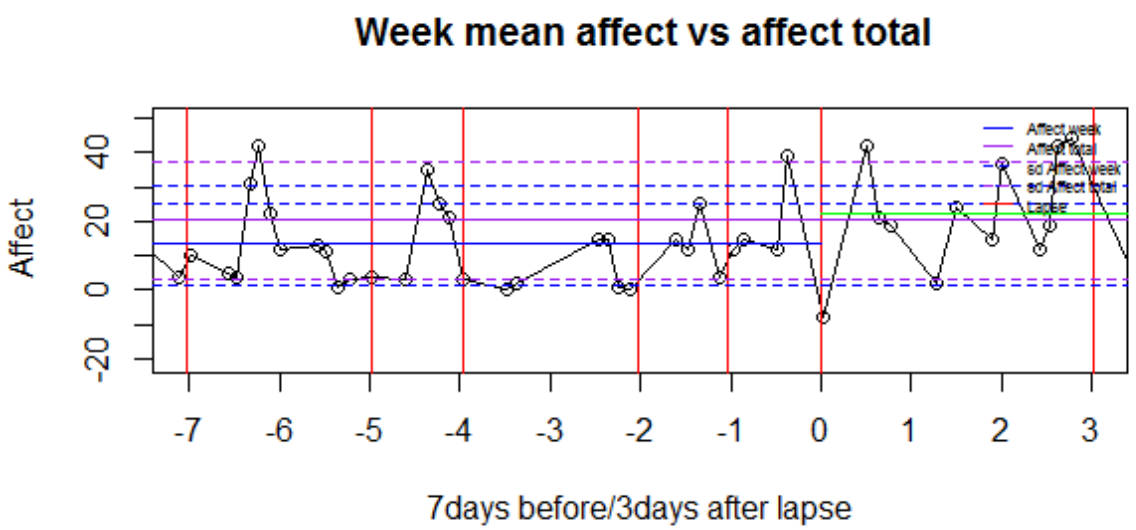

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

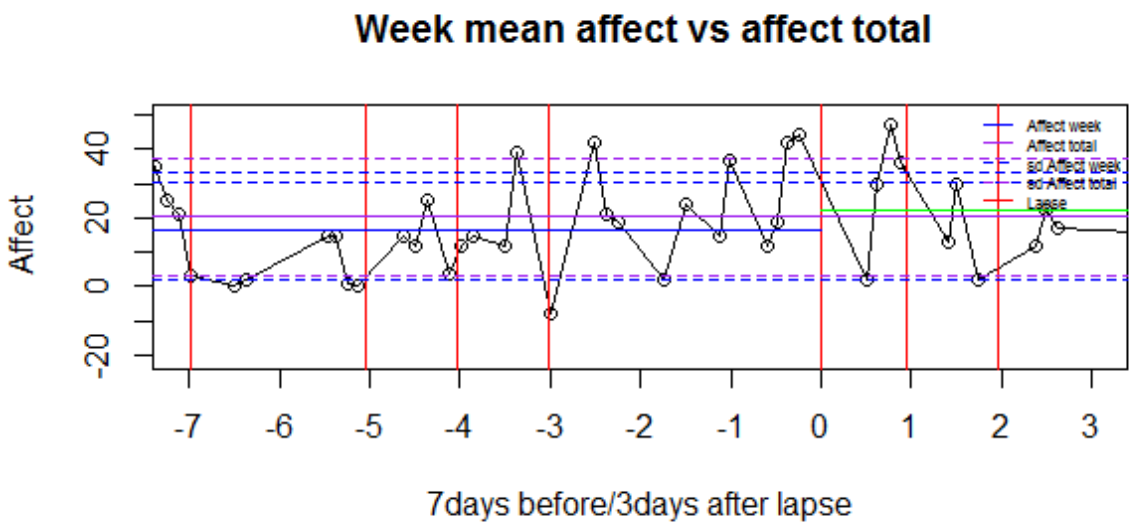

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

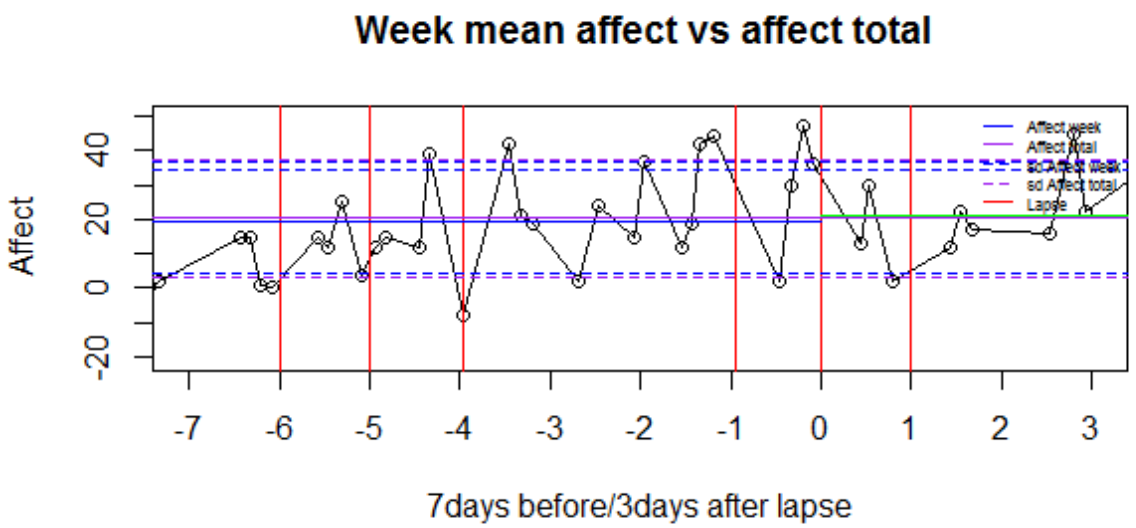

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

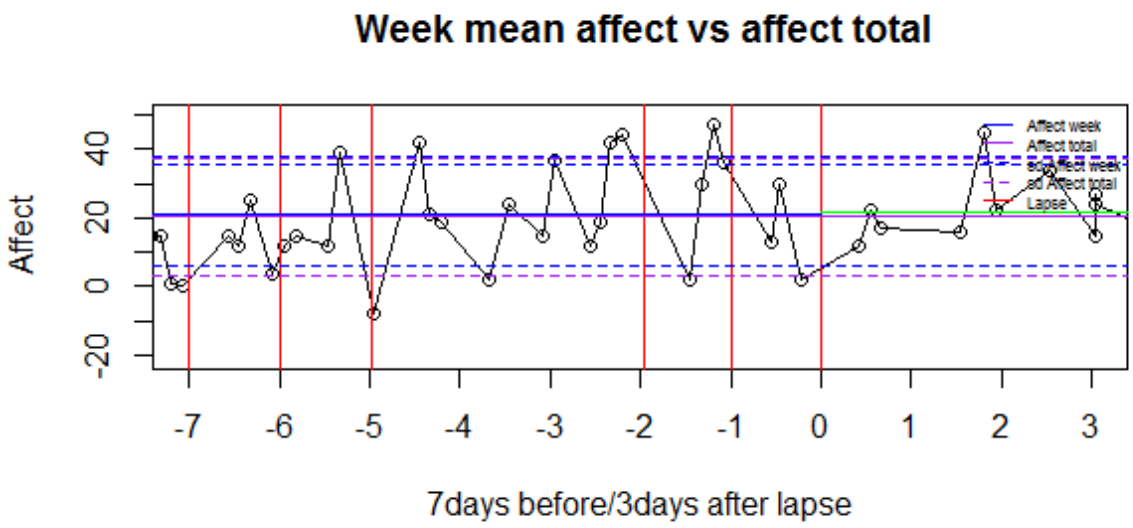

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse


Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse


Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

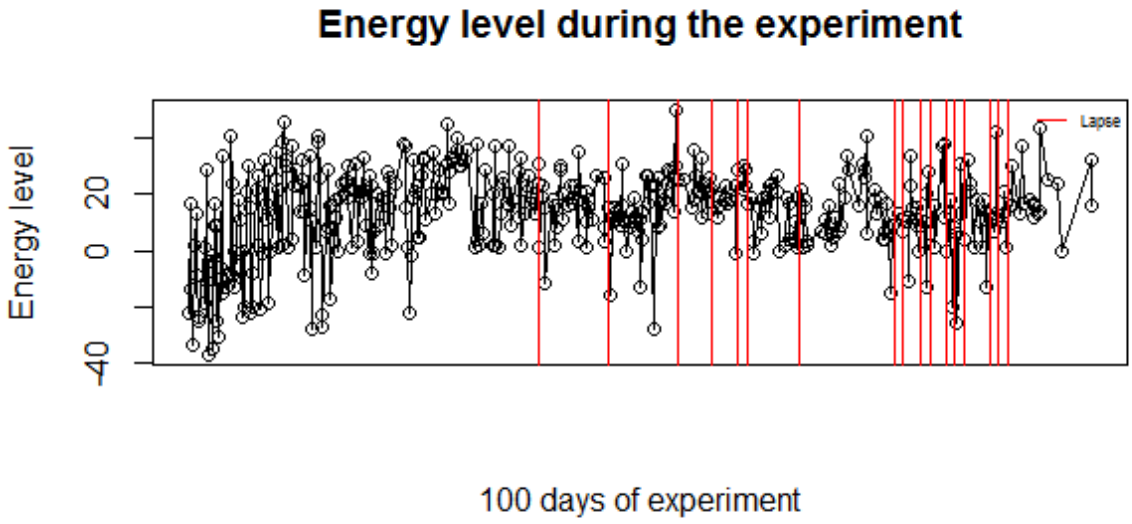

Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse


Week mean affect vs affect total
Affect
-20
0
20
40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse



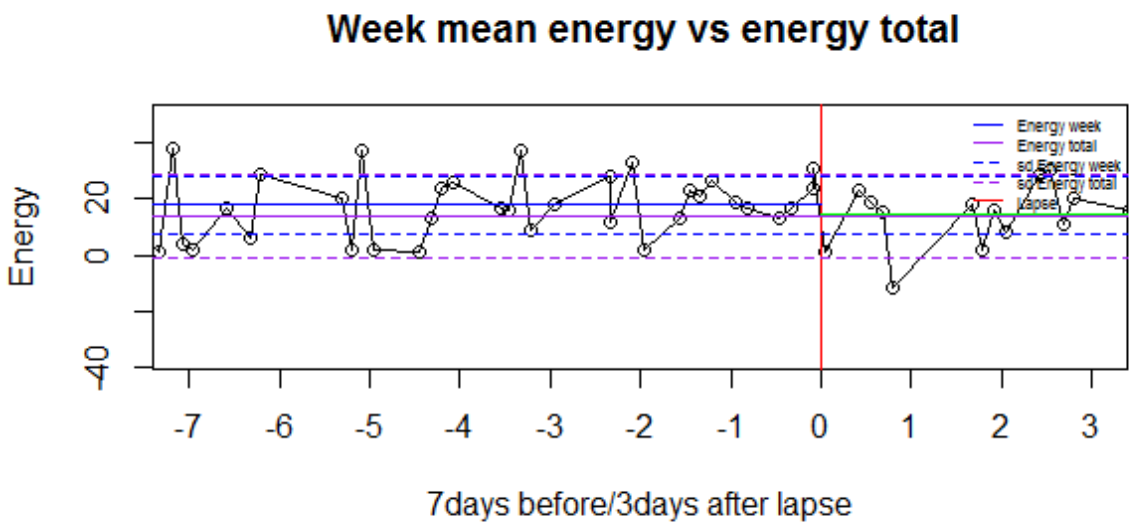
Energy

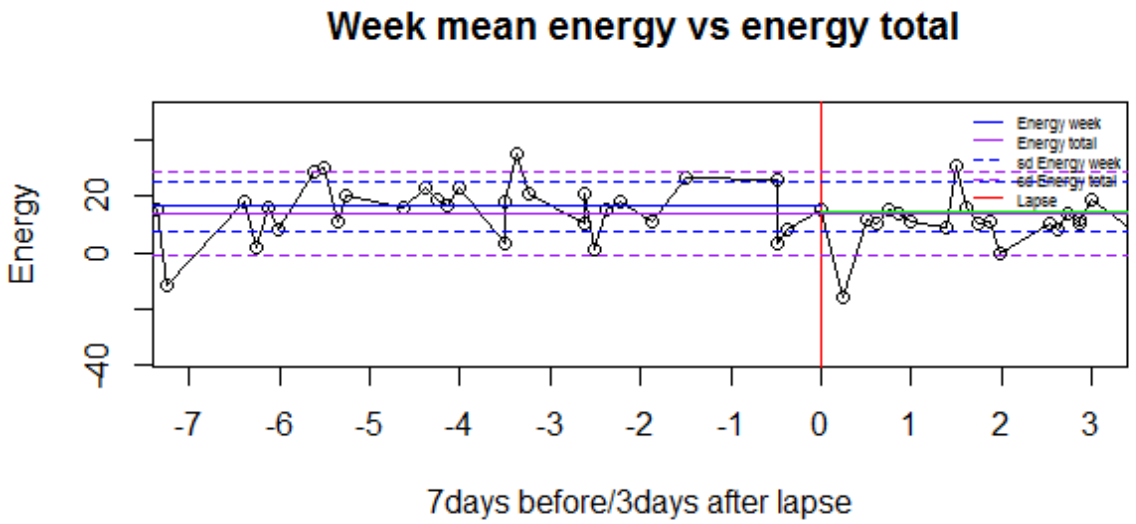
Figure 22 *Total number of all observation of energy during 100 days of the experiment and lapses of ID590*

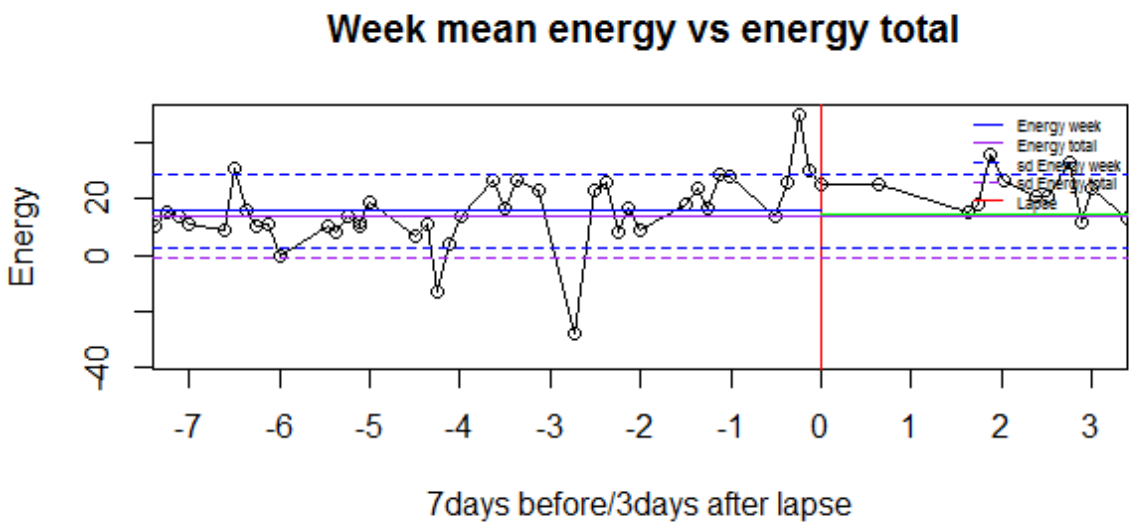


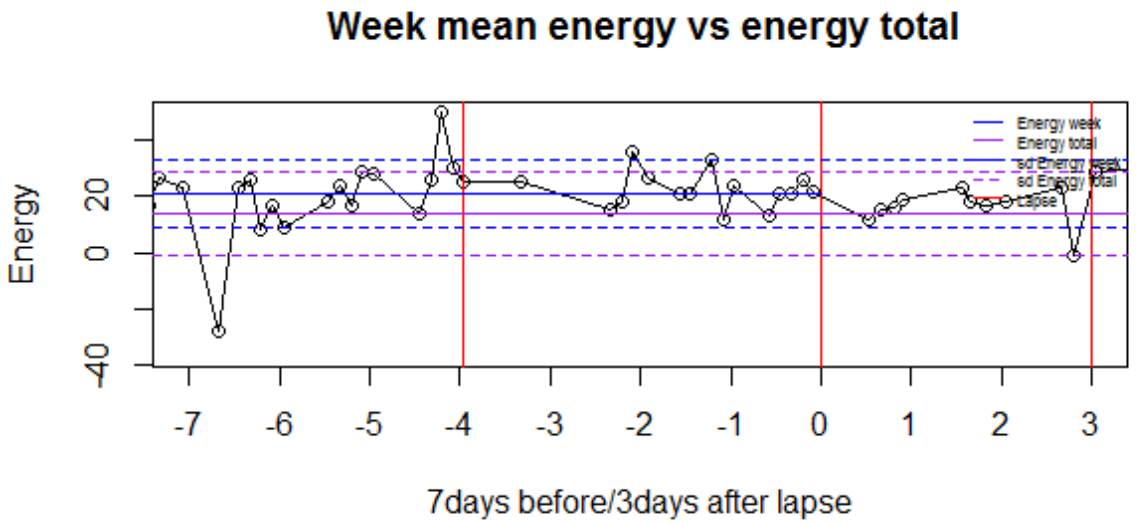
Energy levels during the weeks prior to lapses

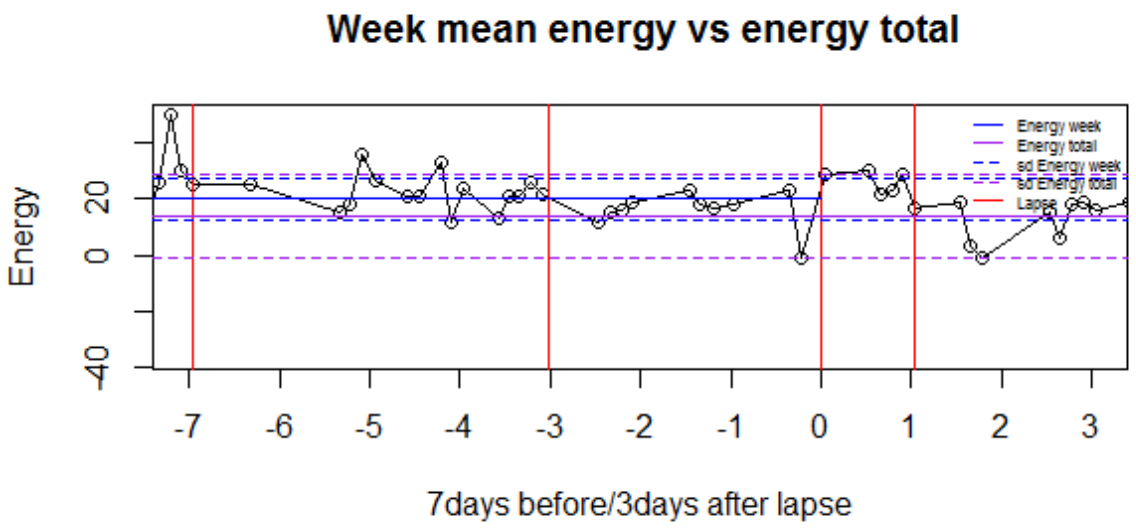
Figure 23 *Energy level before and after lapse (0)*

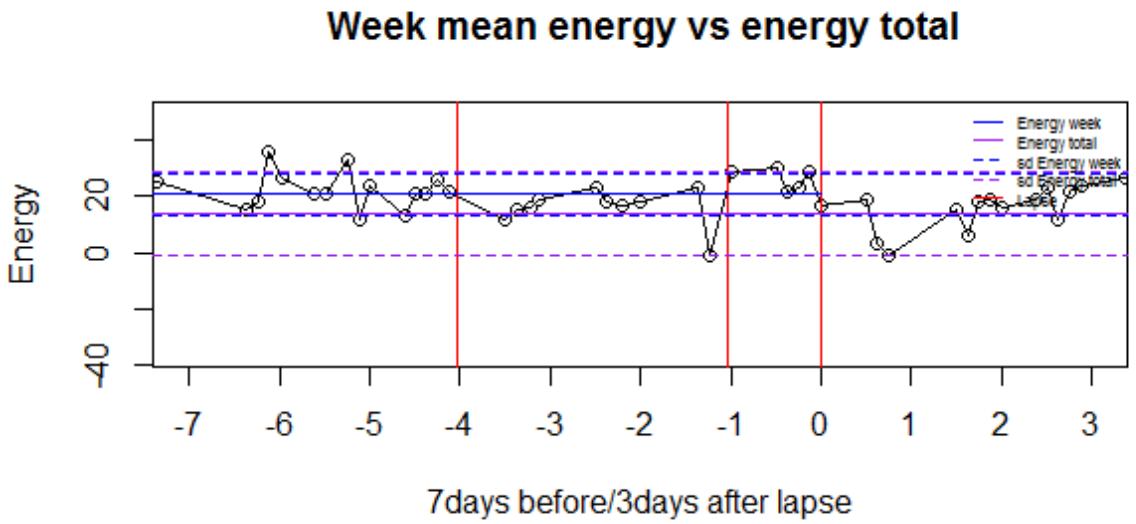

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

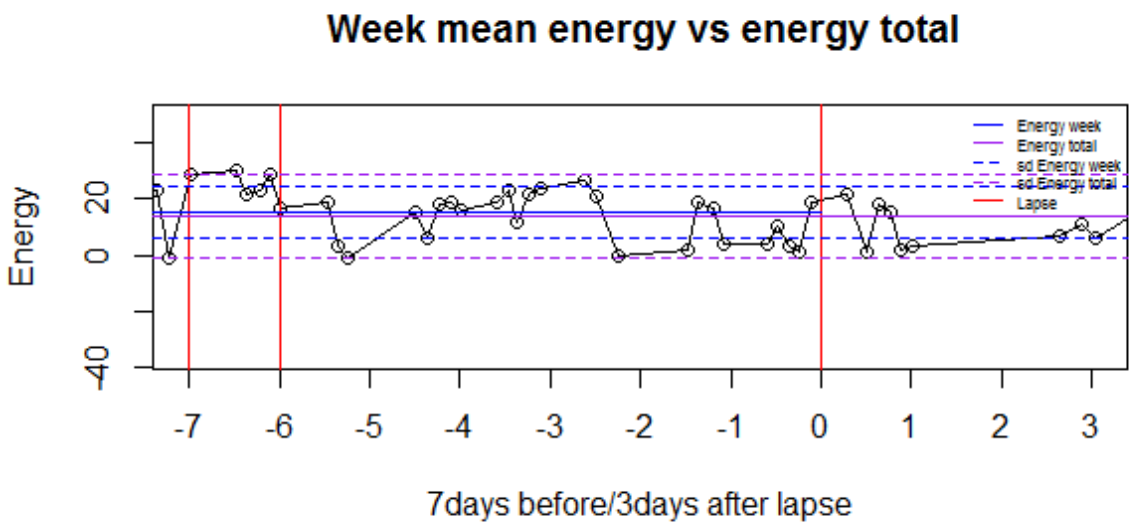

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

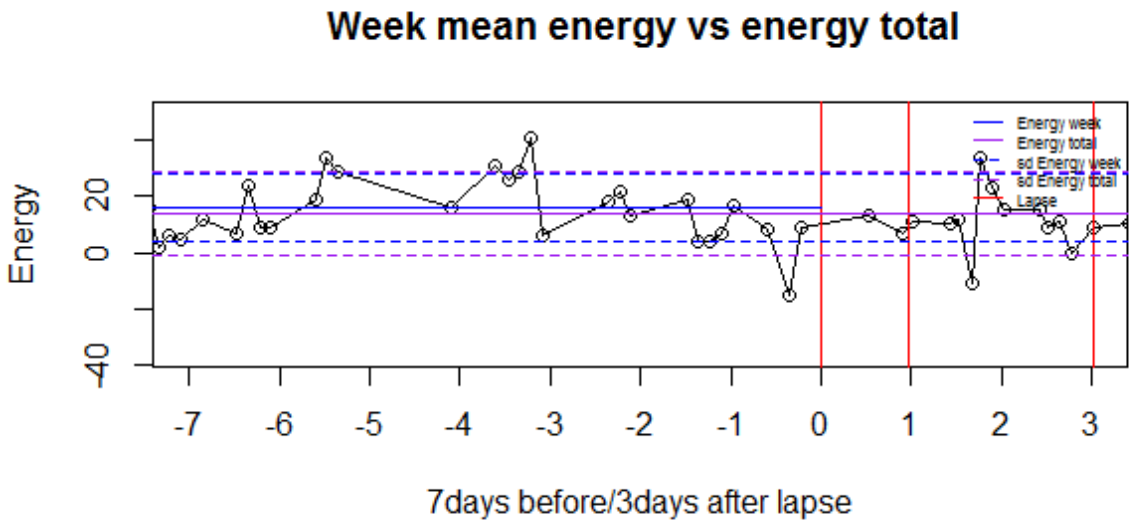

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

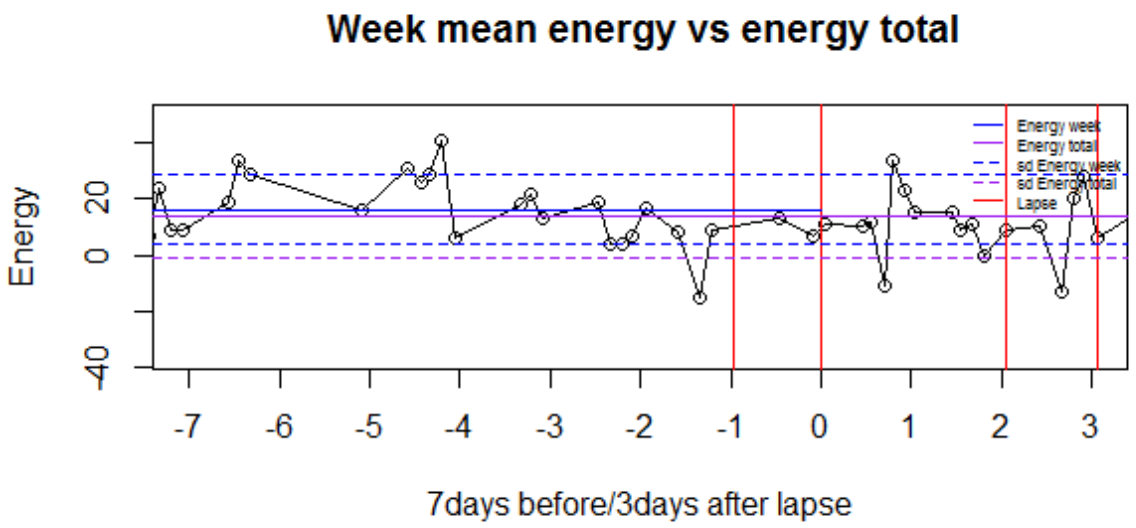

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

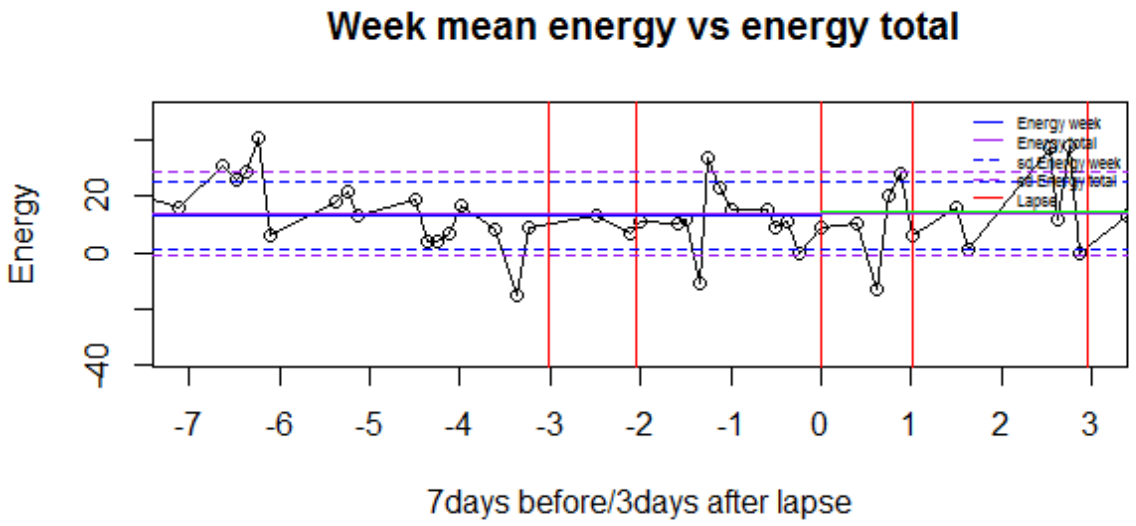

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

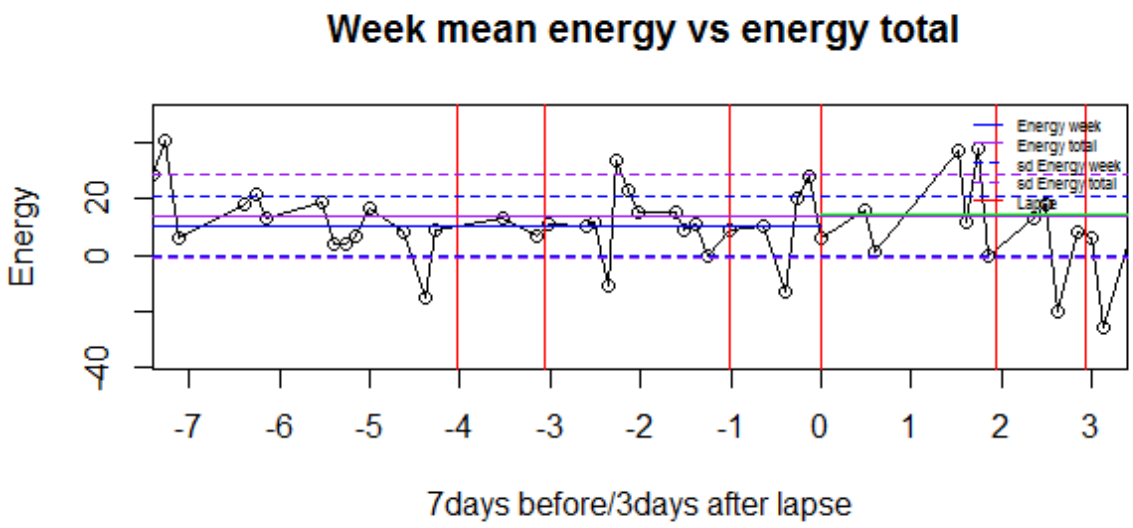

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

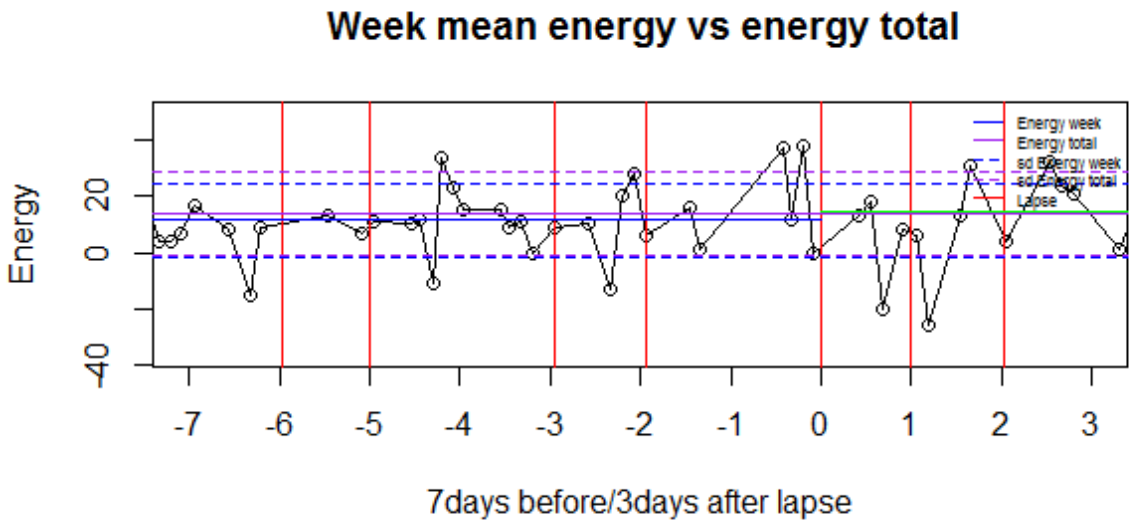

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

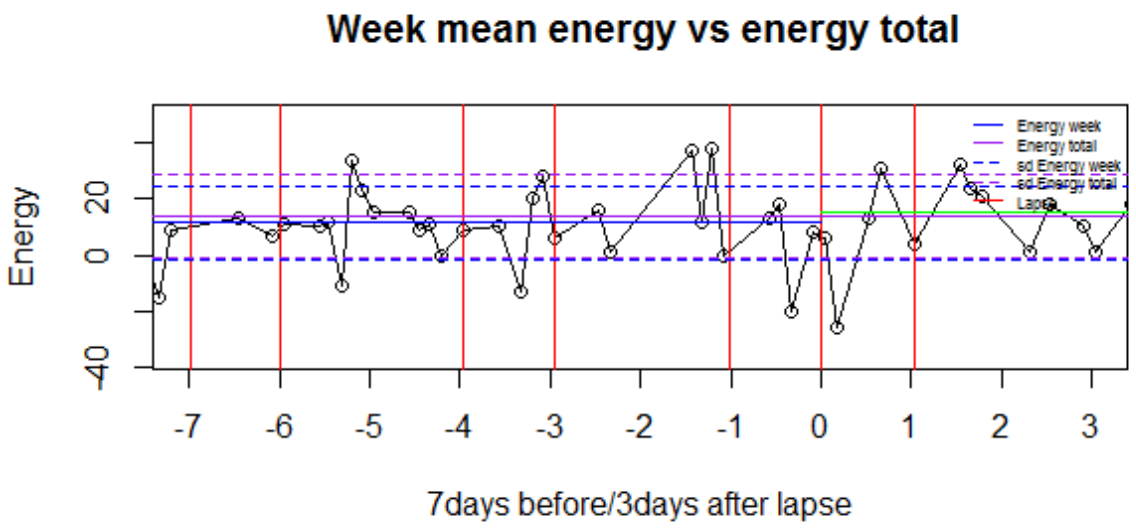

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

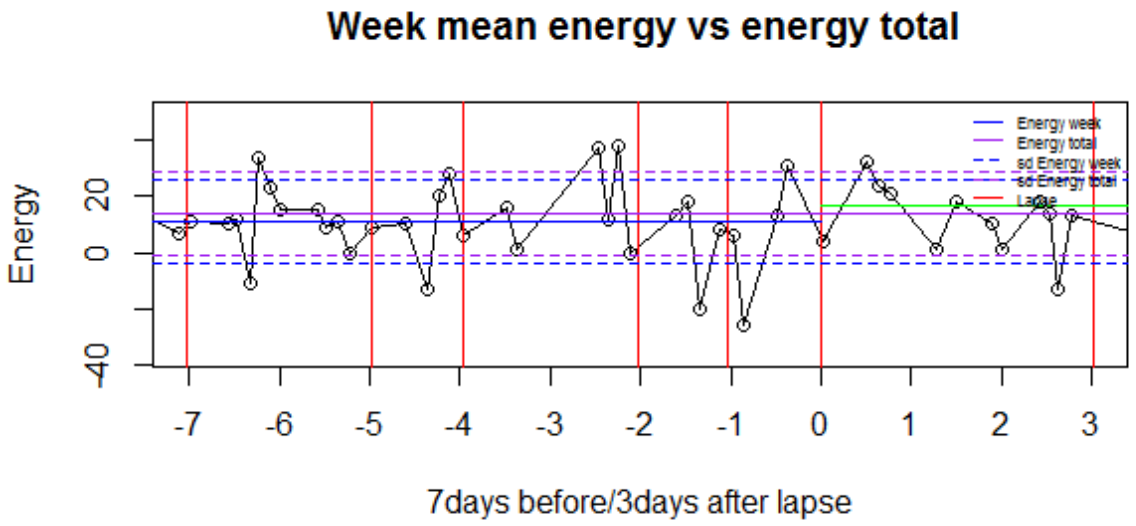

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

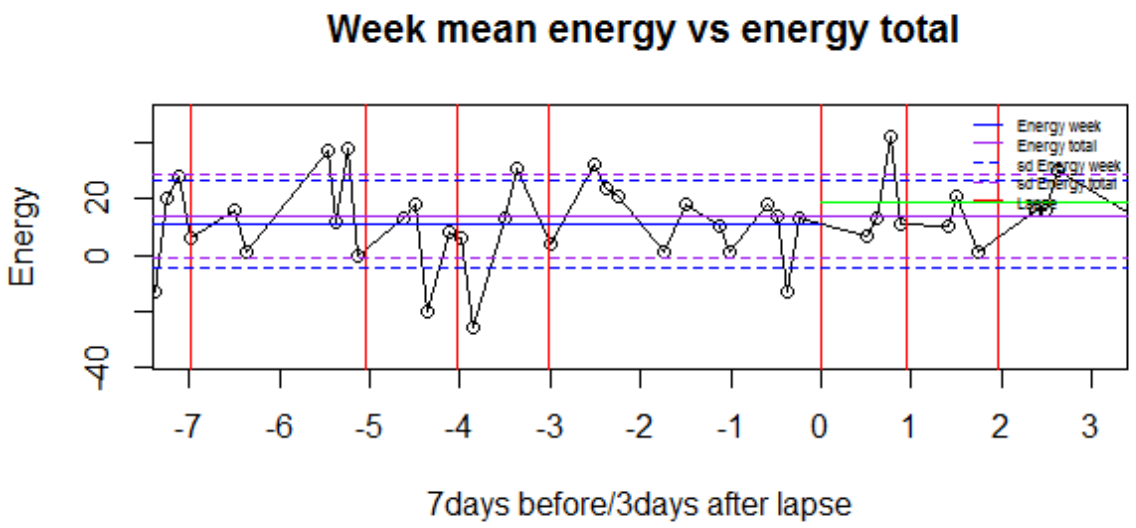

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

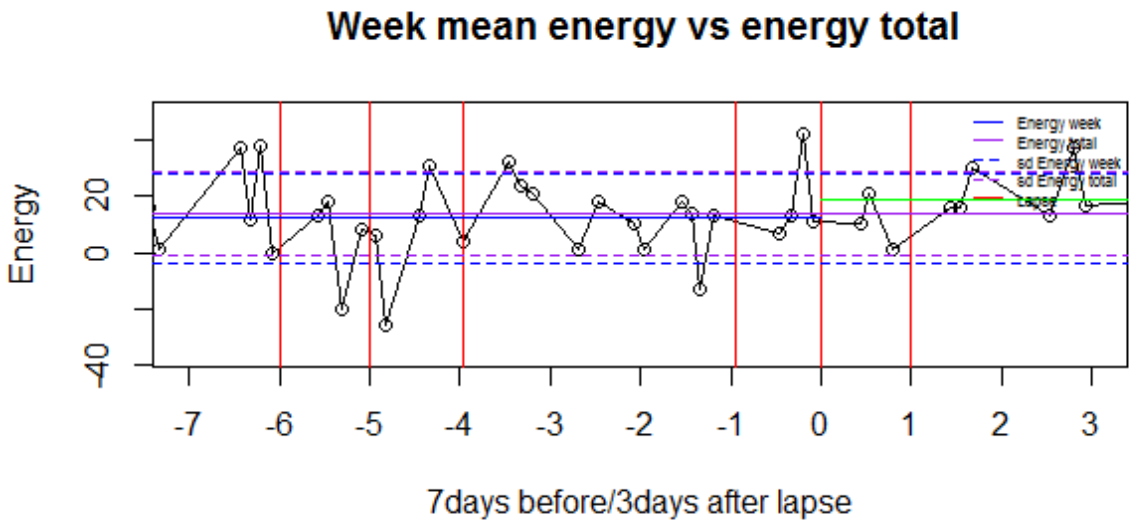

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

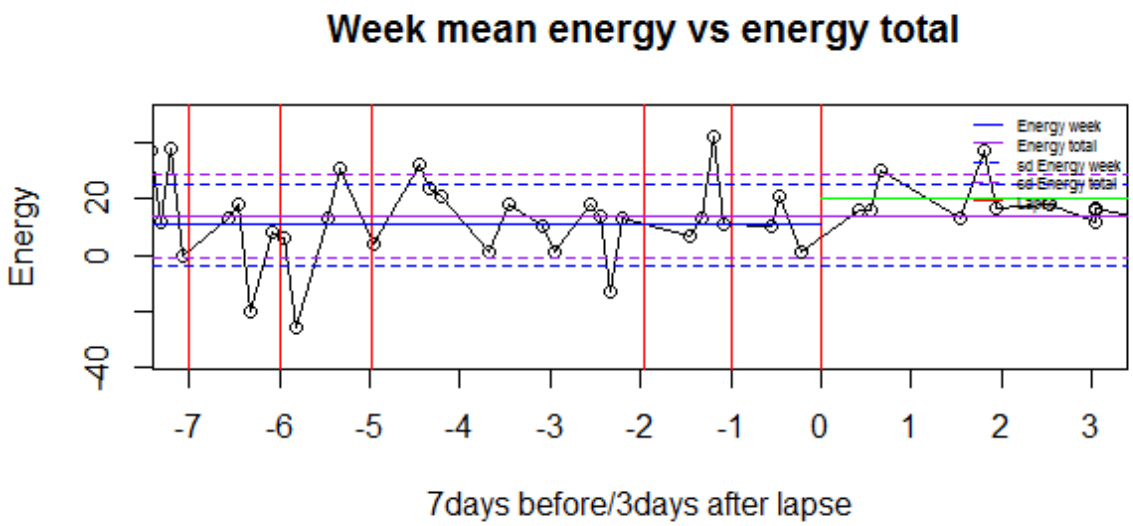

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

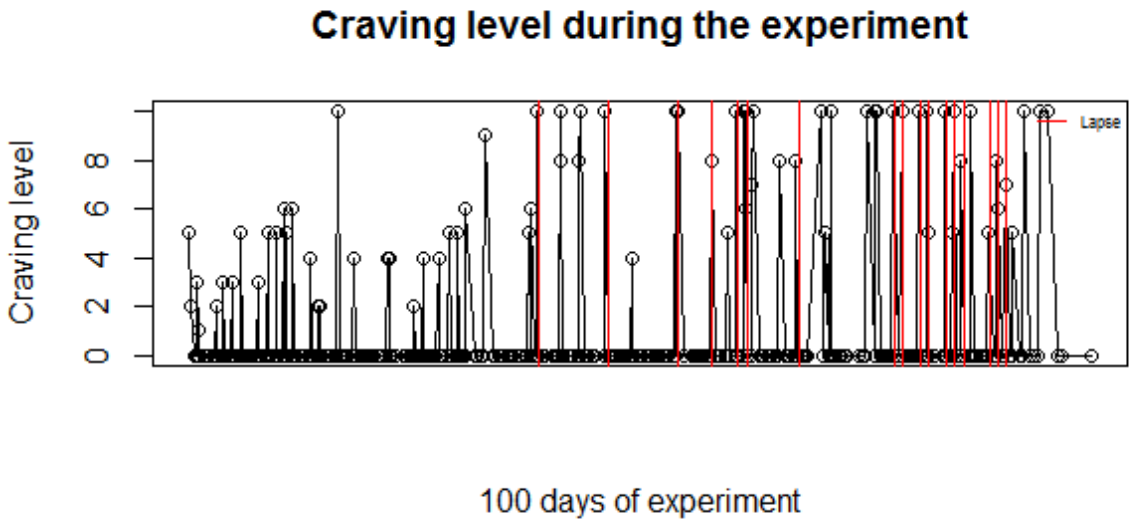

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse



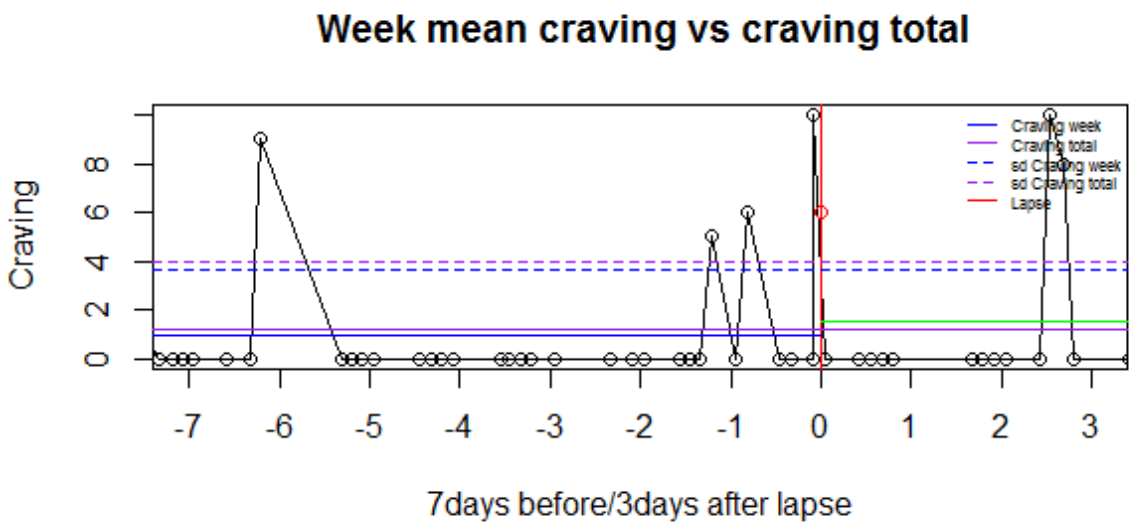
Craving

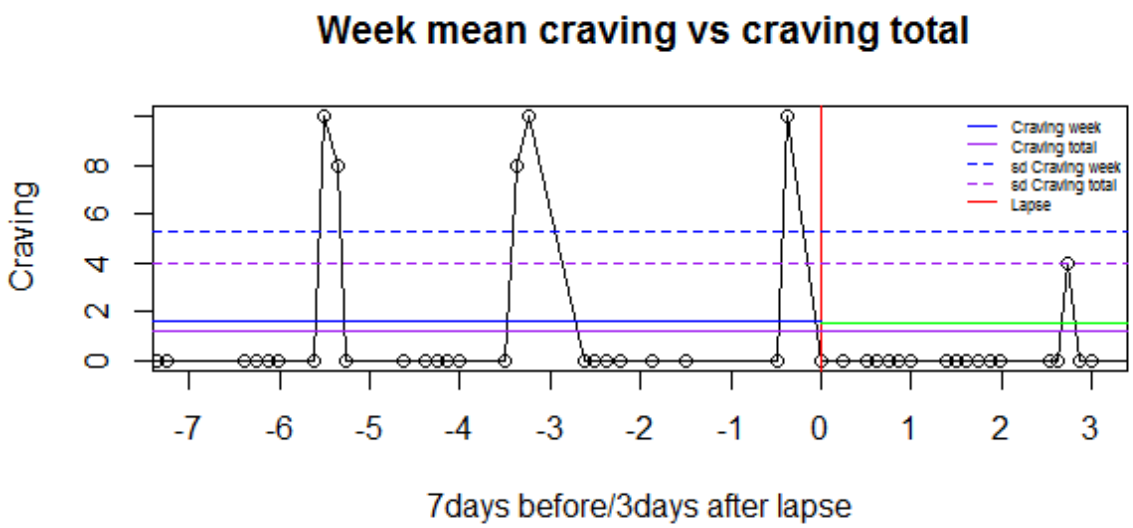
Figure 24 *Total number of all observation of craving during 100 days of the experiment and lapses of ID590*

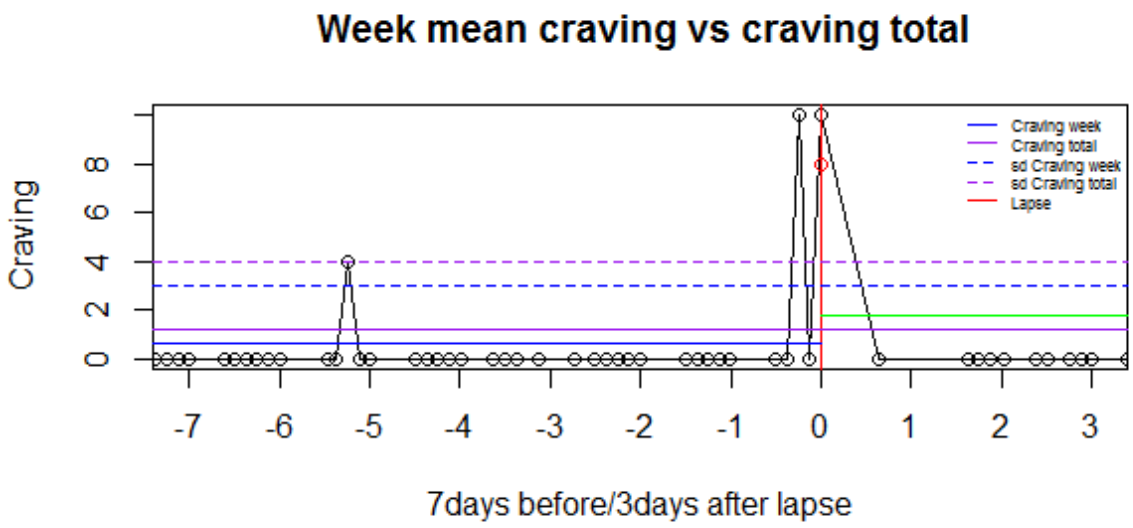


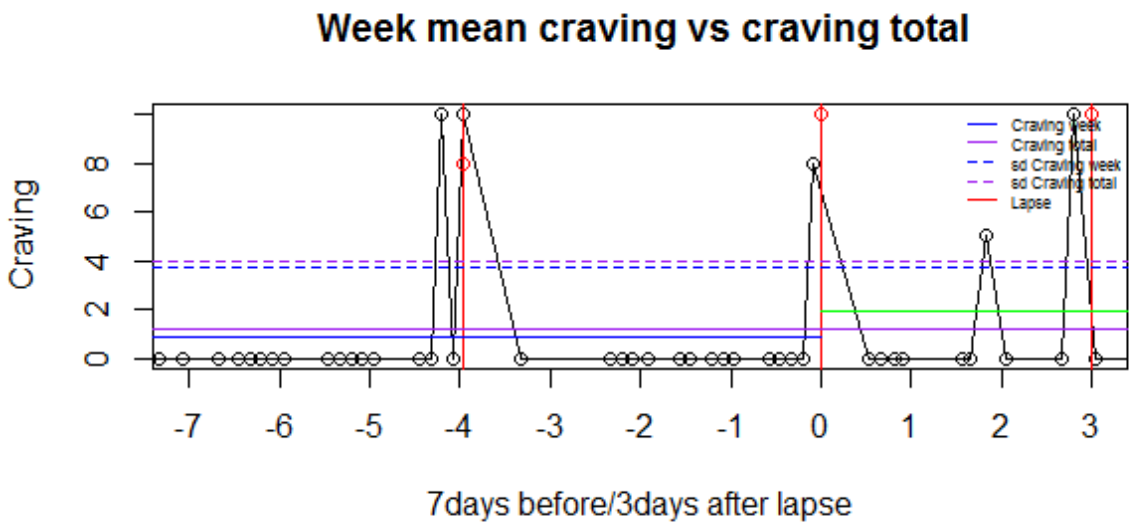
Craving level during the weeks prior to lapses

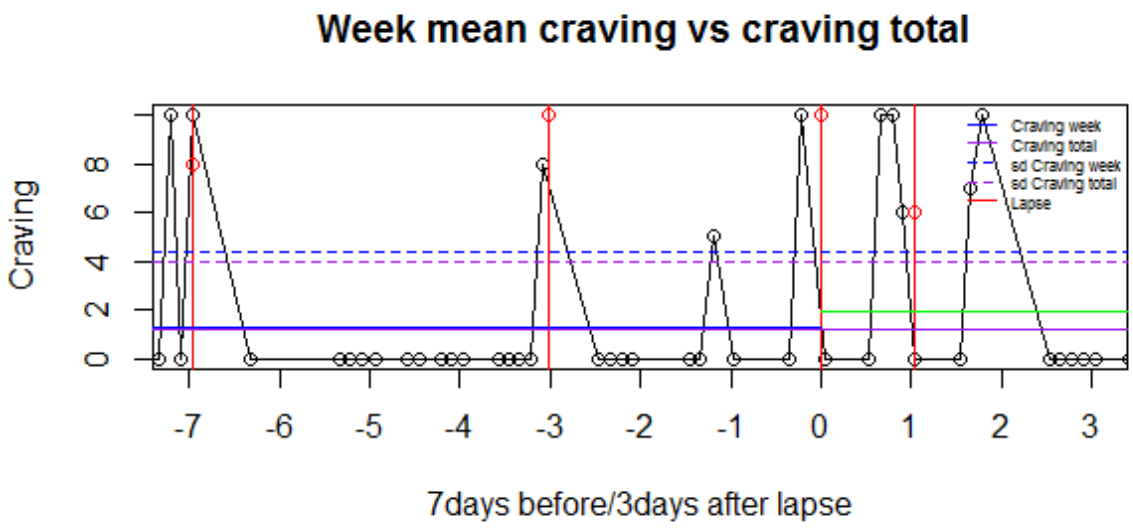
Figure 25 *Craving level before and after lapse (0)*

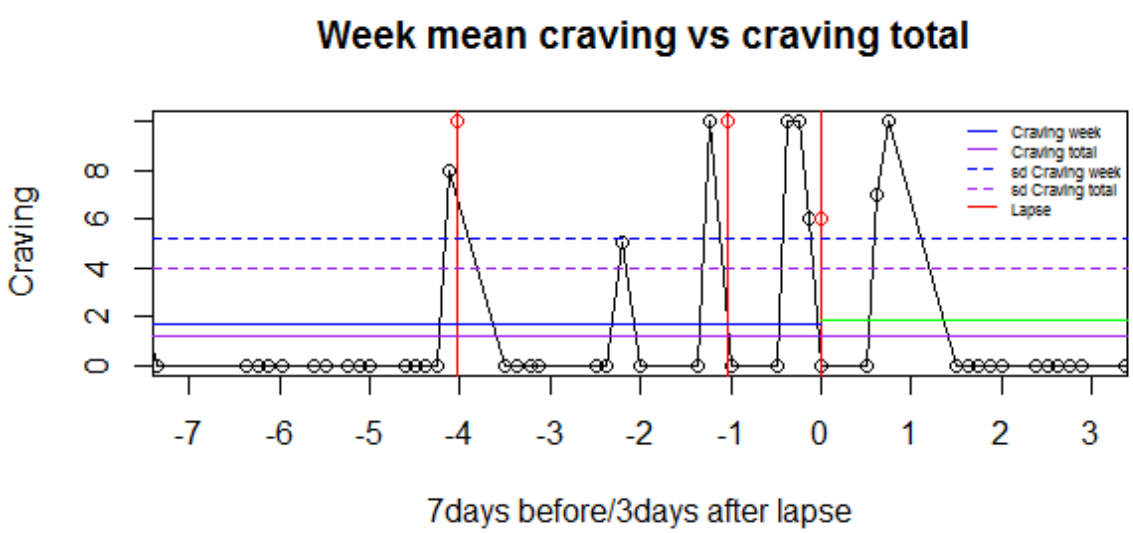

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

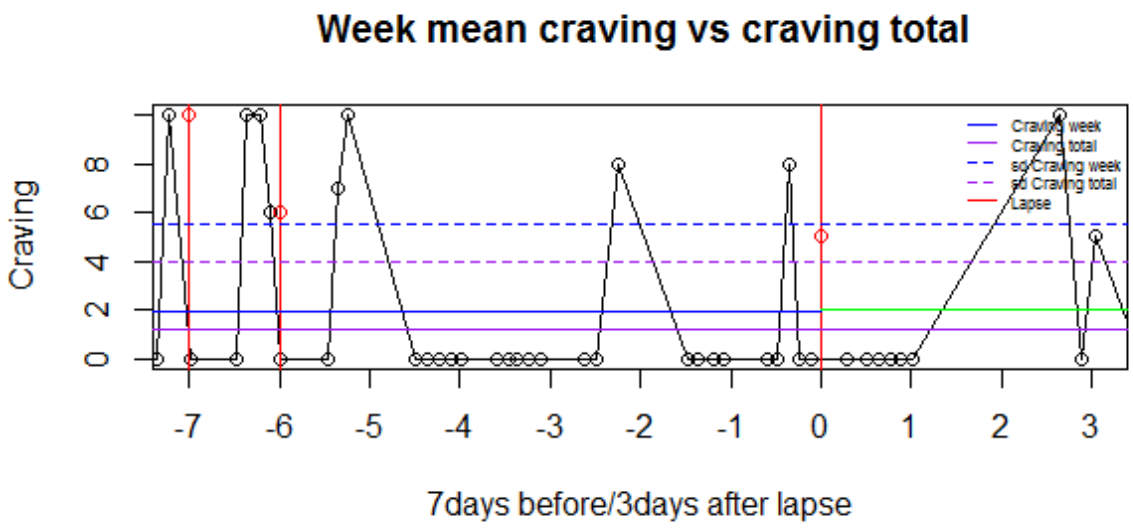

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

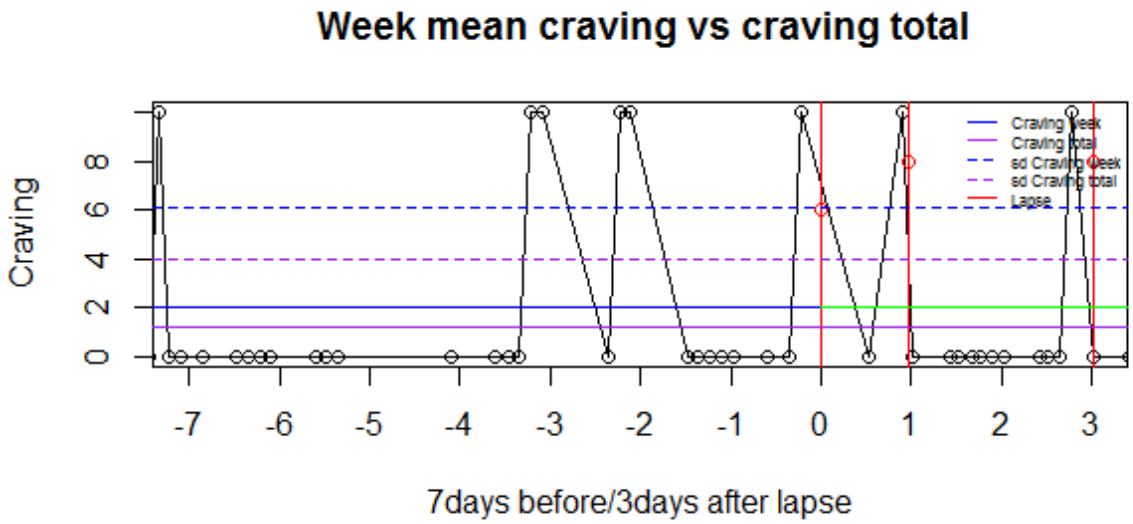

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

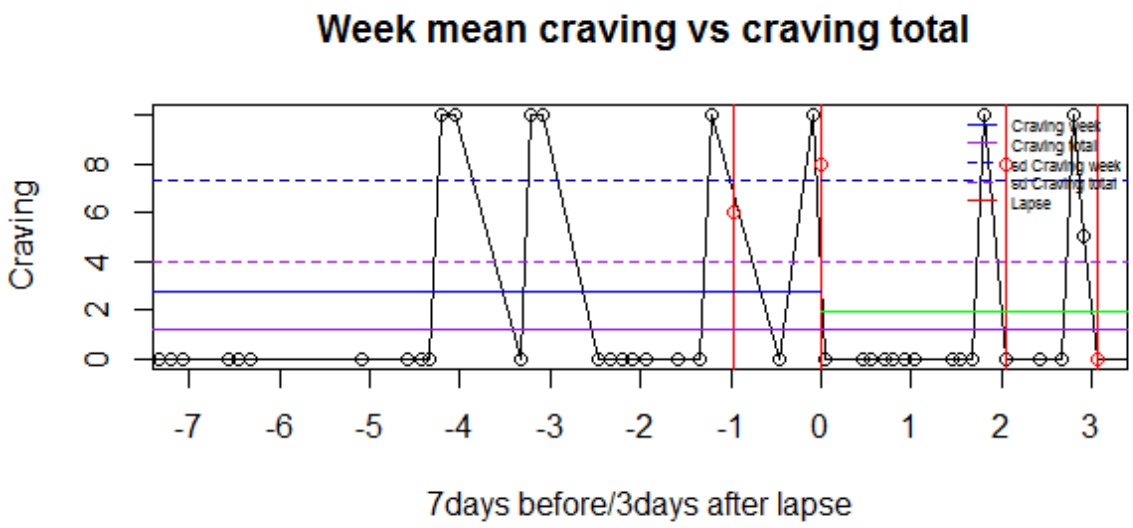

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

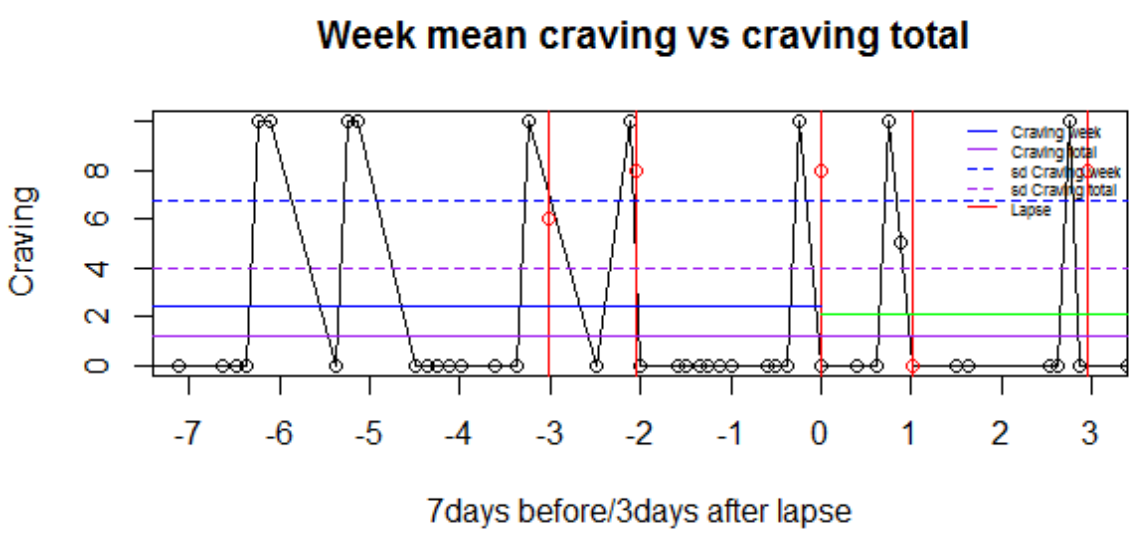

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

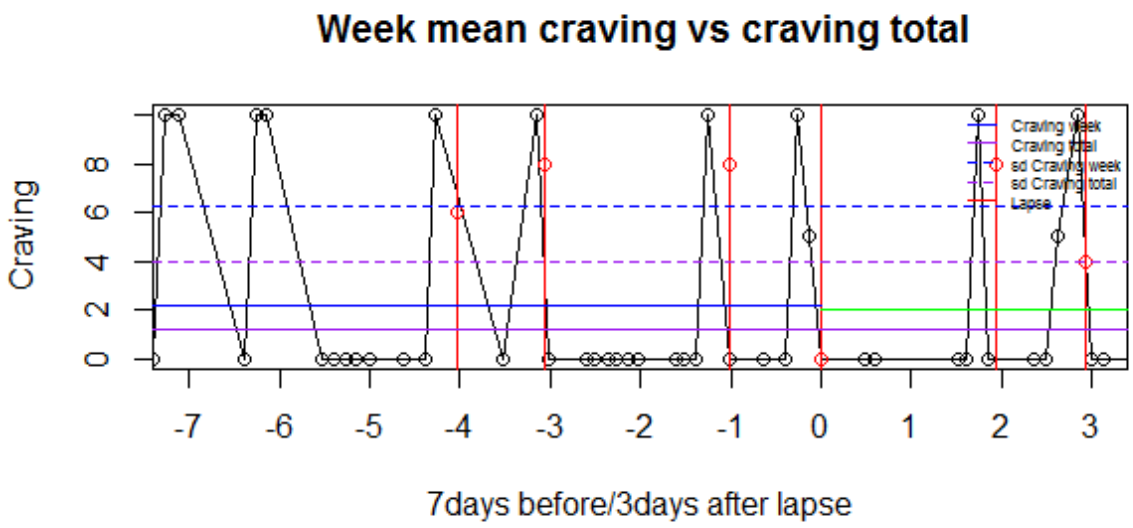

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

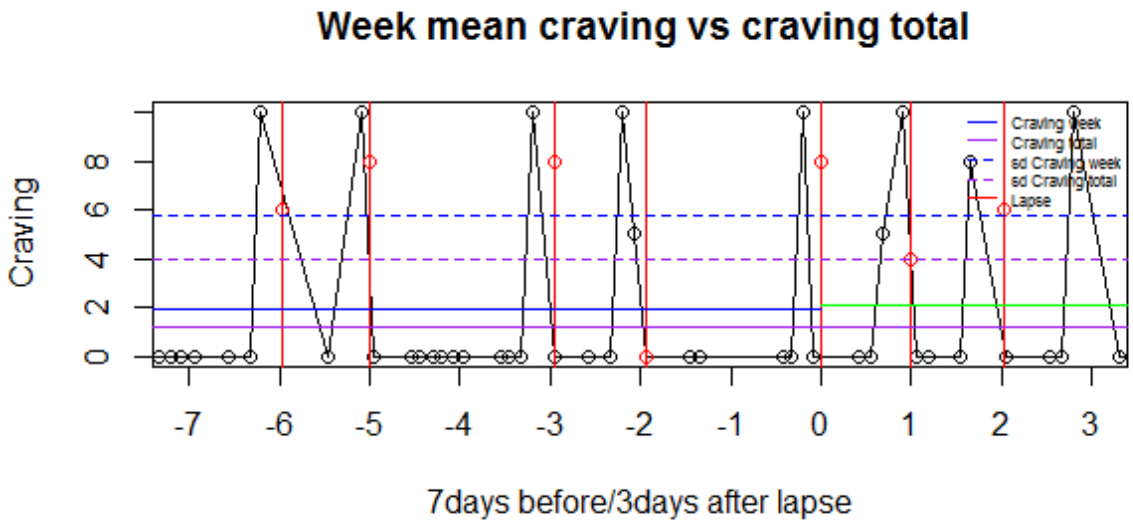

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

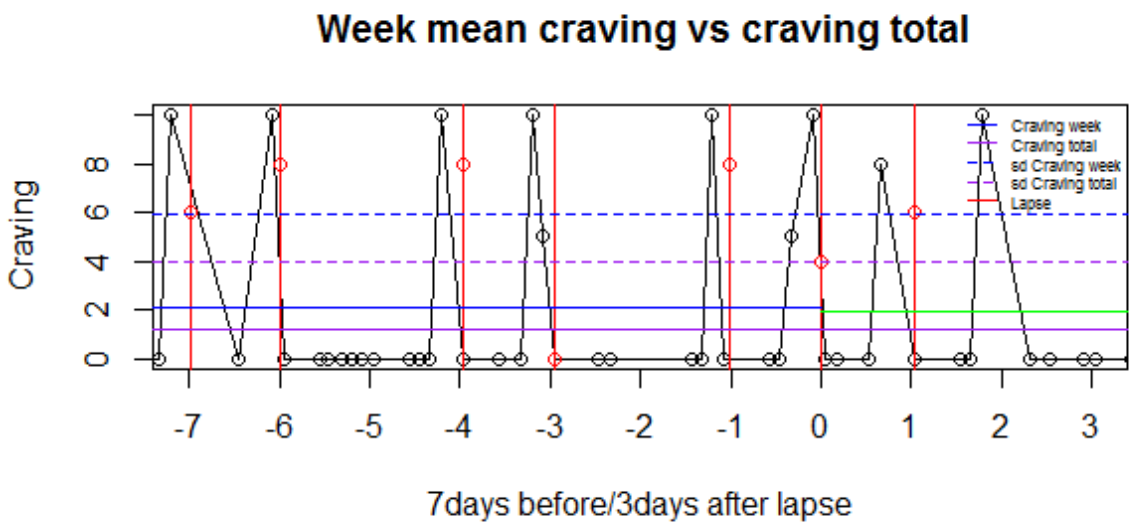

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

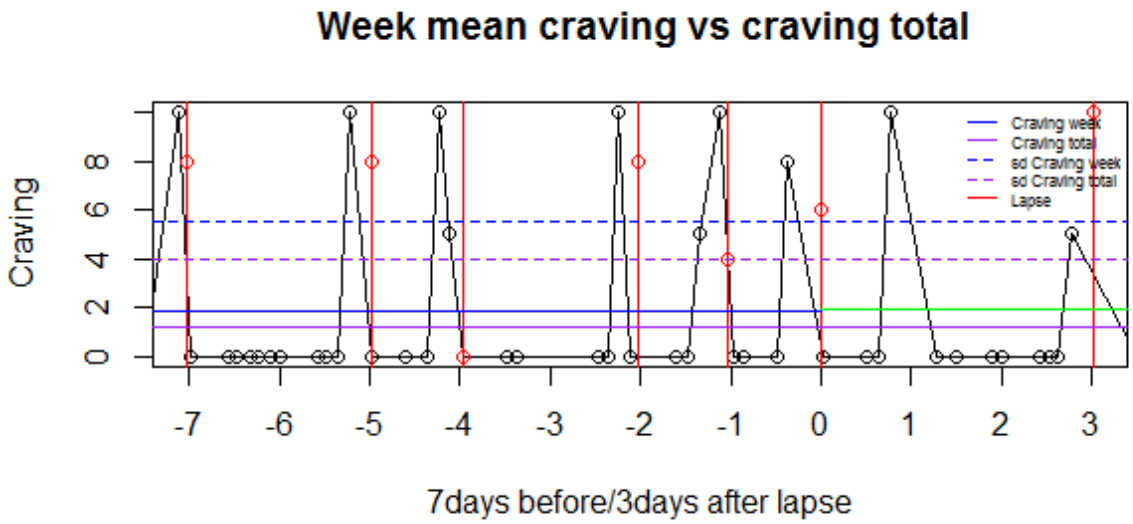

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

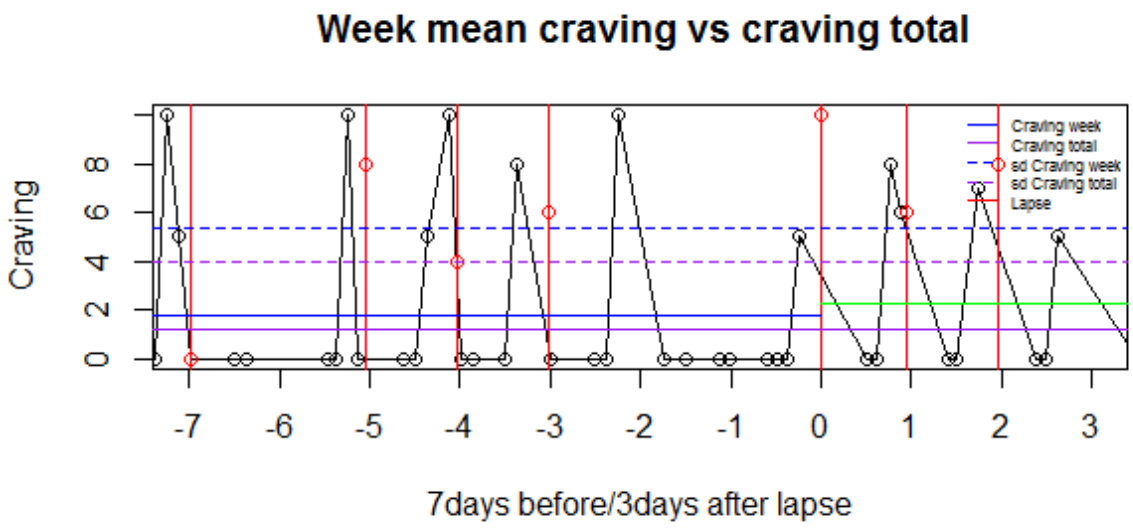

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

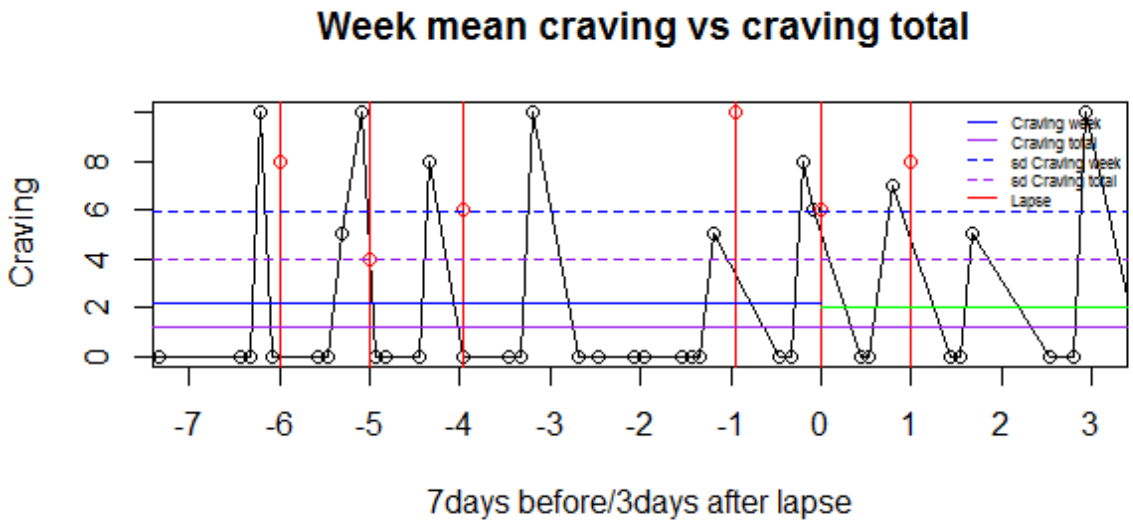

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

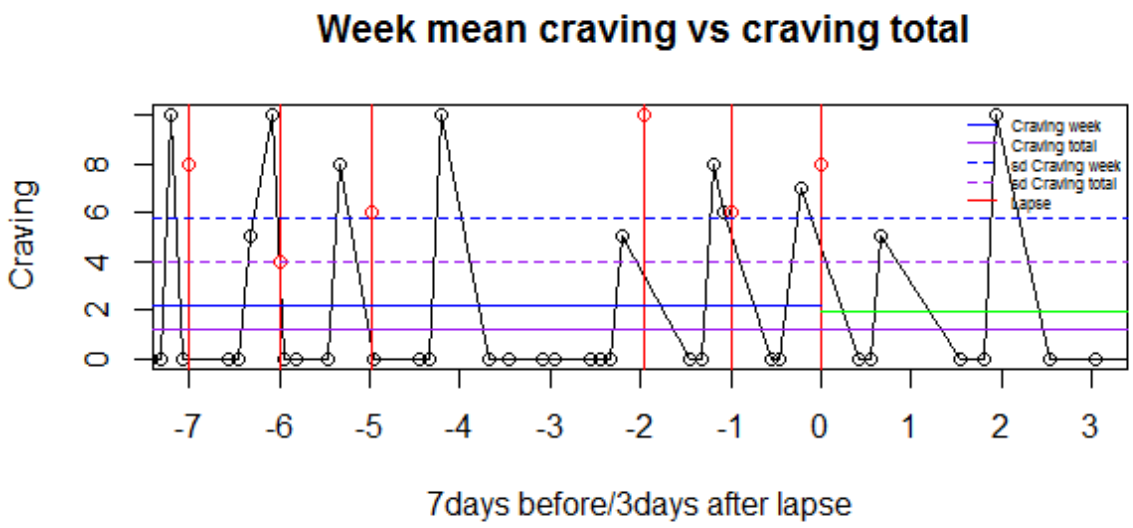

Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse



6.3 ID624

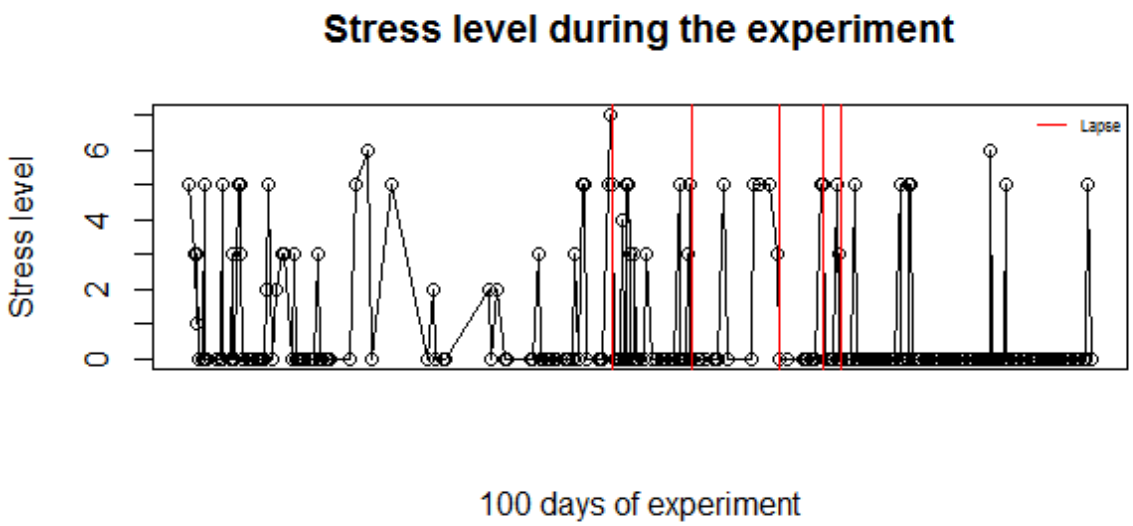
Lapses

Table 11 *Total number of lapses and amount of alcohol ID624*

Lapses	Units
1	13
2	5
3	5
4	5
5	5

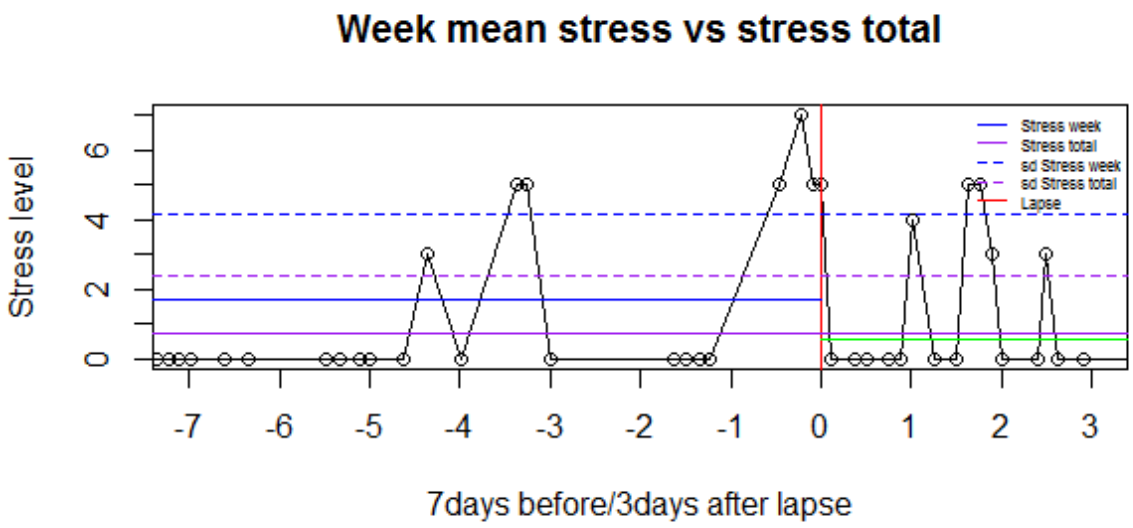
Stress

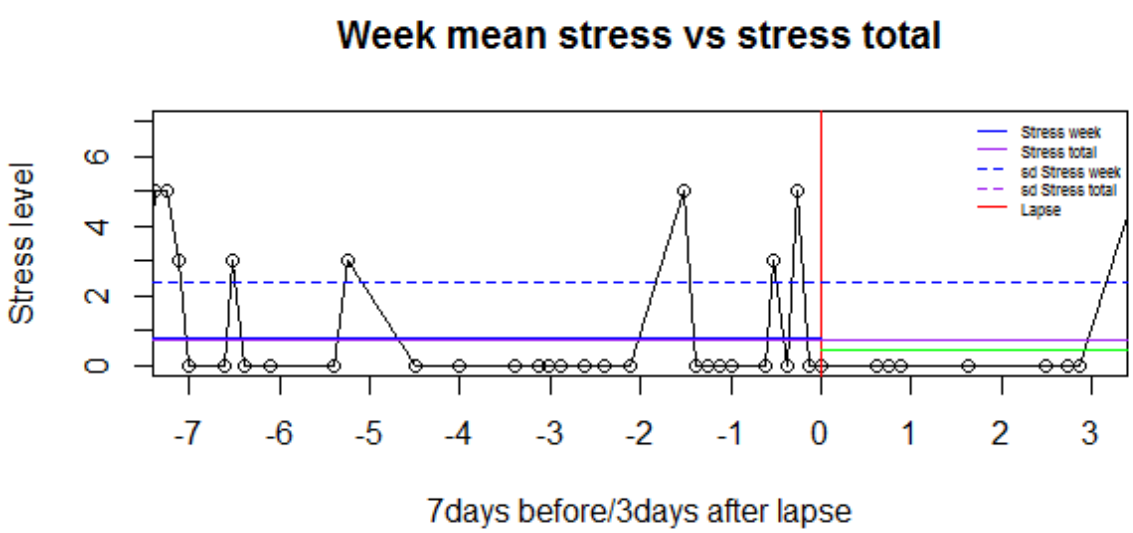
Figure 26 *Total number of all observation of stress during 100 days of the experiment and lapses of ID624*

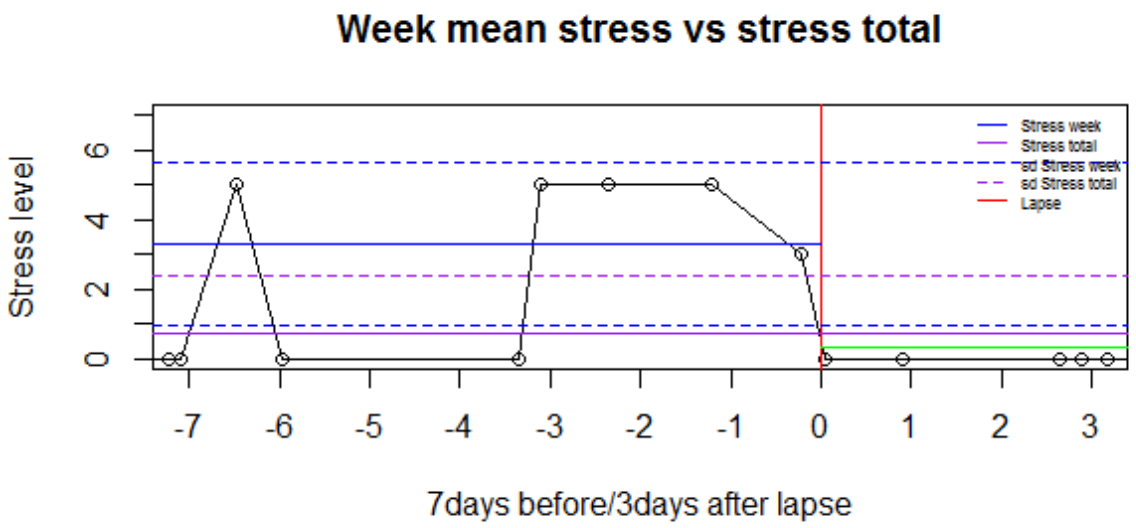


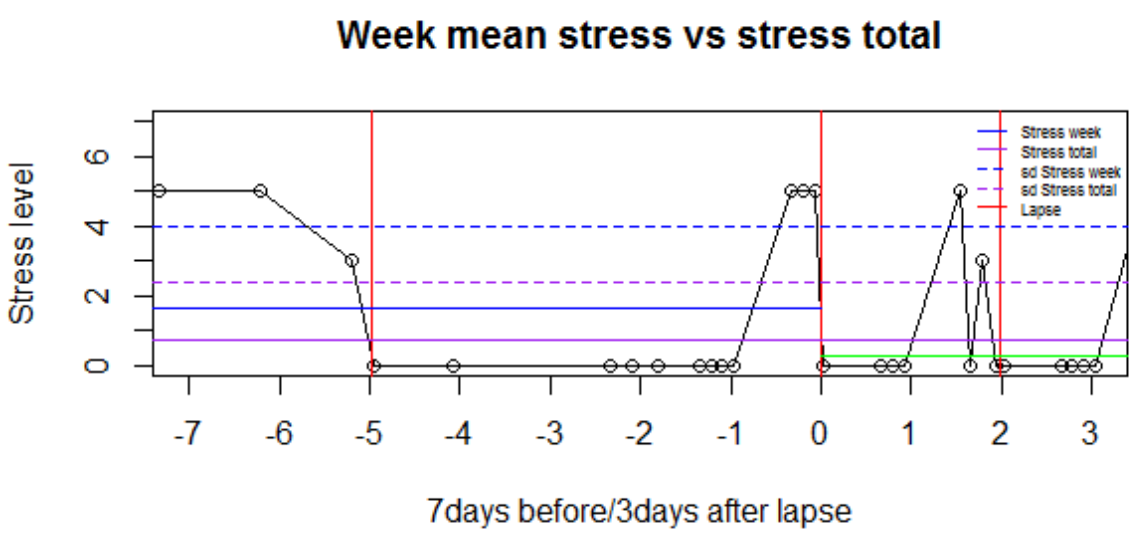
Stress levels during the weeks prior to lapses

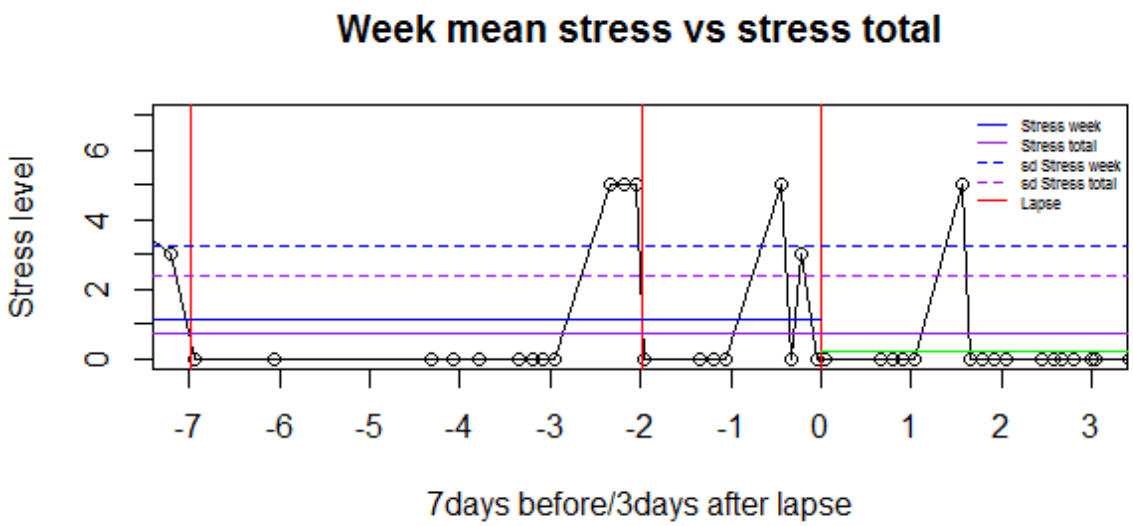
Figure 27 *Stress level before and after lapse (0)*


Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

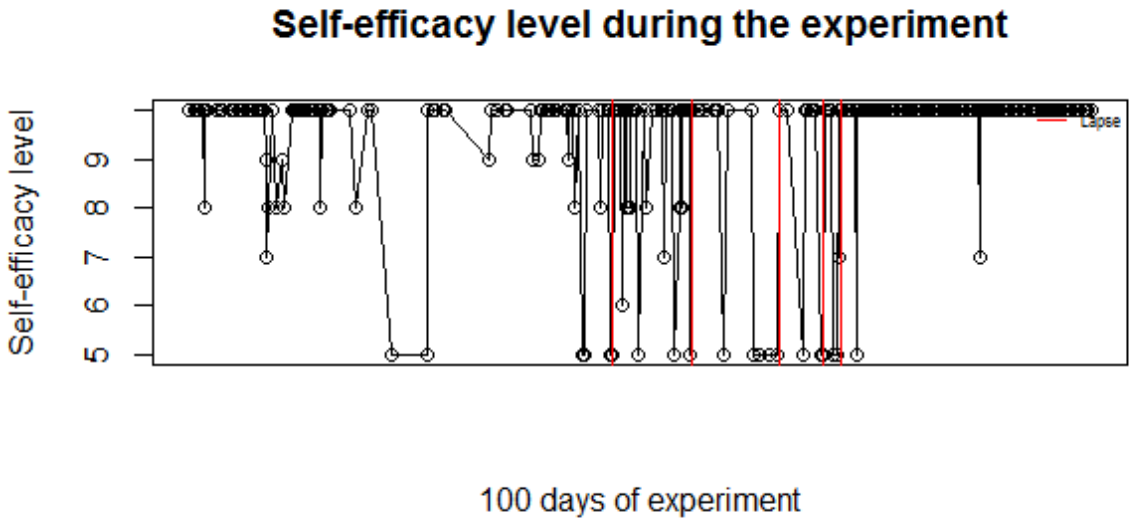

Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse



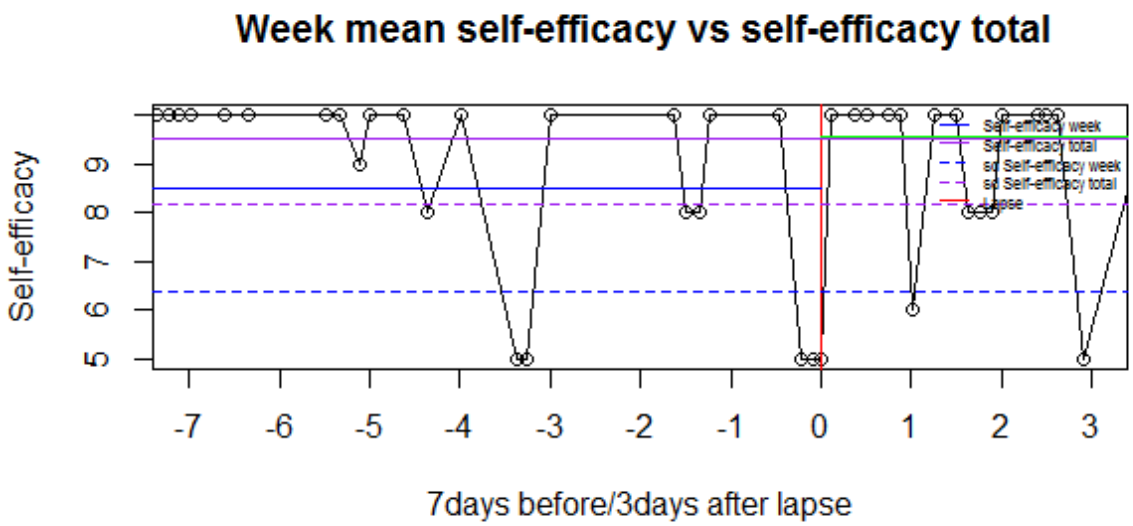
Self-efficacy

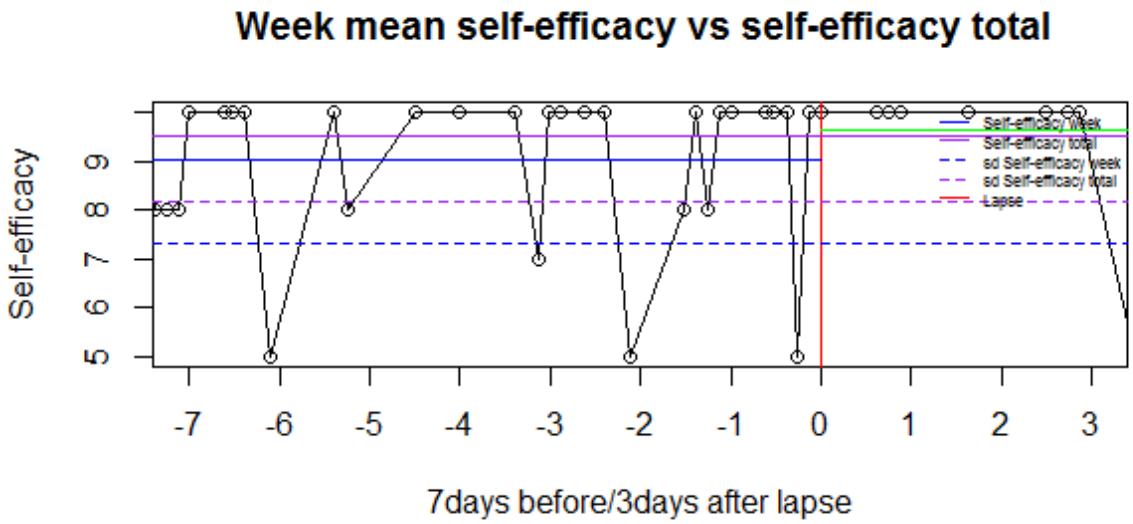
Figure 28 *Total number of all observation of self-efficacy during 100 days of the experiment and lapses of ID624*

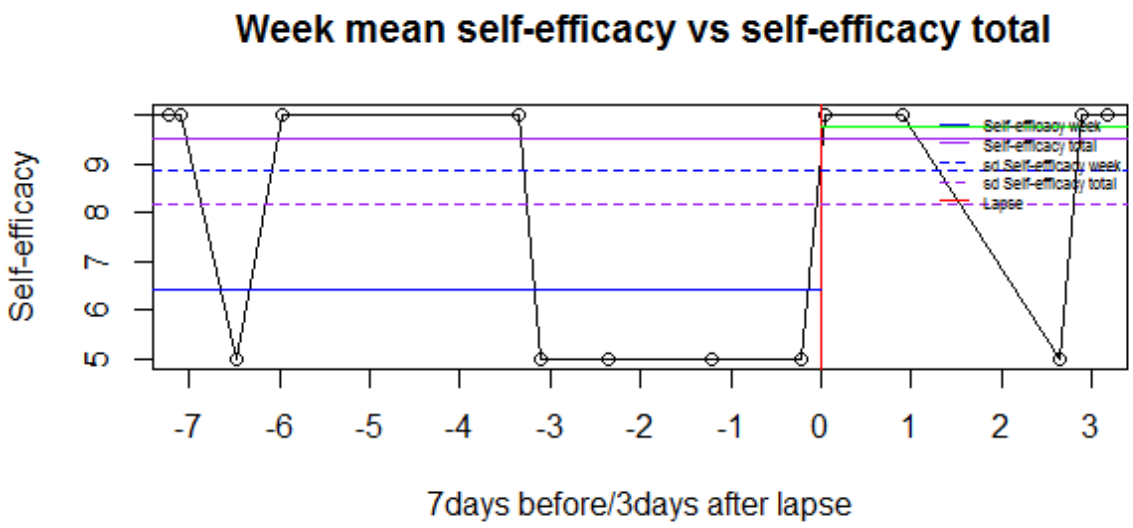


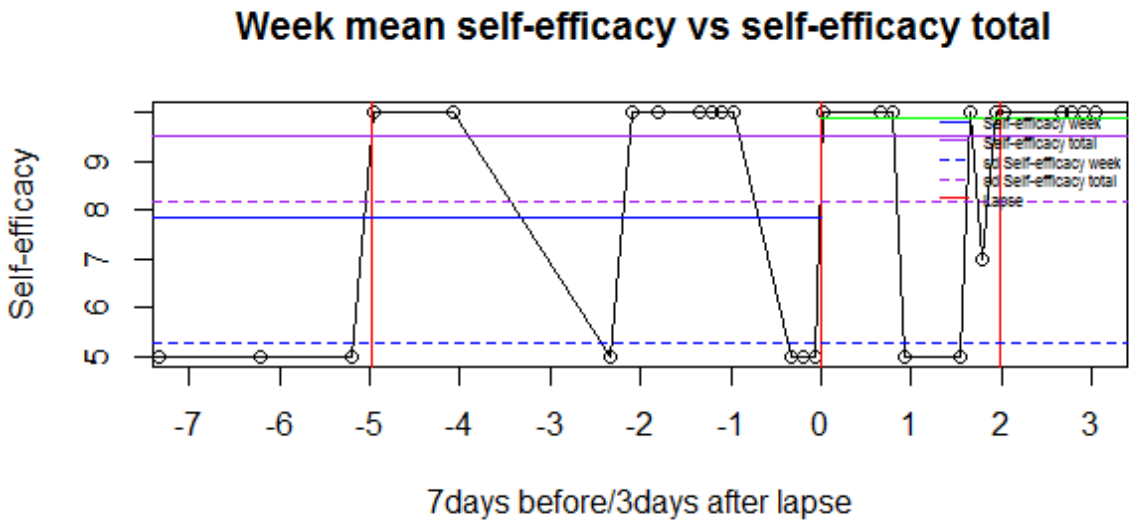
Self-efficacy levels during the weeks prior to lapses

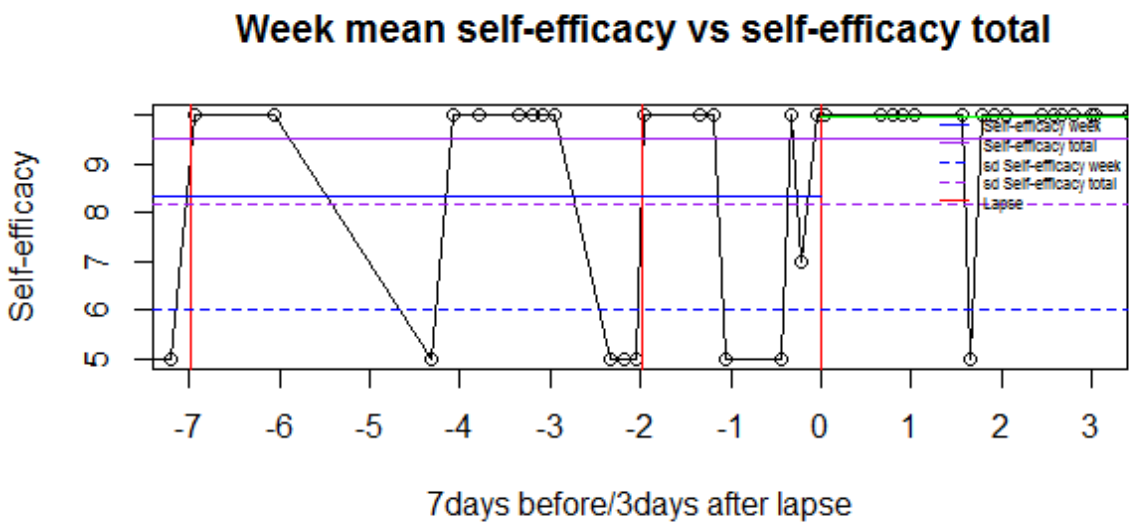
Figure 29 S*elf-efficacy level before and after lapse (0)*


Week mean self-efficacy vs self-efficacy total
Self-efficacy
5
6
7
8
9
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
5
6
7
8
9
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

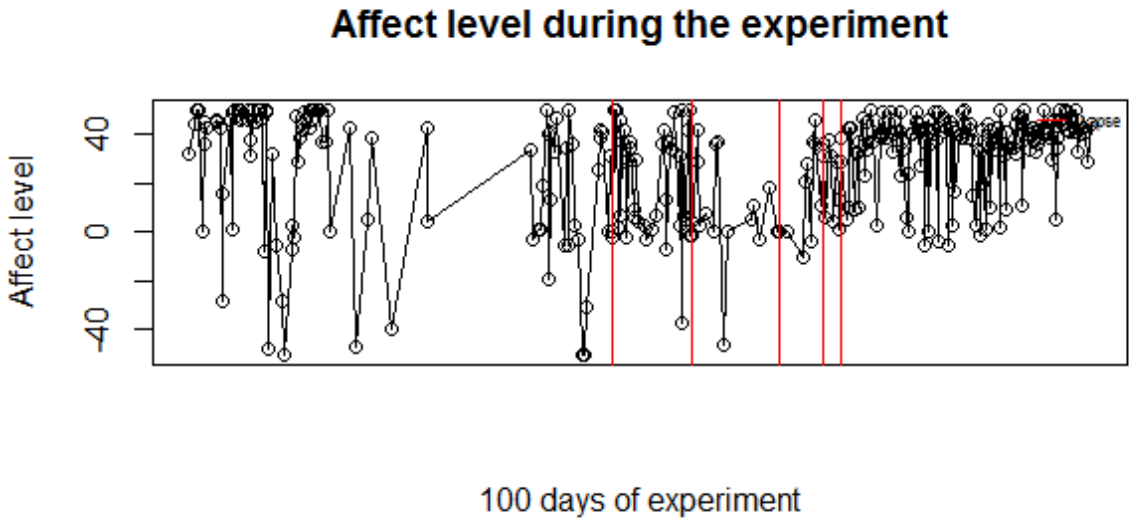

Week mean self-efficacy vs self-efficacy total
Self-efficacy
5
6
7
8
9
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd.Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
5
6
7
8
9
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd.Self-efficacy week
sd Self-efficacy total
Lapse



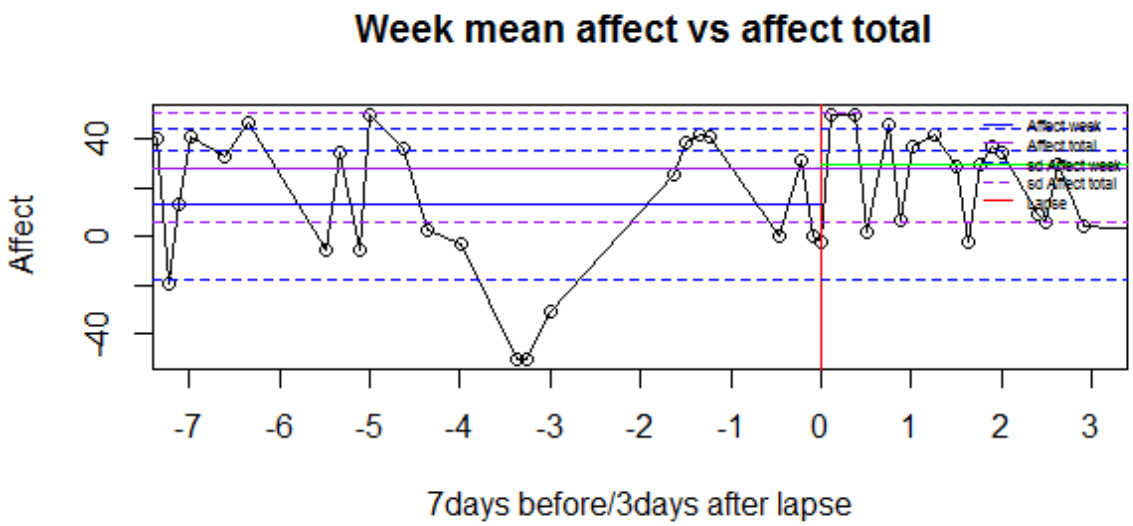
Affect

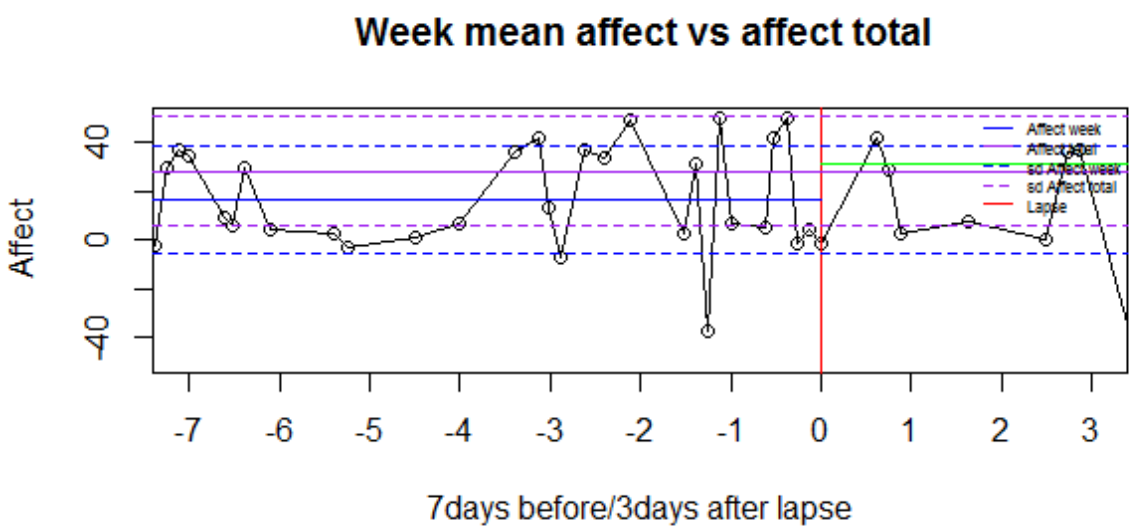
Figure 30 *Total number of all observation of affect during 100 days of the experiment and lapses of ID624*

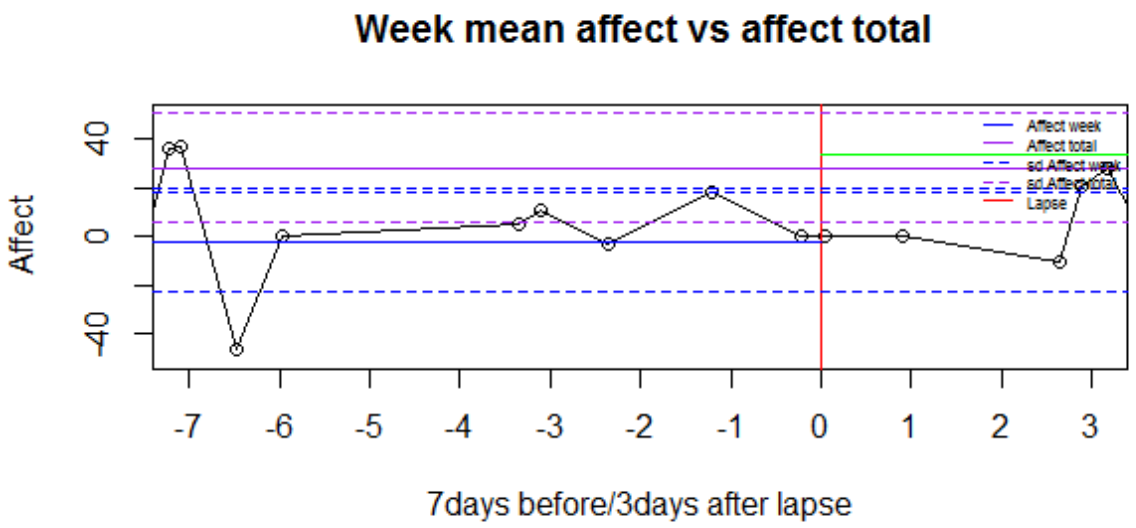


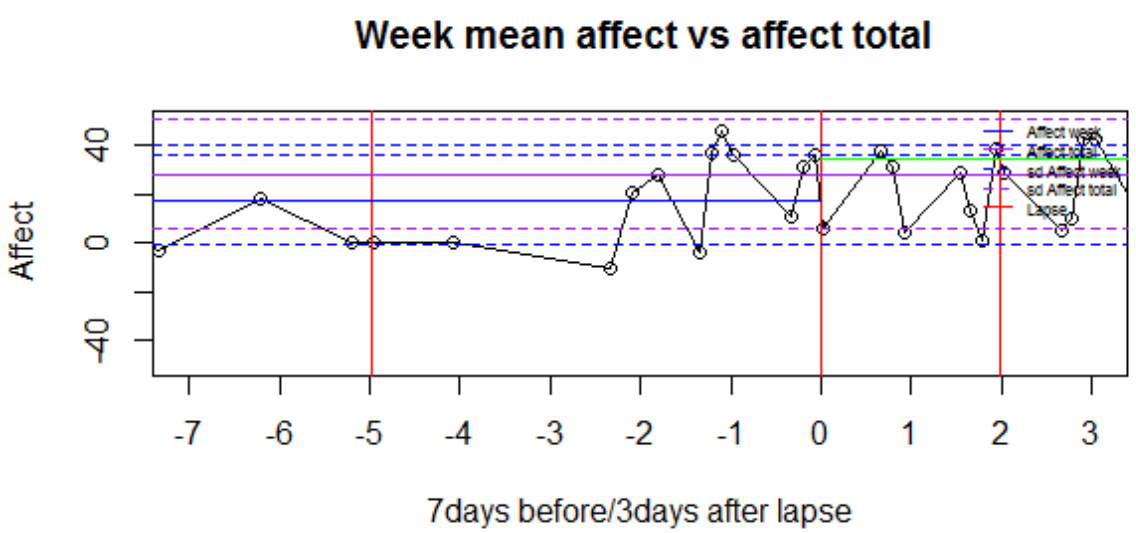
Affect levels during the weeks prior to lapses

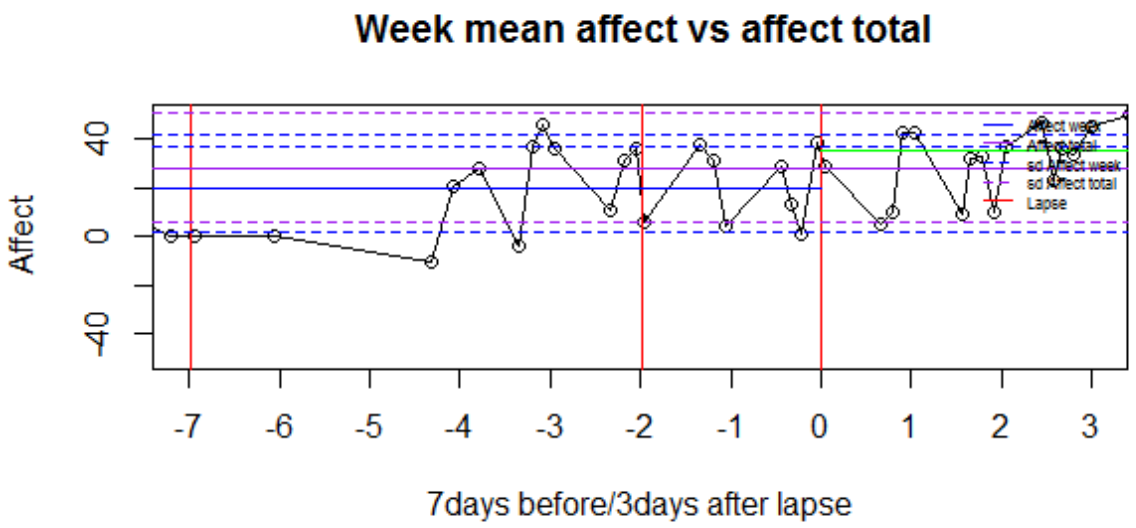
Figure 31 *Affect level before and after lapse (0)*


Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect.week
Affect.total
sd Affect.week
sd Affect total
Lapse


Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
sd Affect total
Lapse

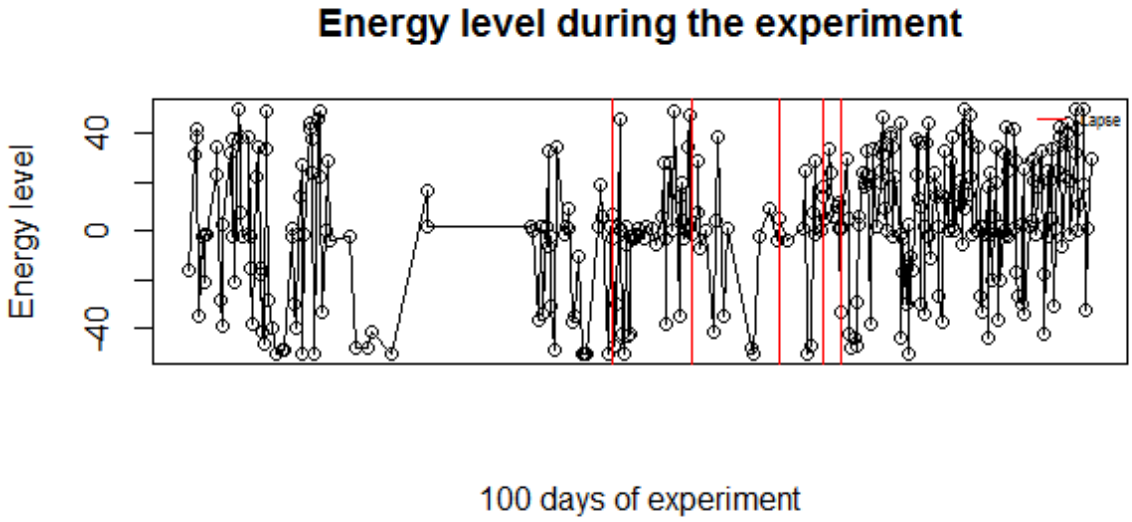

Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse


Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse



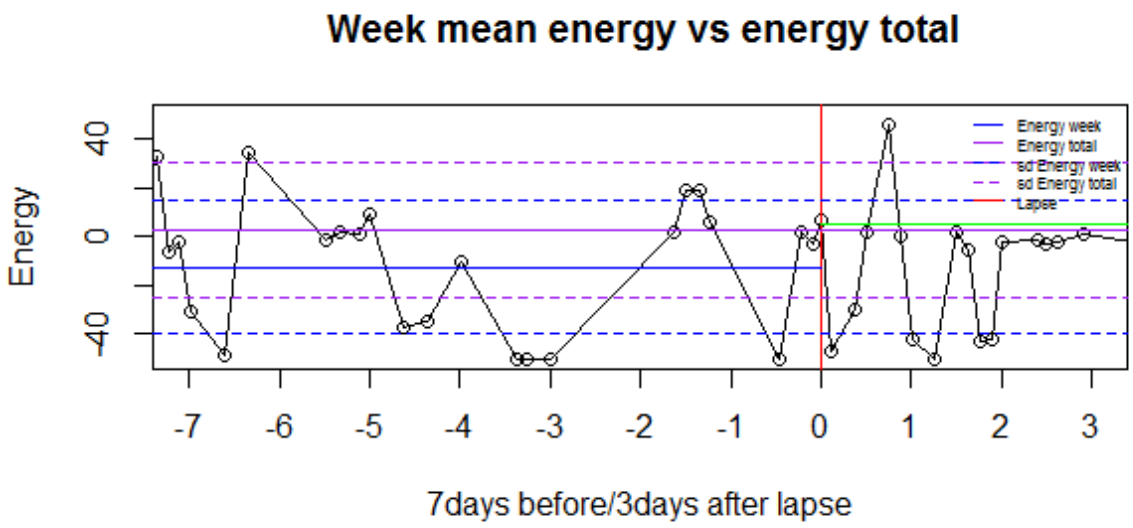
Energy

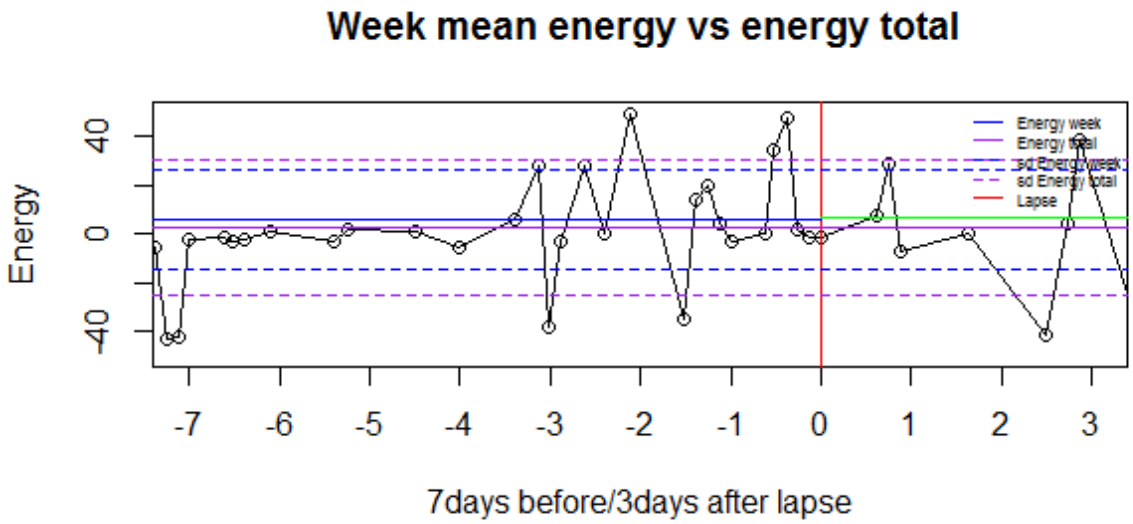
Figure 32 *Total number of all observation of energy during 100 days of the experiment and lapses of ID624*

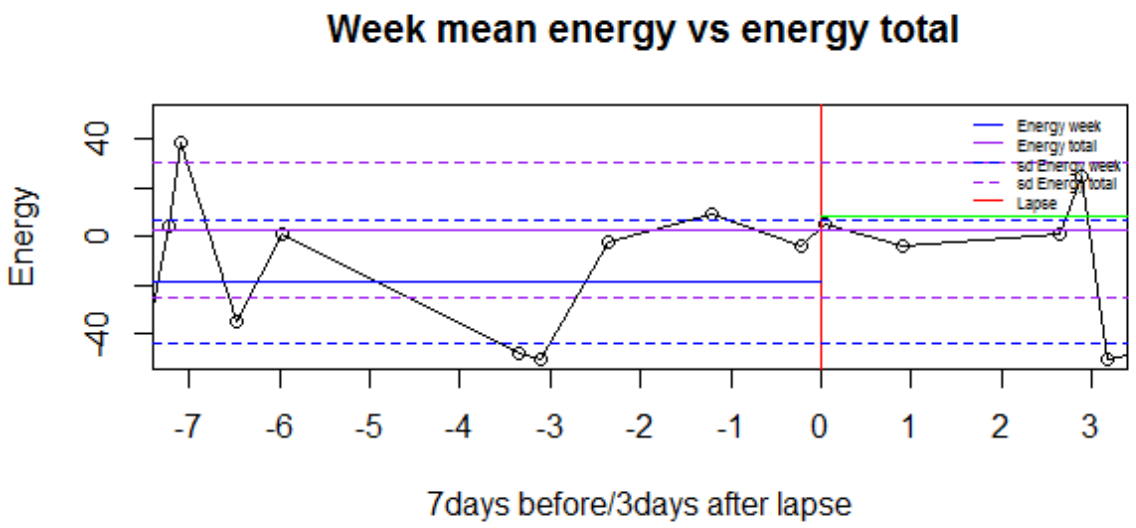


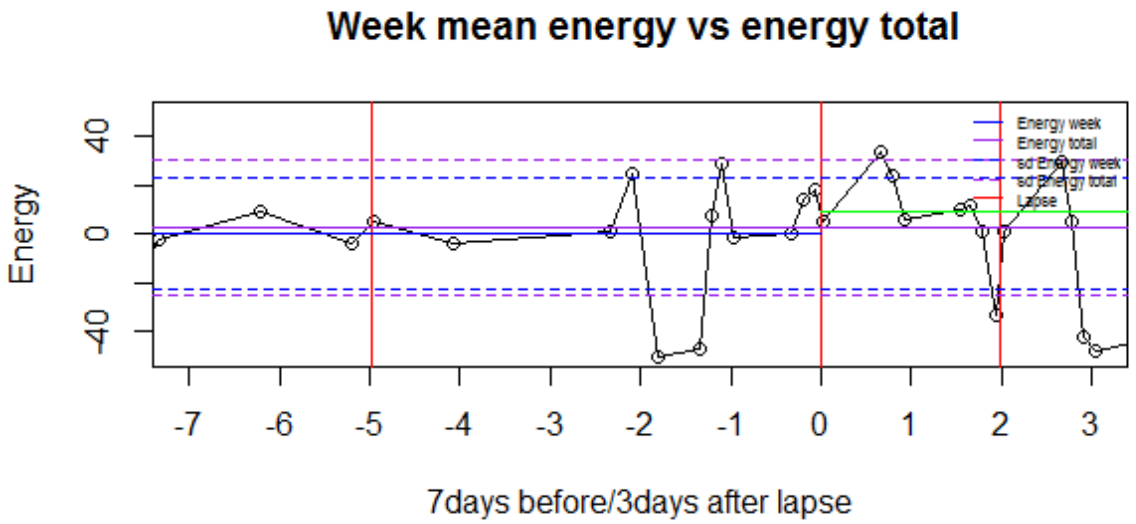
Energy levels during the weeks prior to lapses

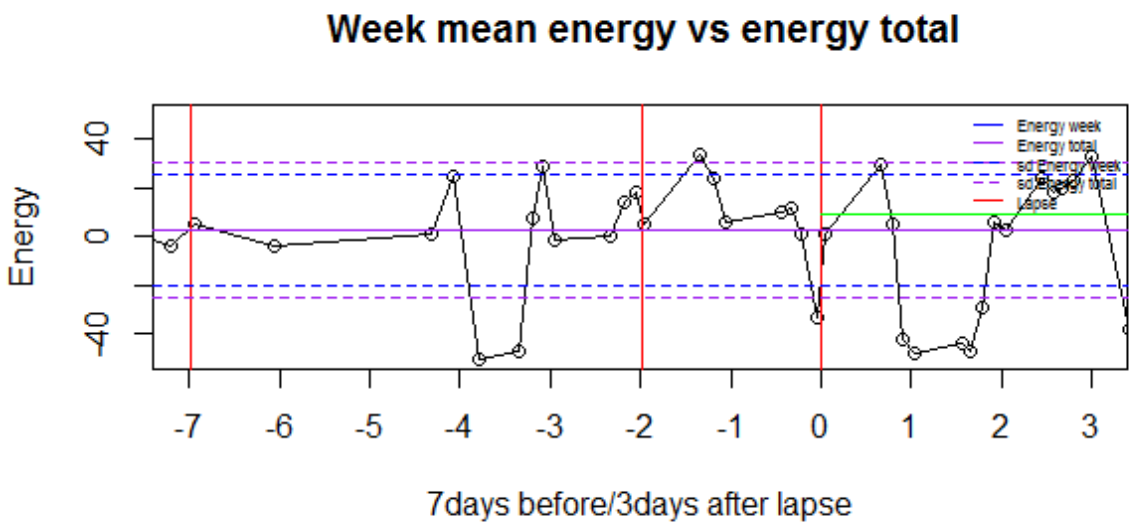
Figure 33 *Energy level before and after lapse (0)*


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

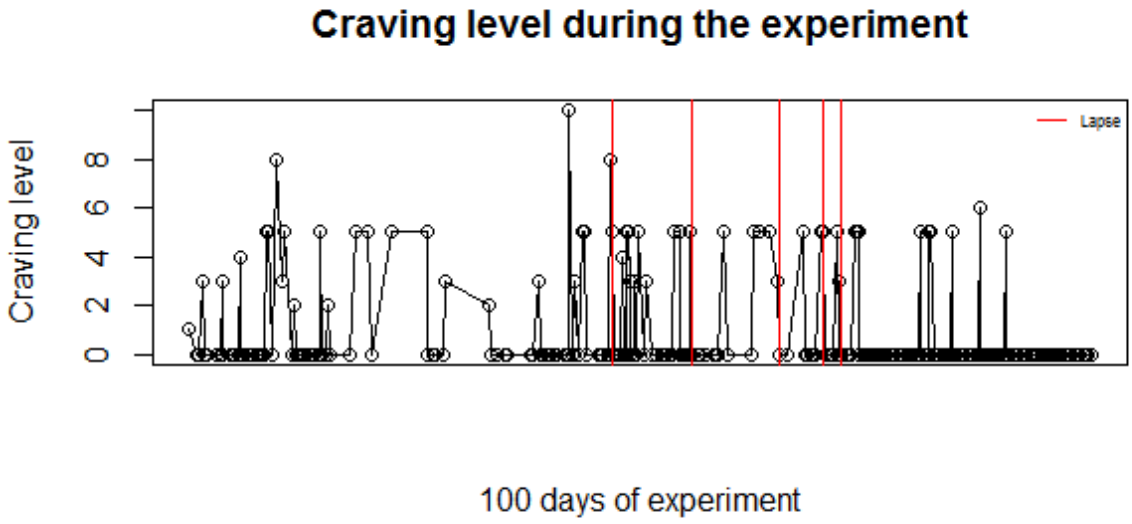

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse



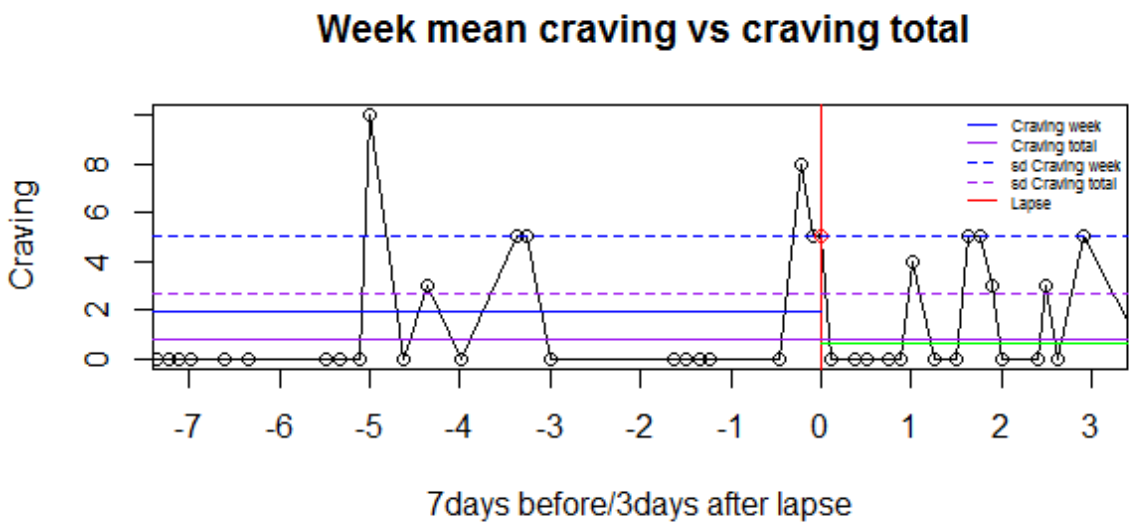
Craving

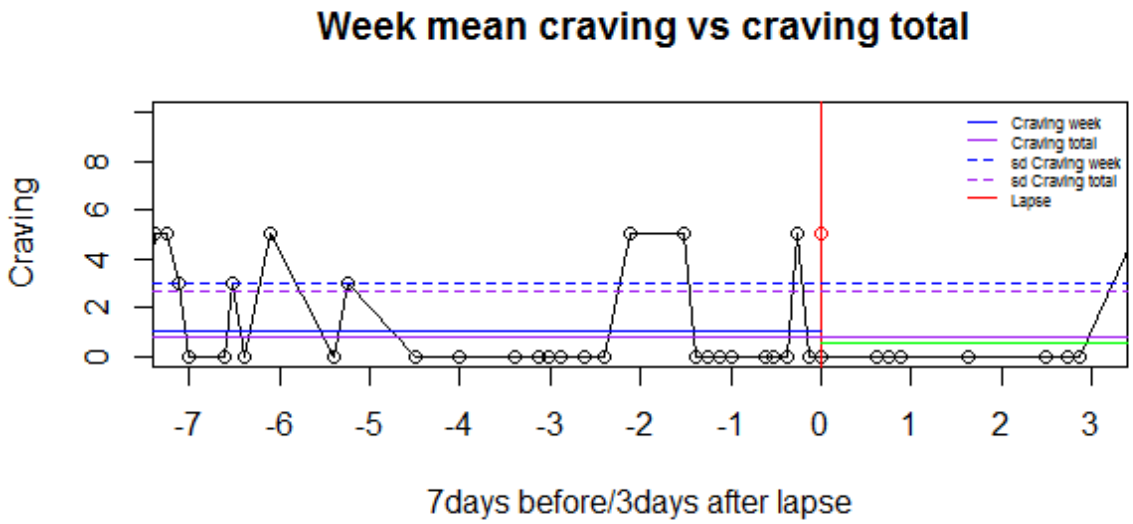
Figure 34 *Total number of all observation of craving during 100 days of the experiment and lapses of ID624*

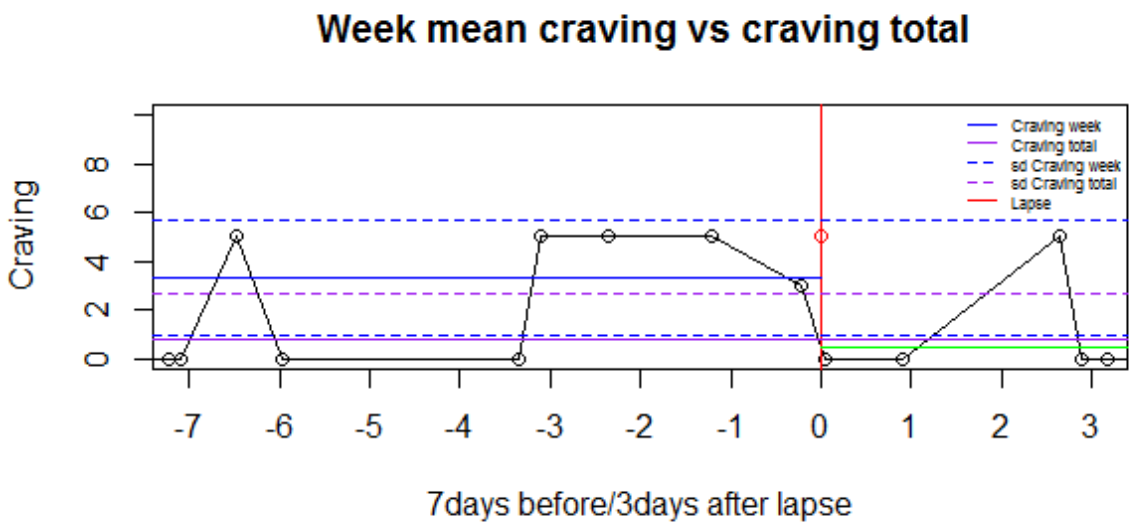


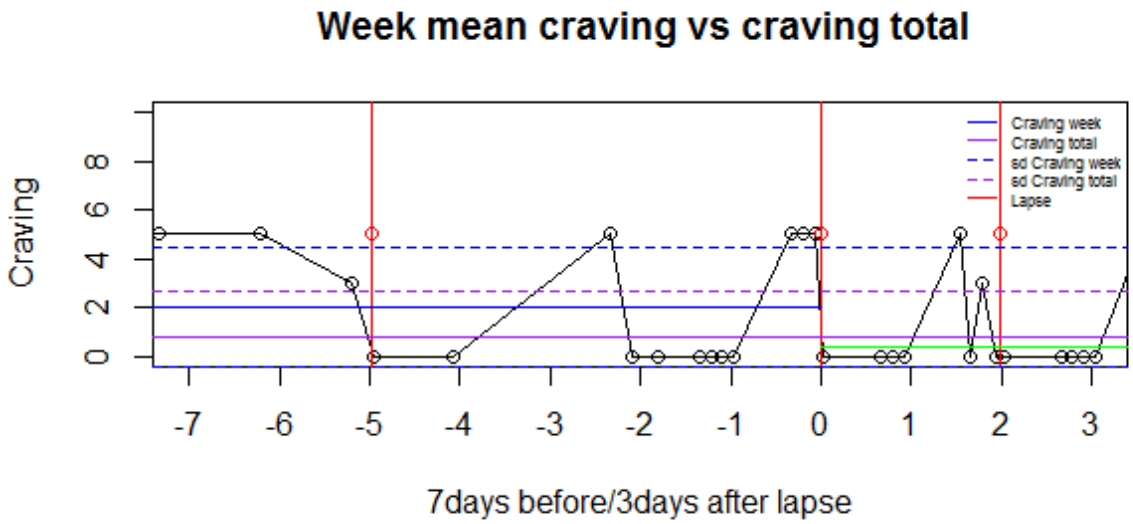
Craving levels during the weeks prior to lapses

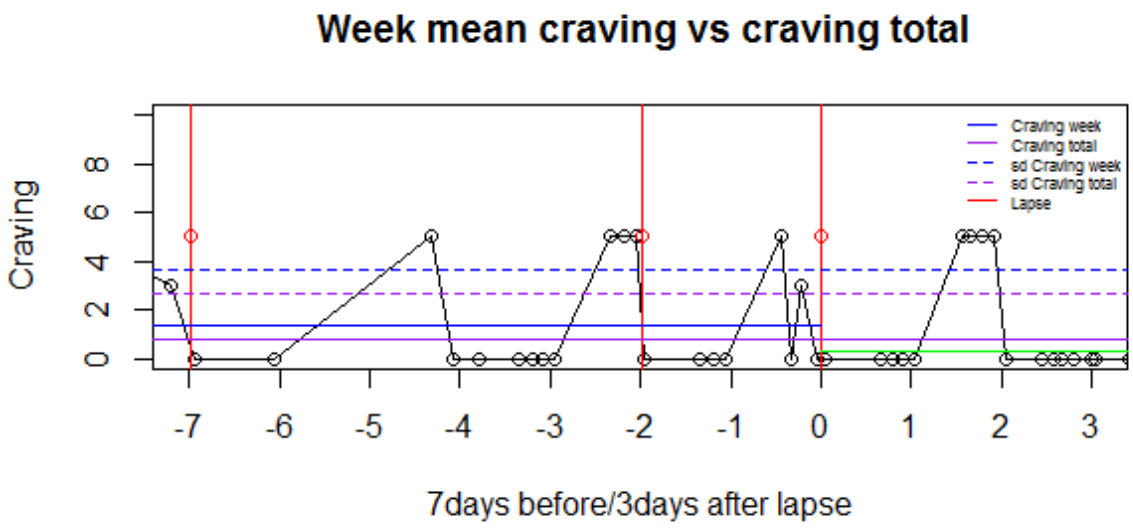
Figure 35 *Craving level before and after lapse (0)*


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse



6.4 ID923

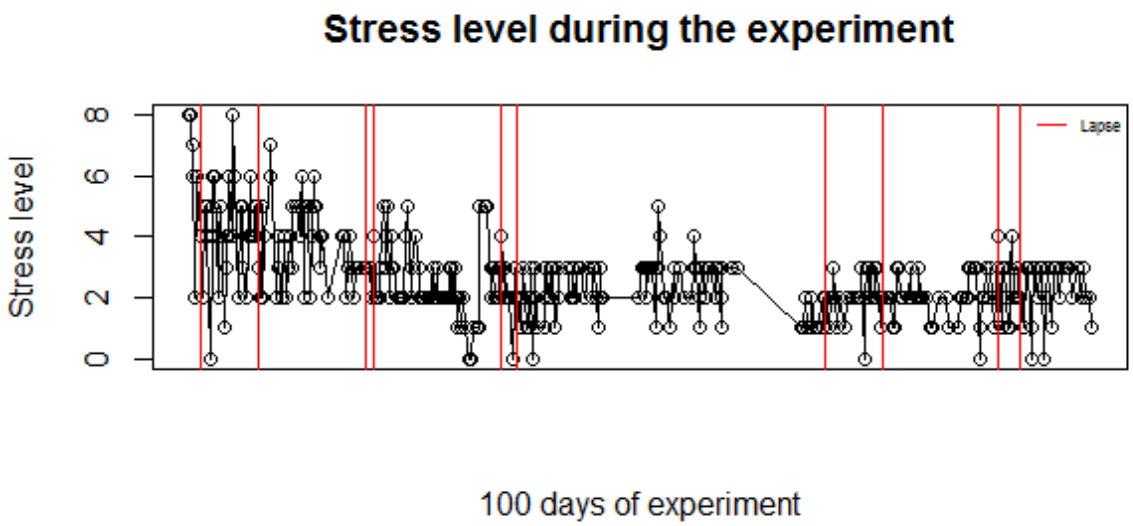
Lapses

Table 12 *Total number of lapses and amount of alcohol ID923*

Lapses	Units
1	4
2	2
3	2
4	2
5	3
6	2
7	3
8	2
9	2
10	4

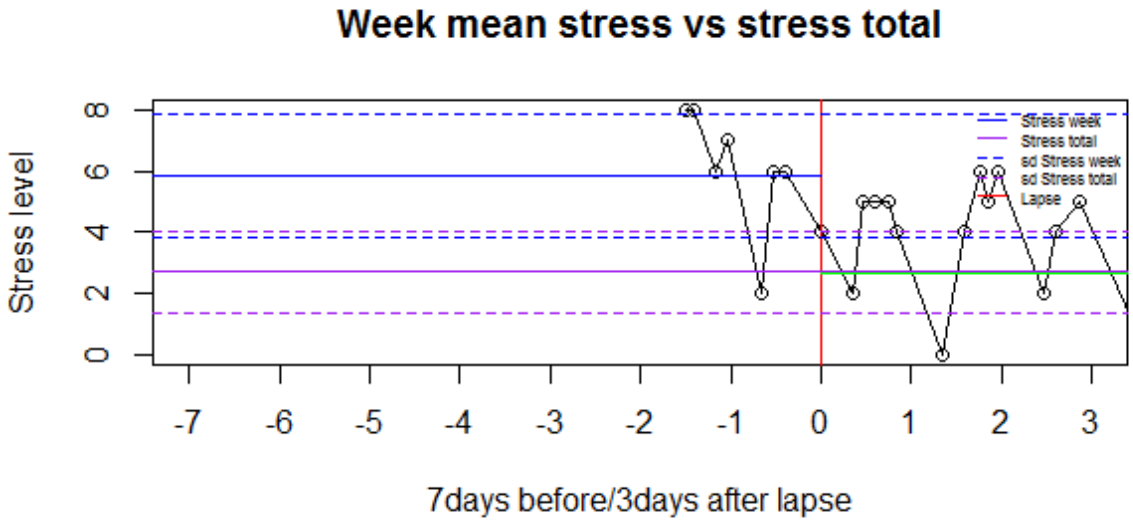
Stress

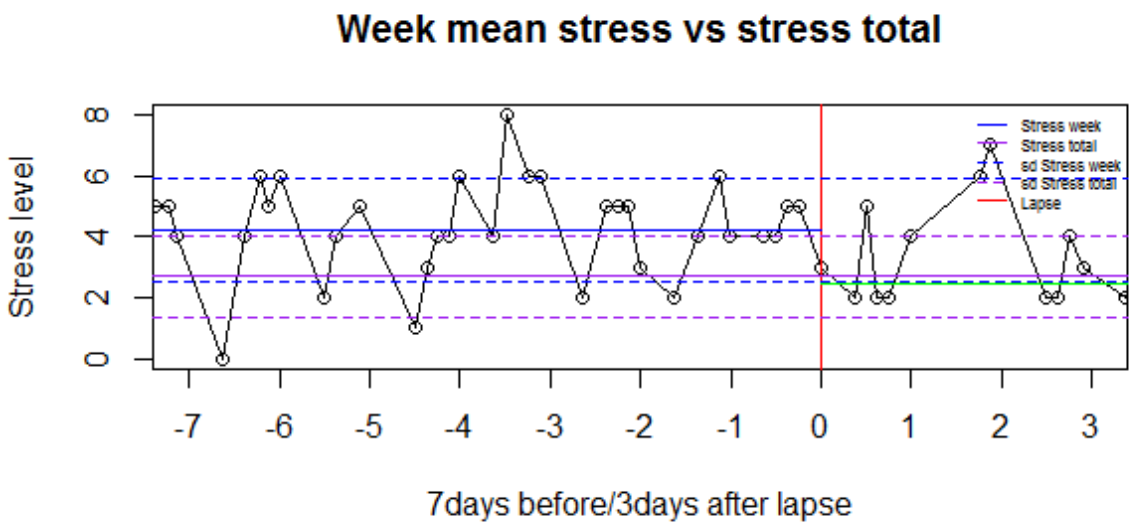
Figure 36 *Total number of all observation of stress during 100 days of the experiment and lapses of ID923*

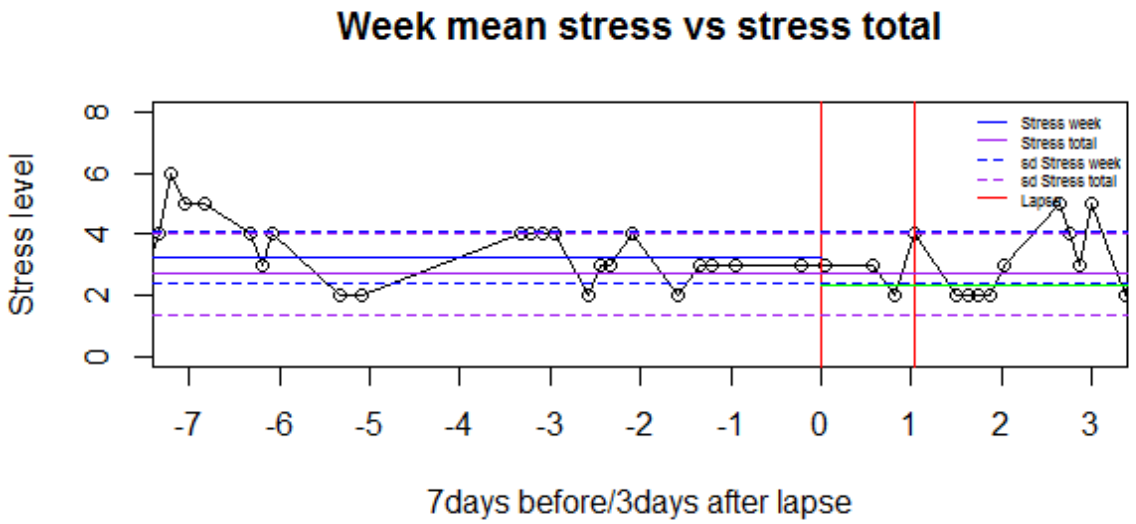


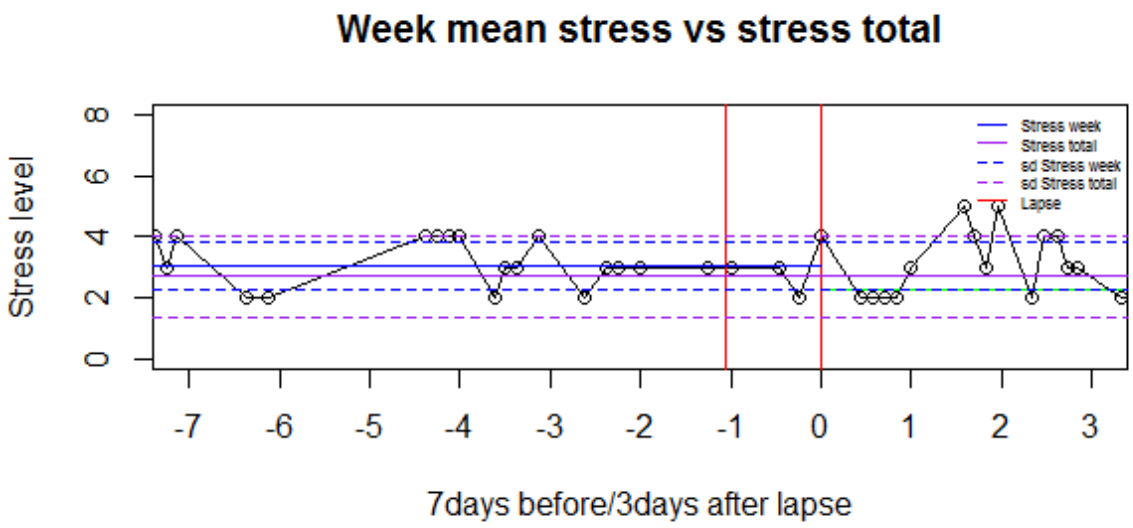
Stress levels during the weeks prior to lapses

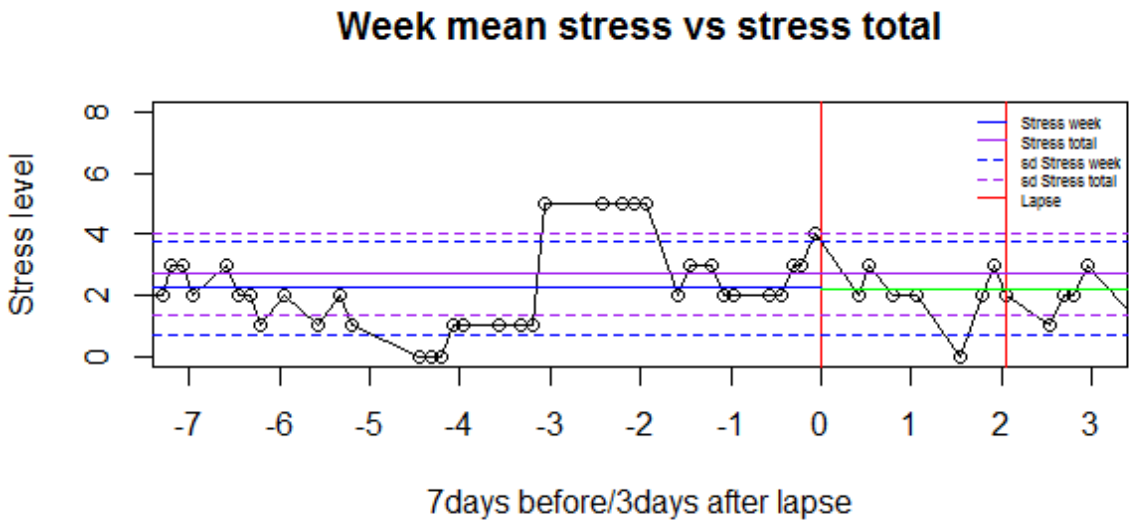
Figure 37 *Stress level before and after lapse (0)*

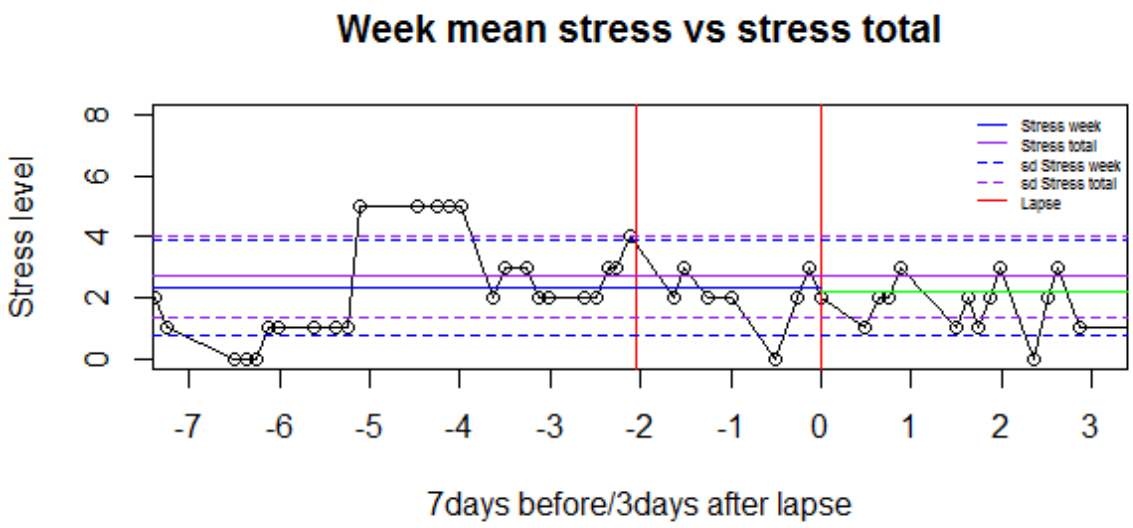


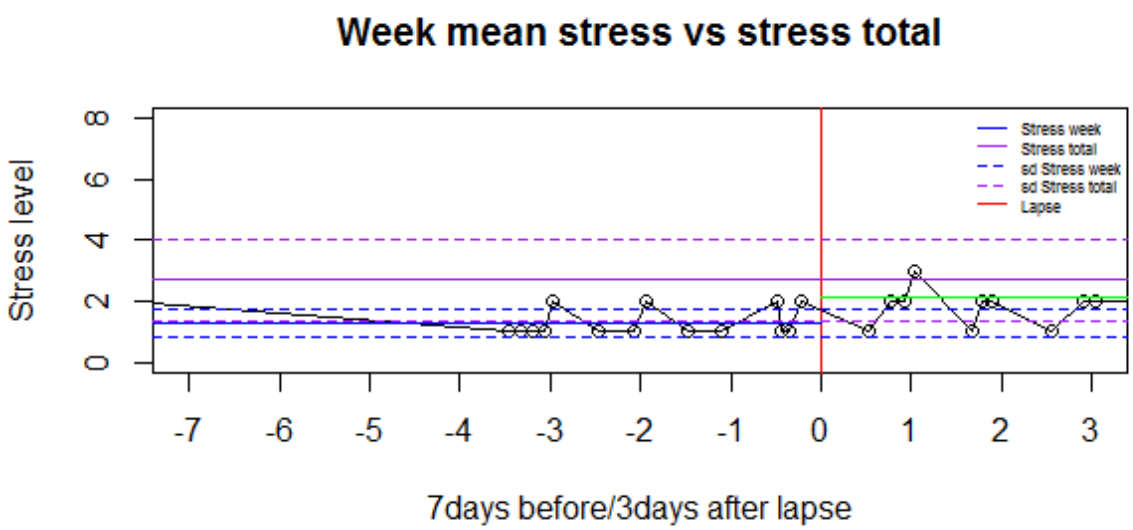

Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

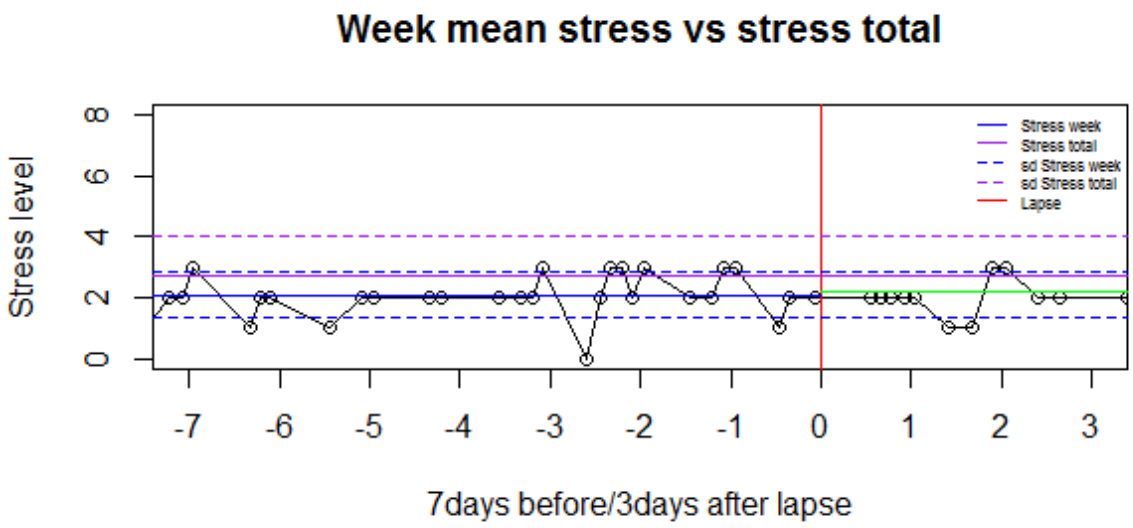

Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

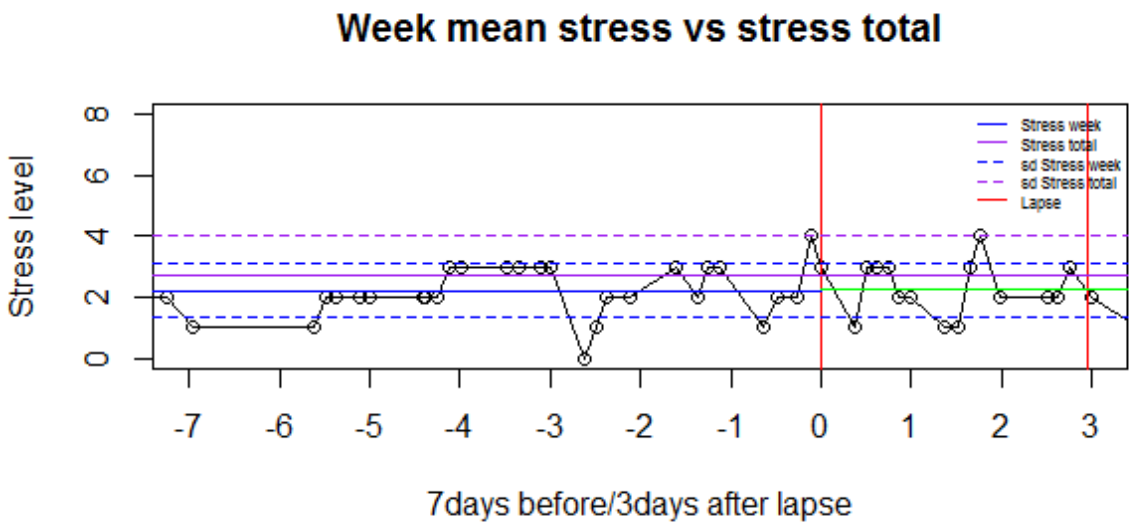

Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

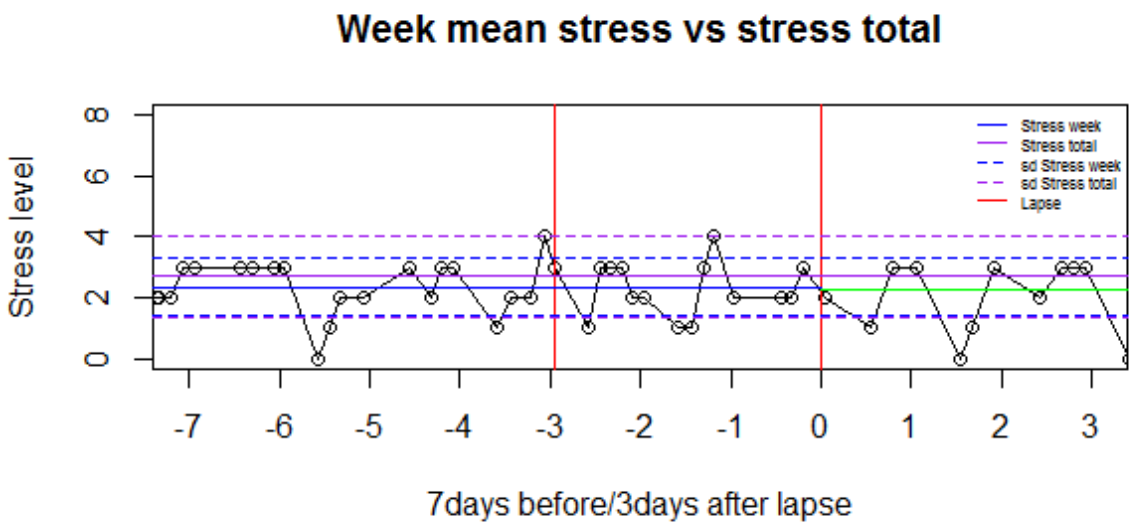

Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse


Week mean stress vs stress total
Stress level
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Stress week
Stress total
sd Stress week
sd Stress total
Lapse

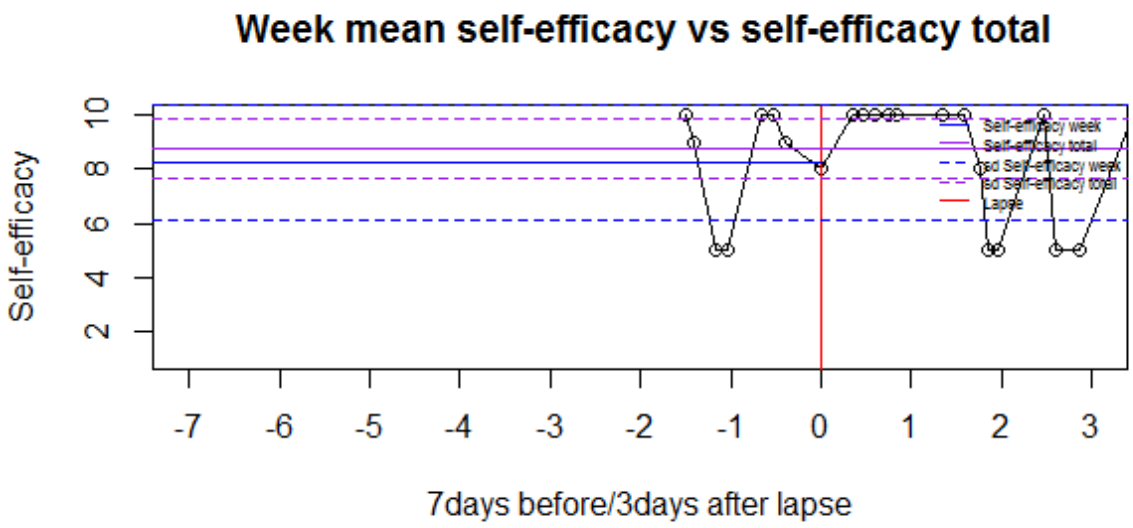


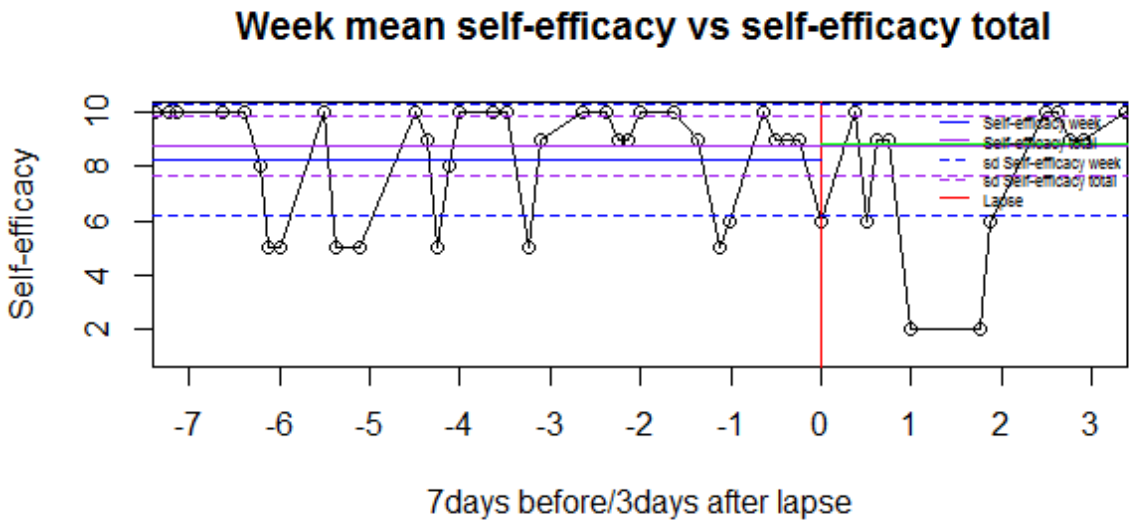
Self-efficacy

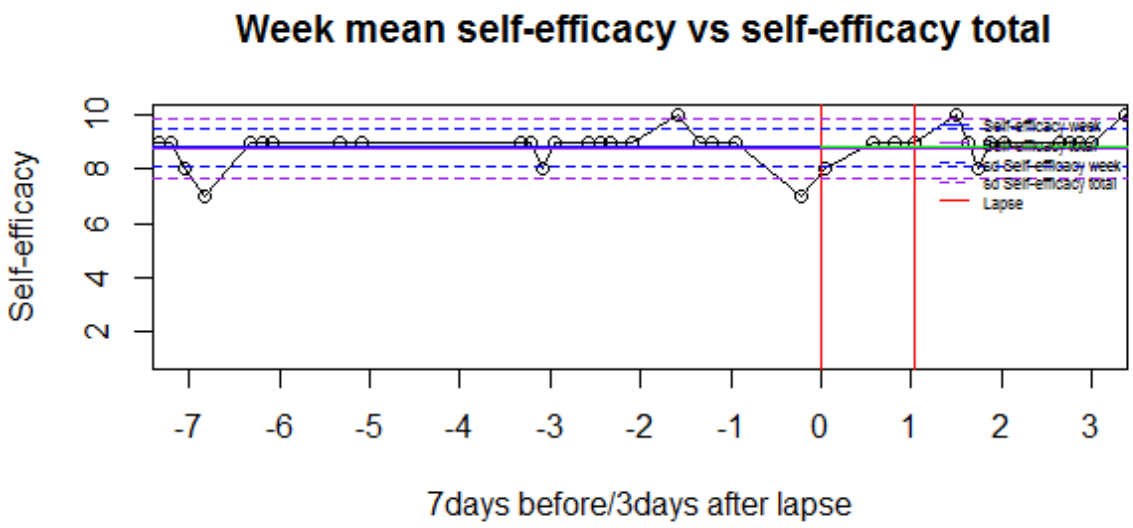
Figure 38 *Total number of all observation of self-efficacy during 100 days of the experiment and lapses of ID923*

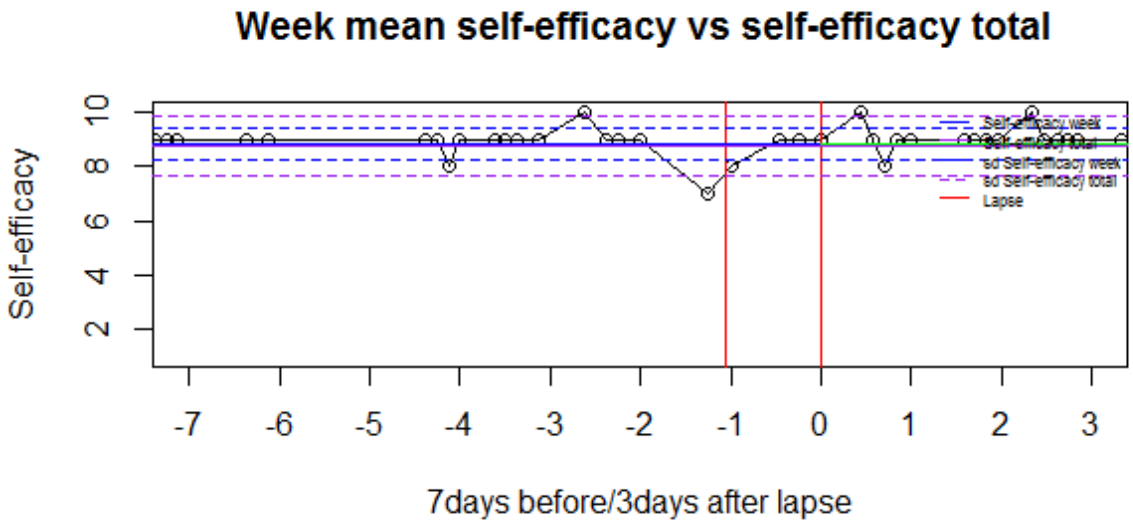
Self-efficacy levels during the weeks prior to lapses

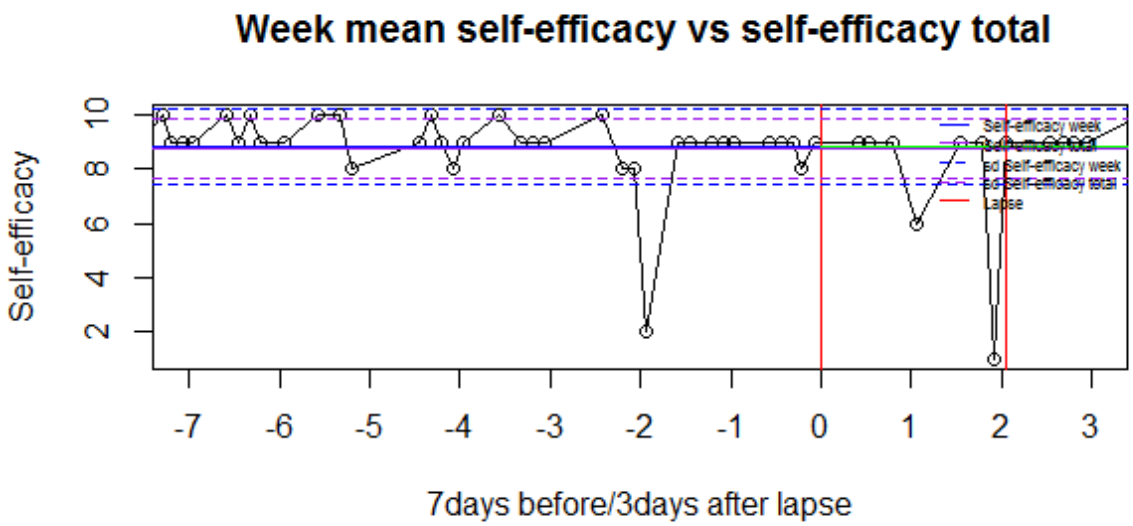
Figure 39 *Self-efficacy level before and after lapse (0)*

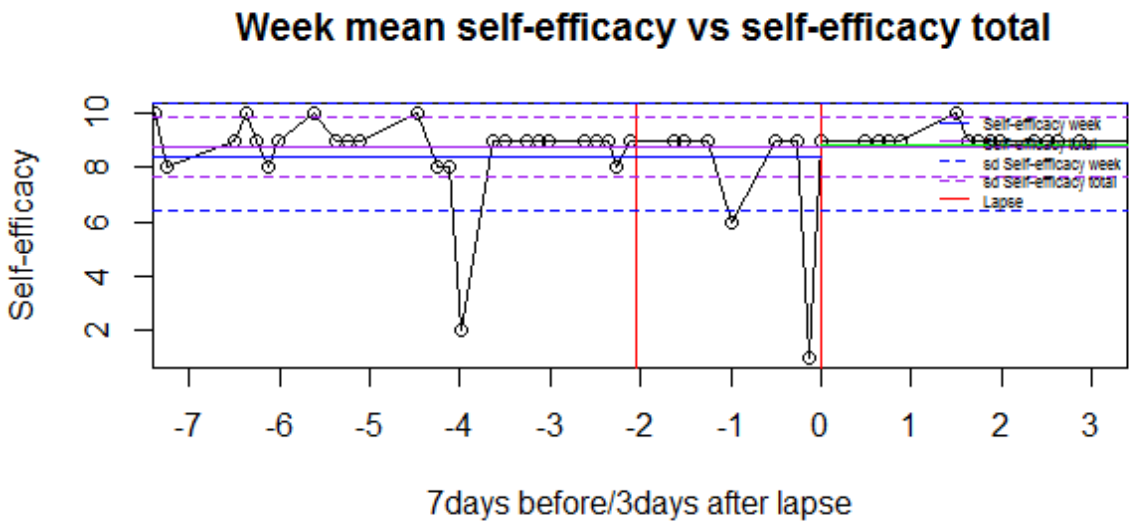

Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

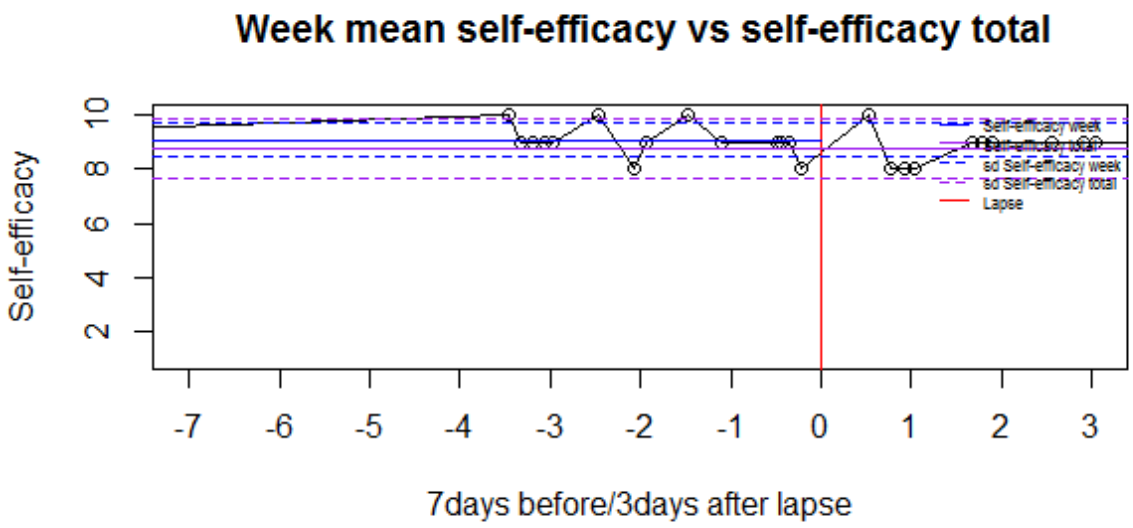

Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

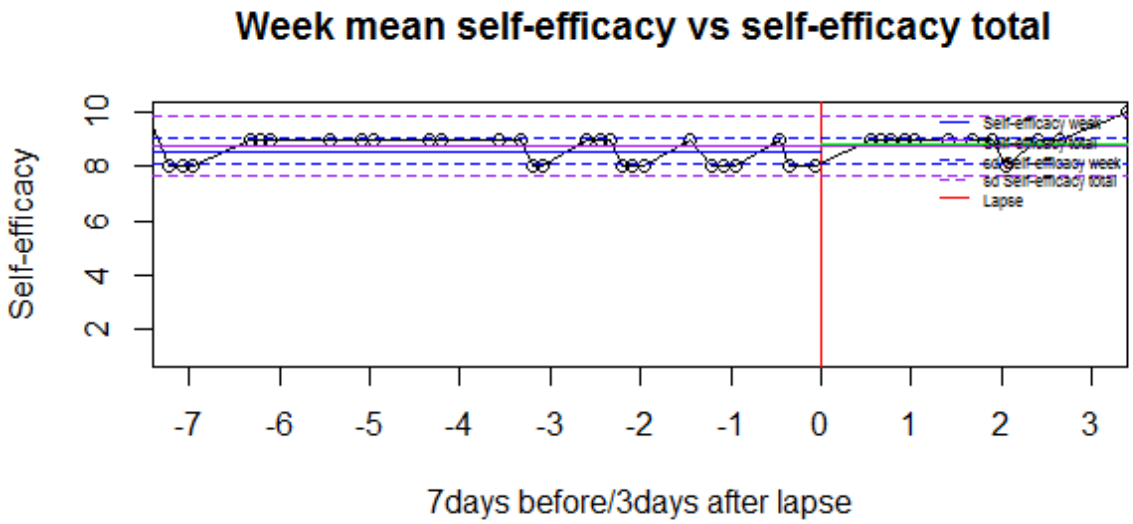

Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
sd Self-efficacy week
sd Self-efficacy total
Lapse

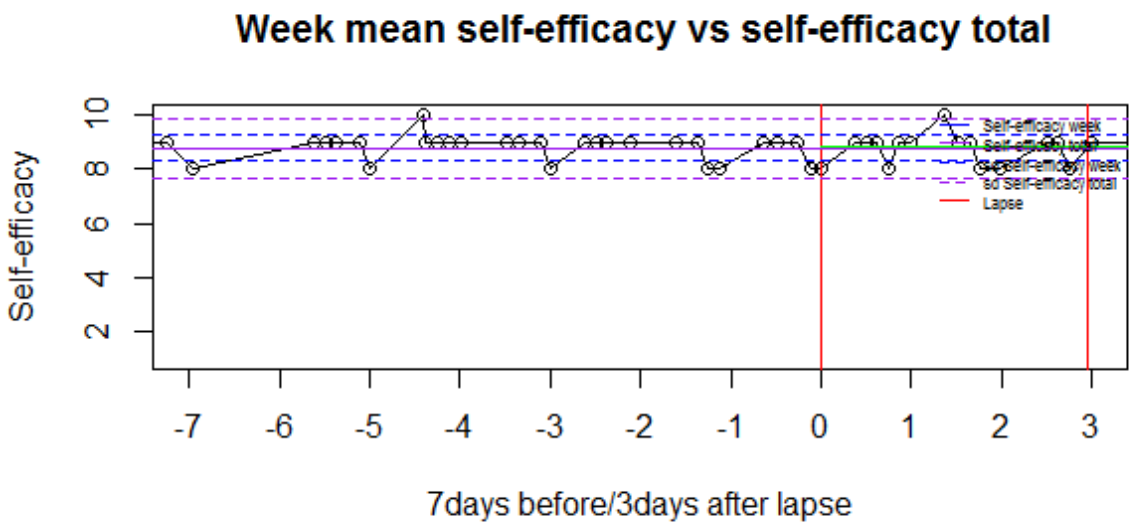

Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
sd Self-efficacy week
sd Self-efficacy total
Lapse

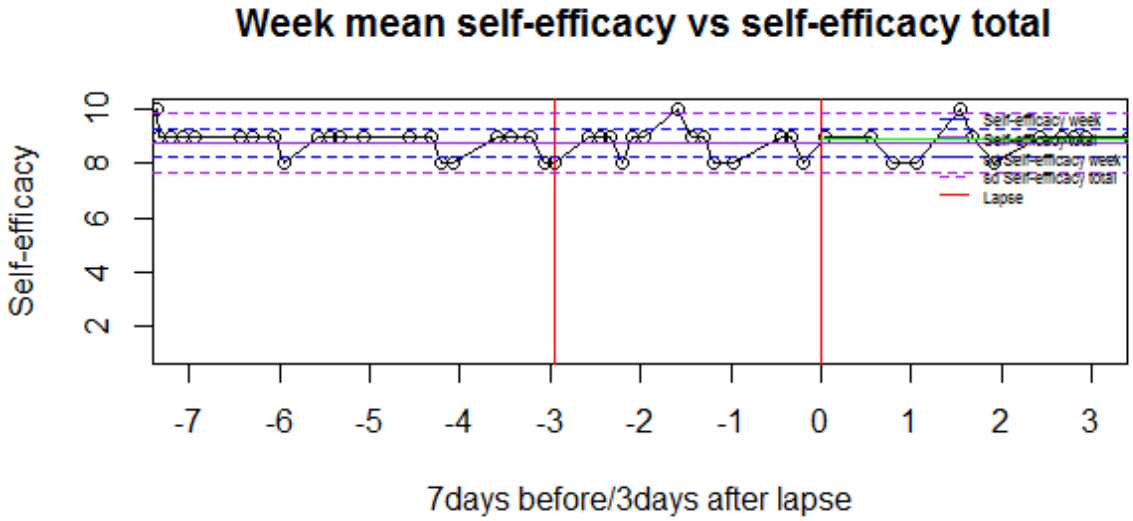

Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

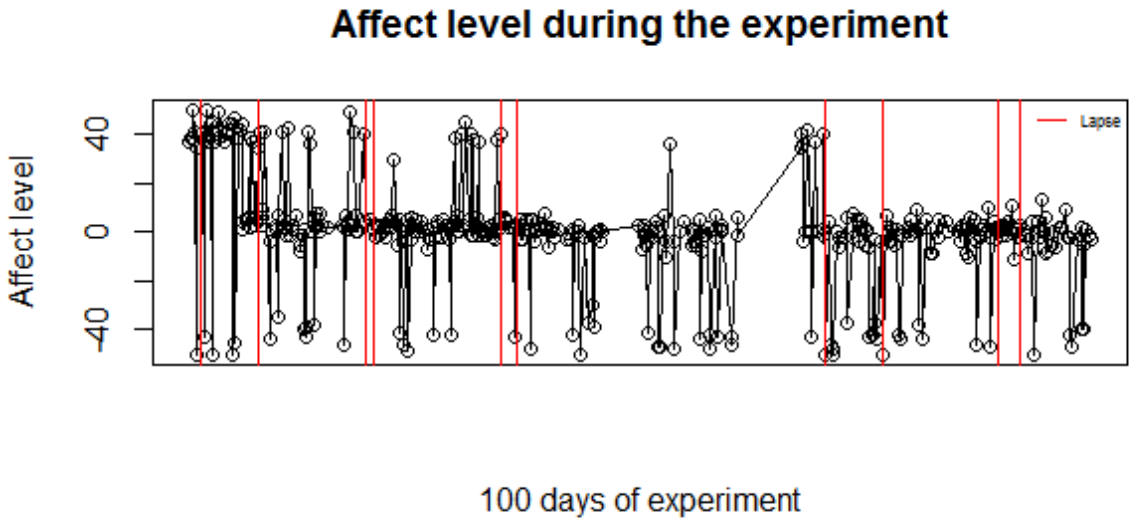

Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse


Week mean self-efficacy vs self-efficacy total
Self-efficacy
2
4
6
8
10
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Self-efficacy week
Self-efficacy total
sd Self-efficacy week
sd Self-efficacy total
Lapse

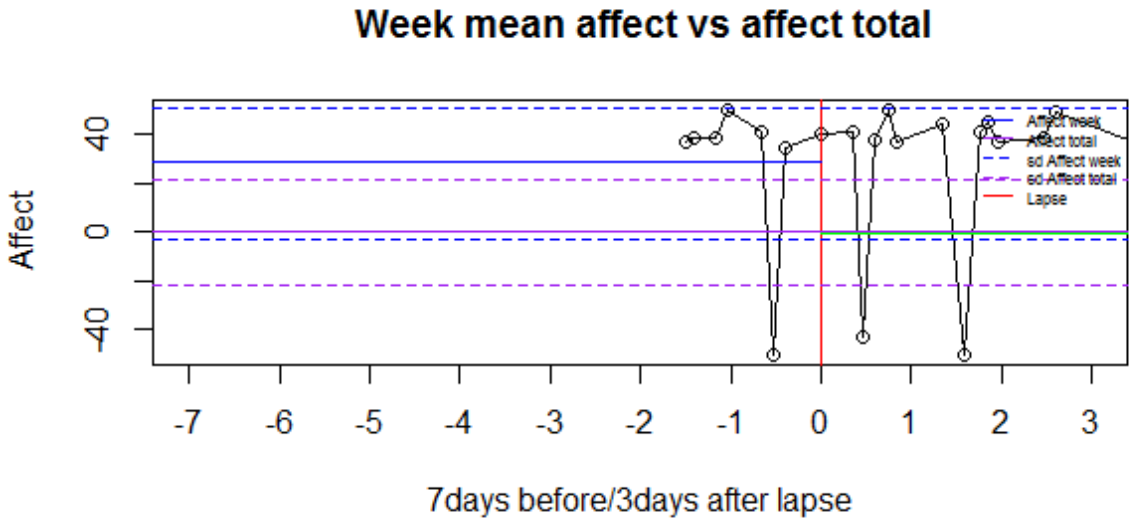
Affect

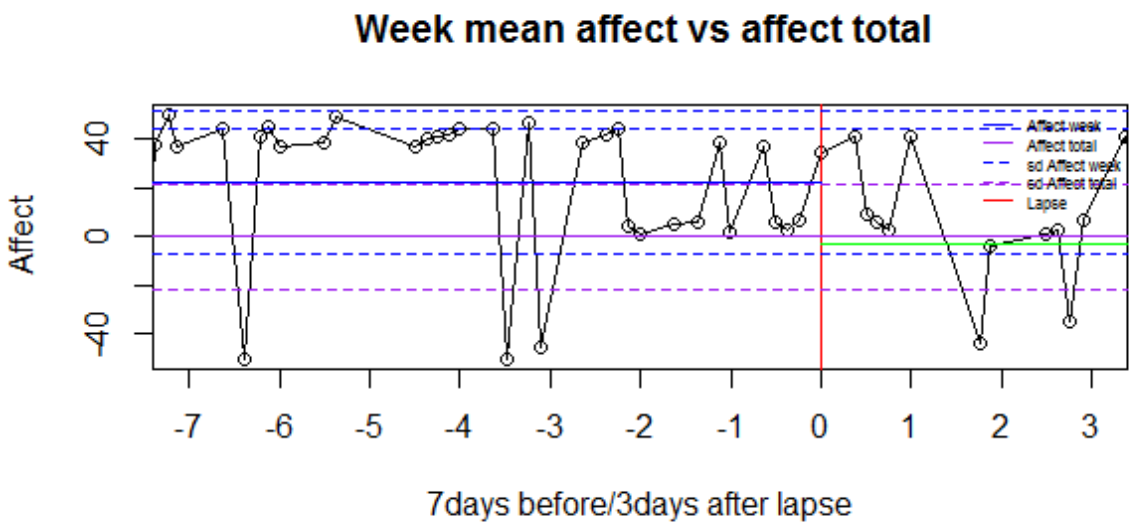
Figure 40 *Total number of all observation of affect during 100 days of the experiment and lapses of ID923*

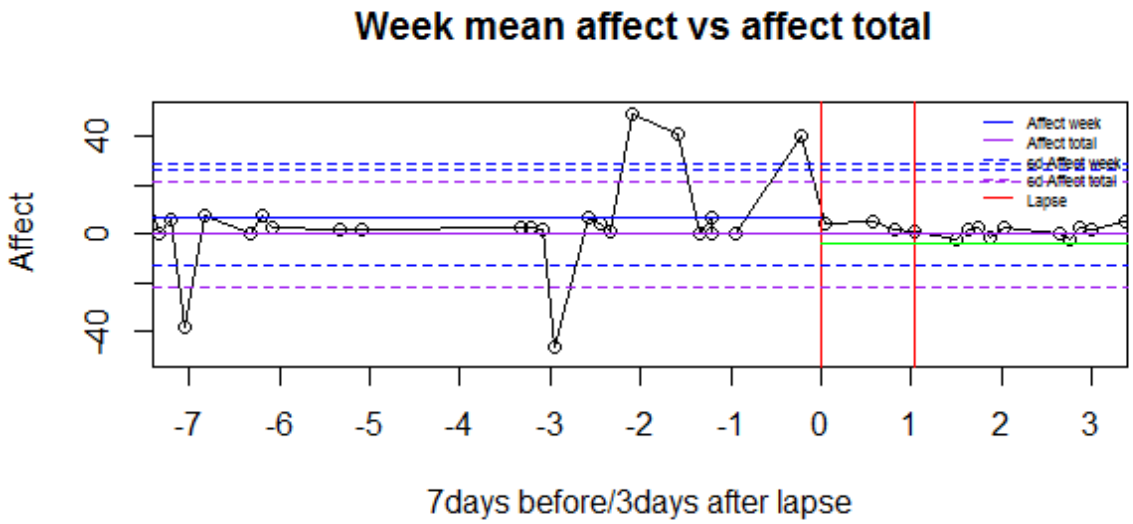


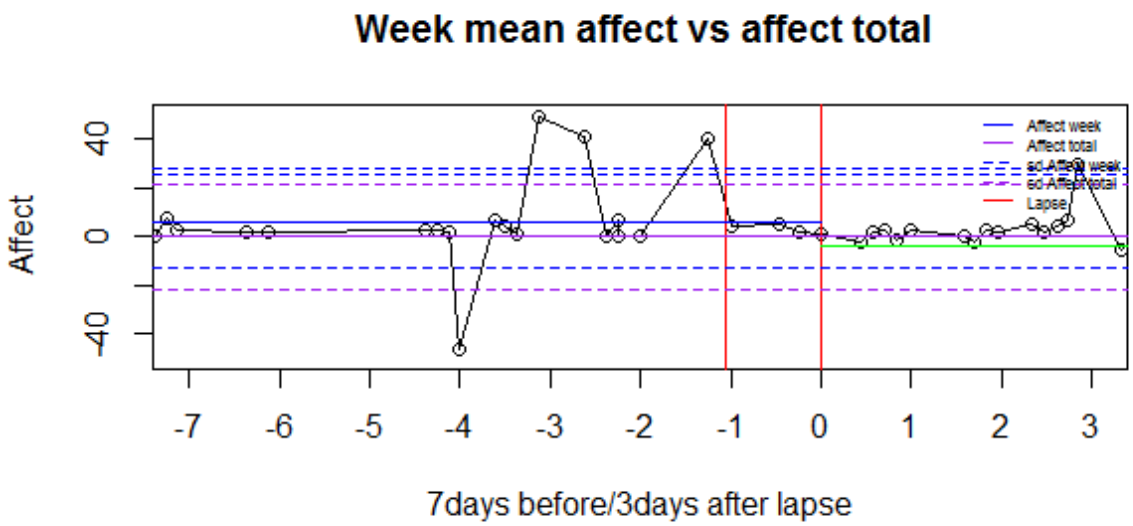
Affect levels during the weeks prior to lapses

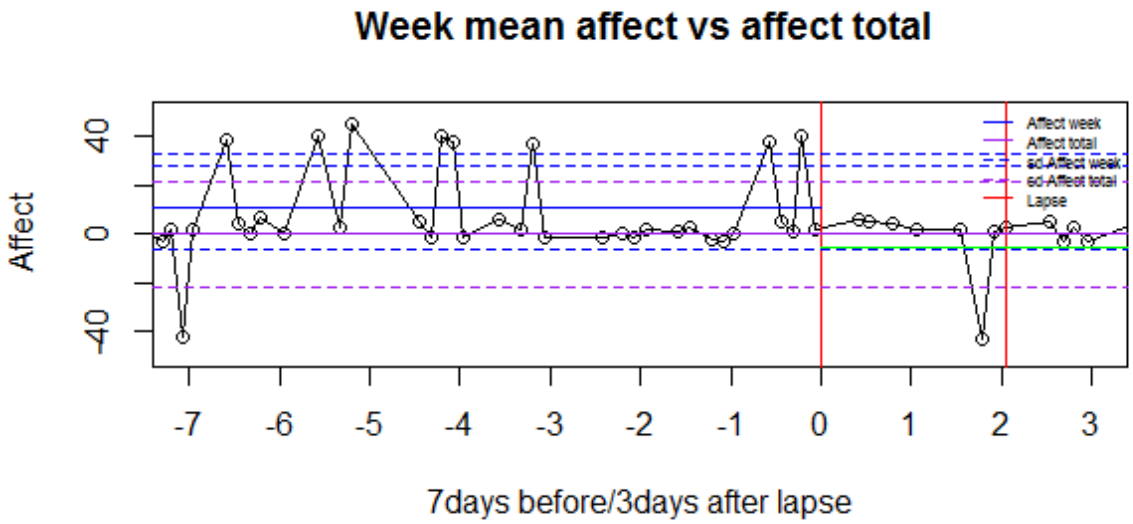
Figure 41 *Affect level before and after lapse (0)*

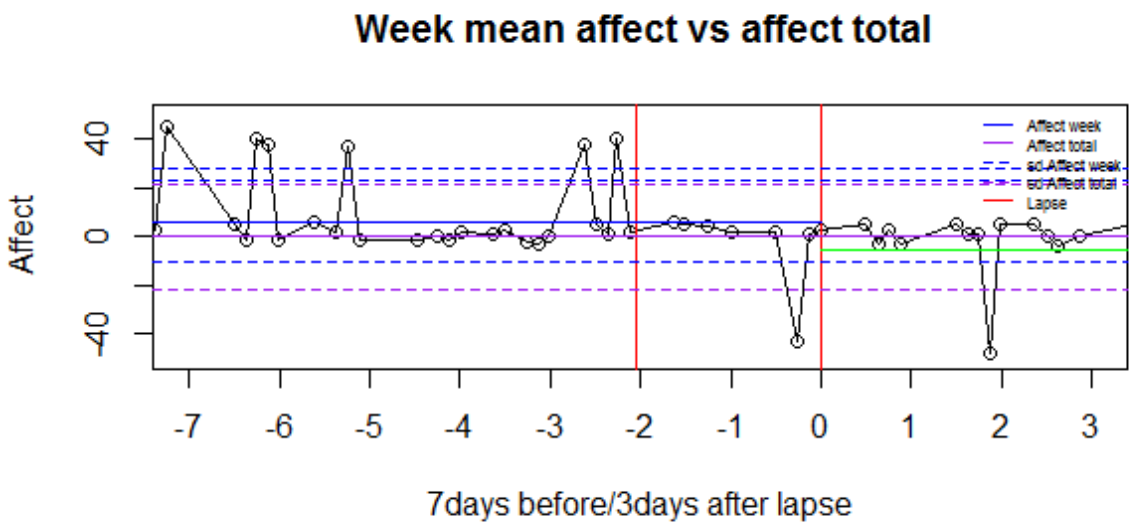


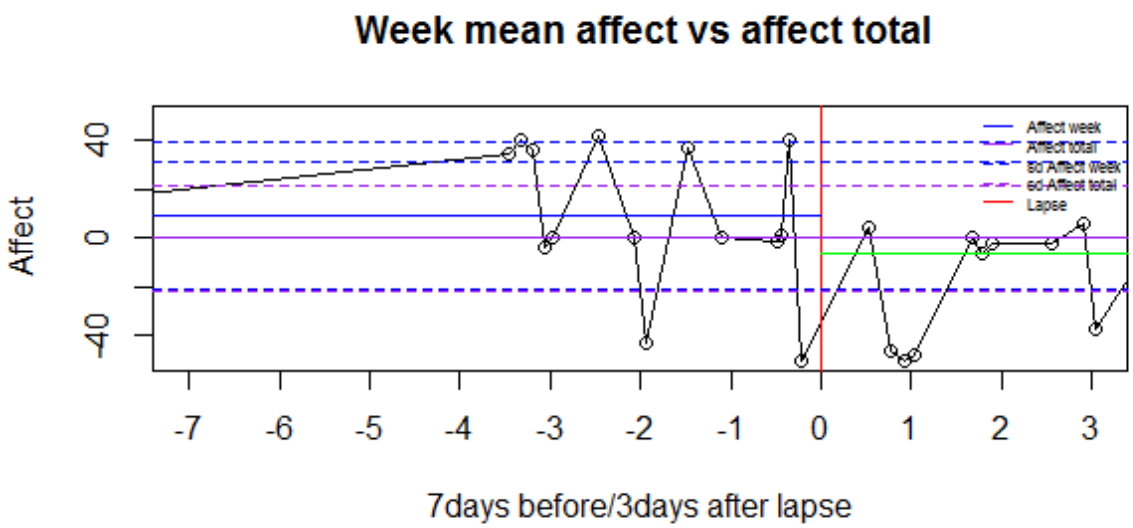

Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

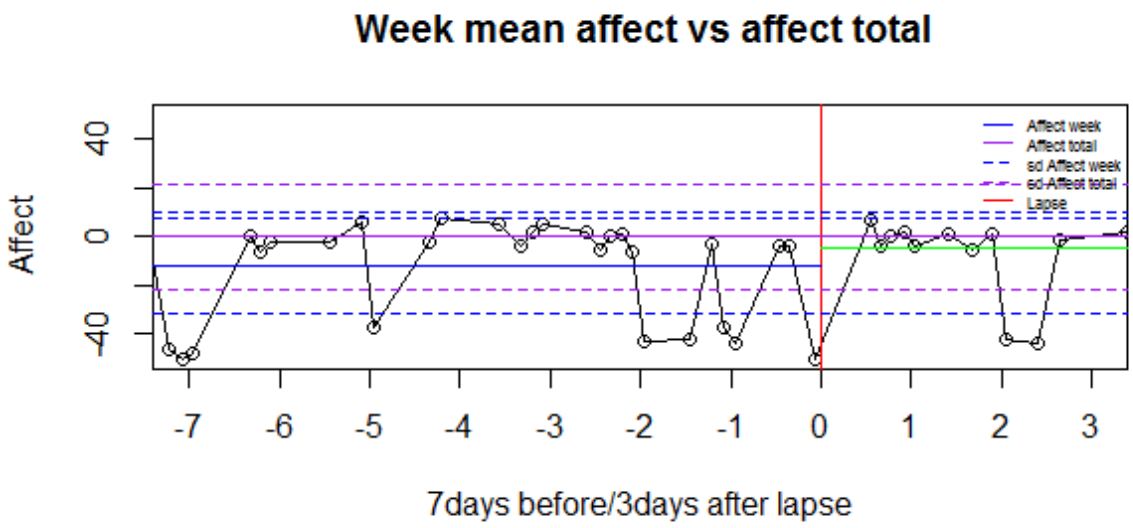

Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

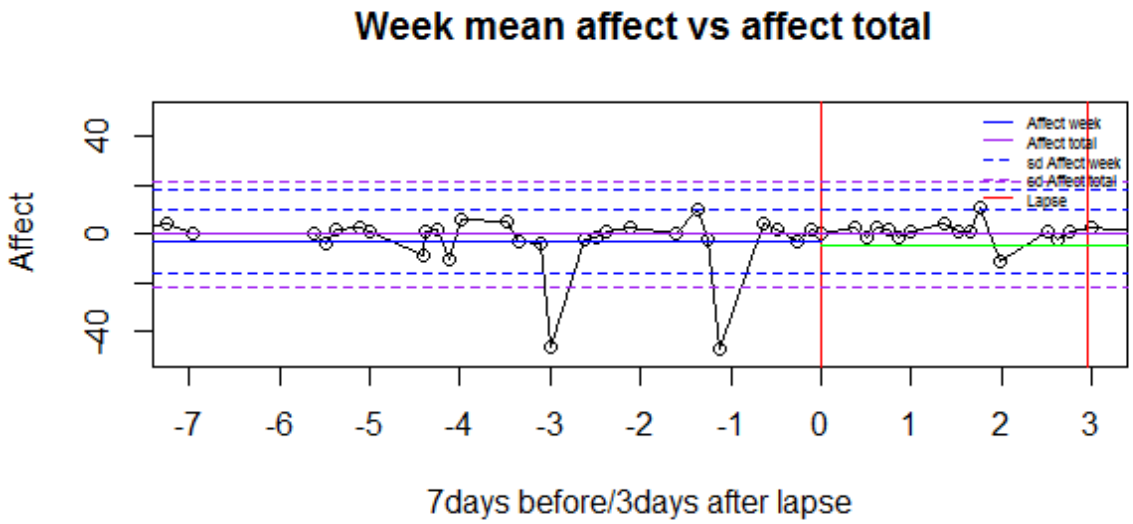

Week mean affect vs affect total
Affect week
Affect total
sd Affect week
sd Affect total
Lapse
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

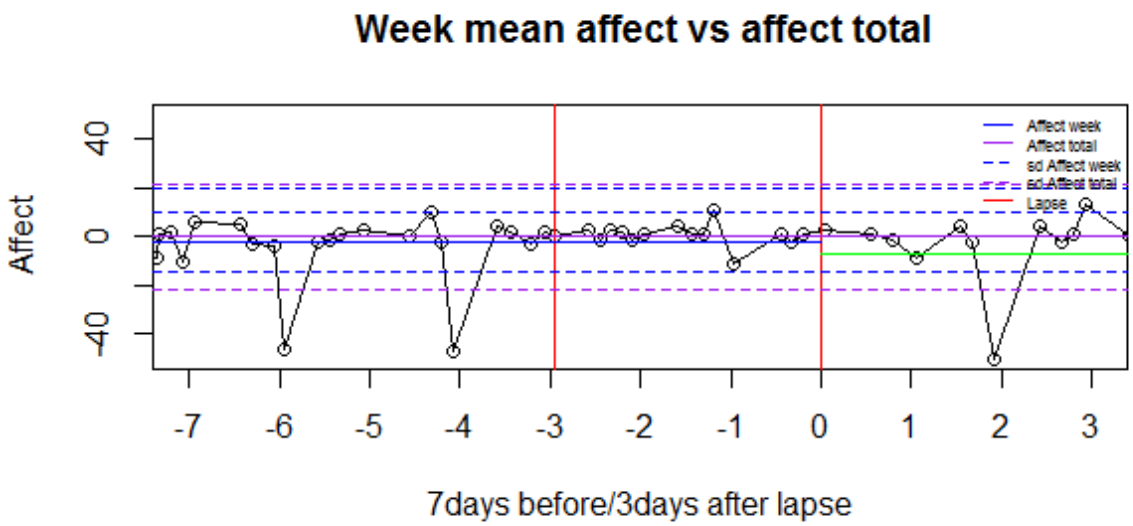

Week mean affect vs affect total
Affect week
Affect total
sd Affect week
sd Affect total
Lapse
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse


Week mean affect vs affect total
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Affect week
Affect total
sd Affect week
sd Affect total
Lapse

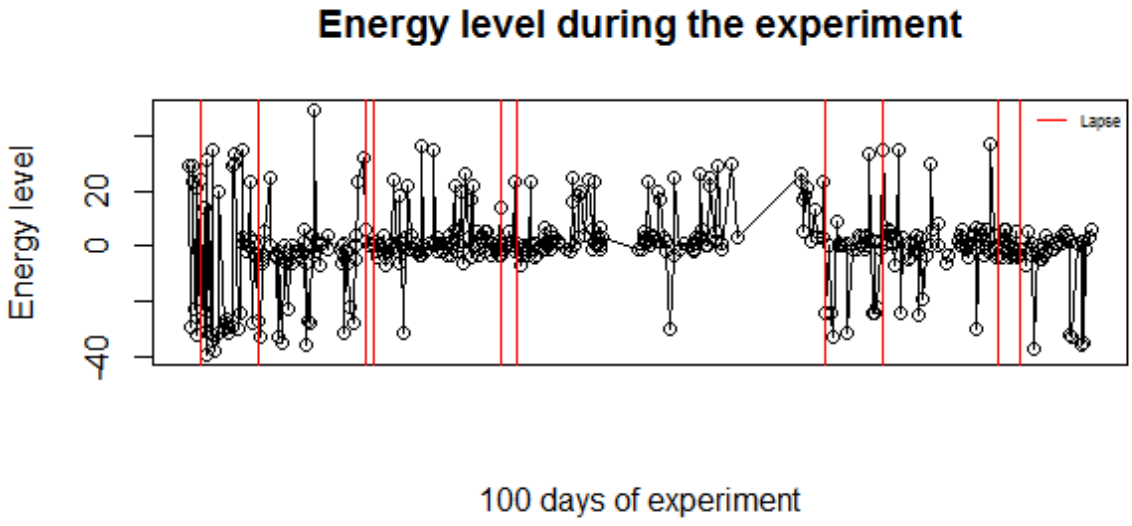

Week mean affect vs affect total
Affect week
Affect total
sd Affect week
sd Affect total
Lapse
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean affect vs affect total
Affect week
Affect total
sd Affect week
sd Affect total
Lapse
Affect
40
0
-40
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse



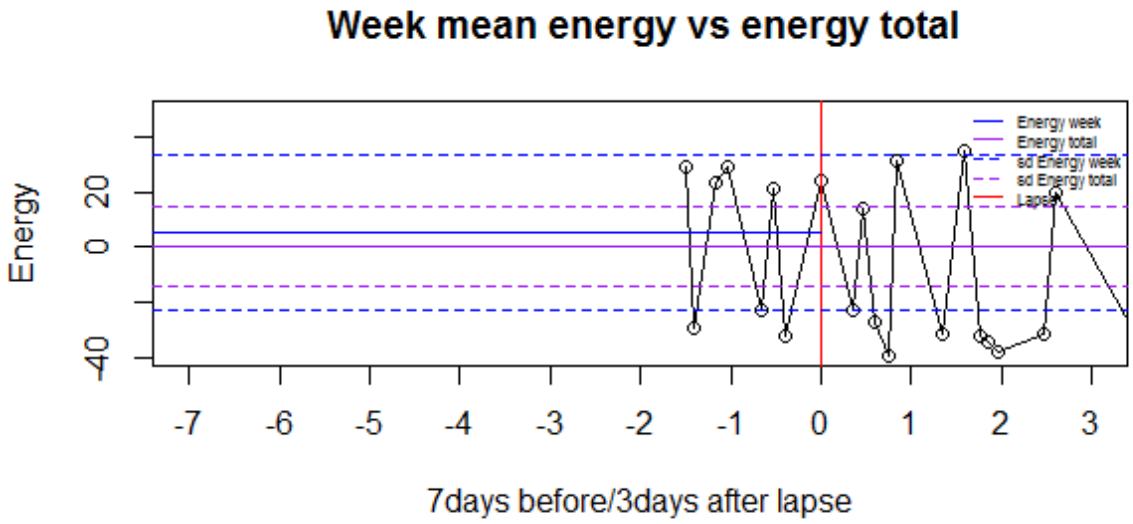
Energy

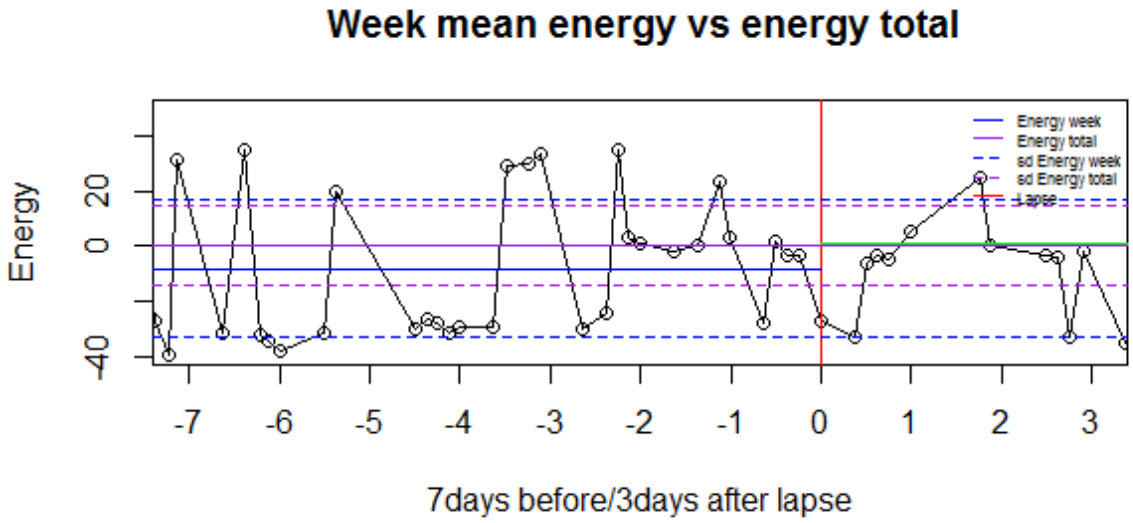
Figure 42 *Total number of all observation of energy during 100 days of the experiment and lapses of ID923*

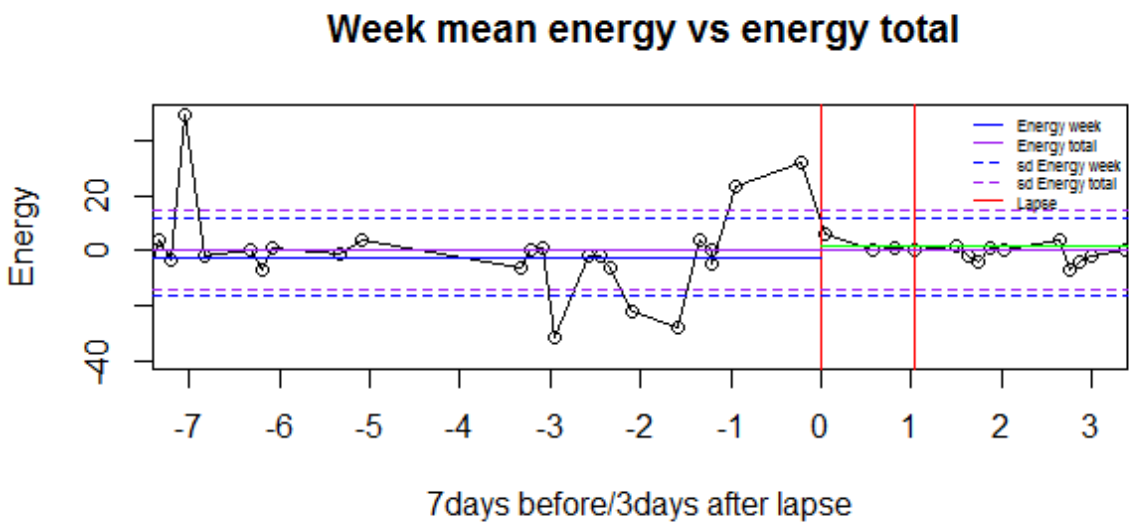


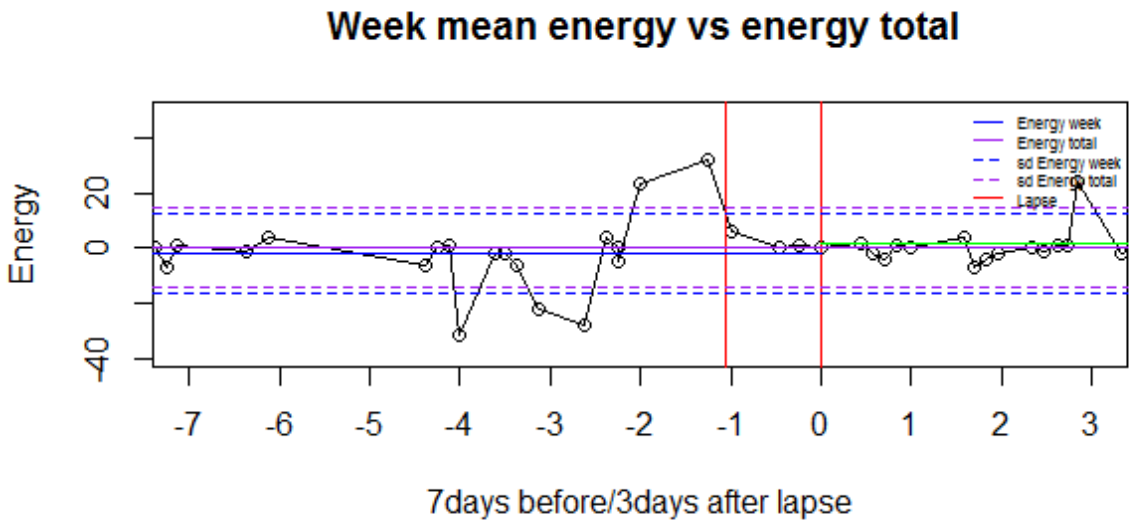
Energy levels during the weeks prior to lapses

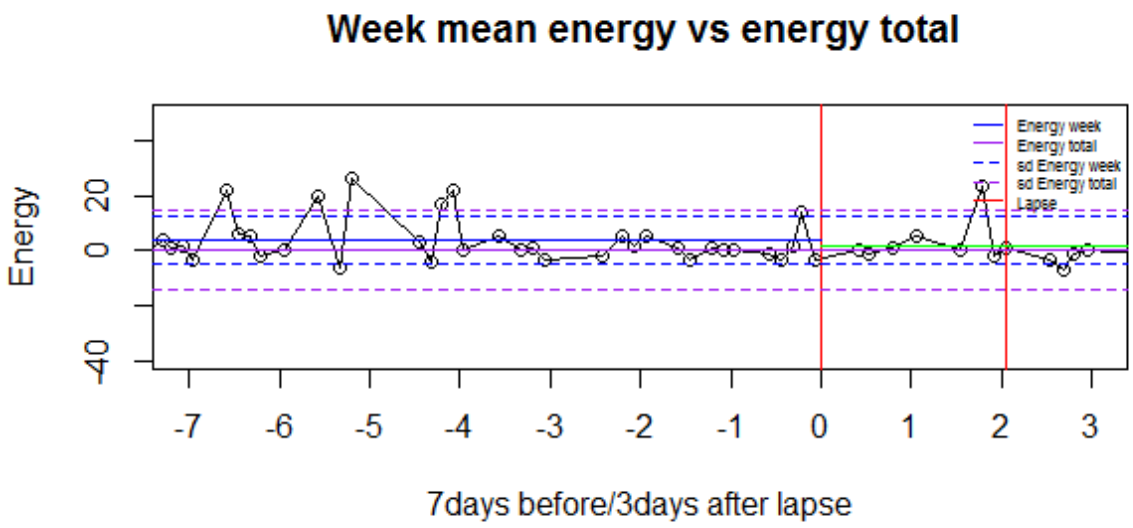
Figure 43 *Energy level before and after lapse (0)*

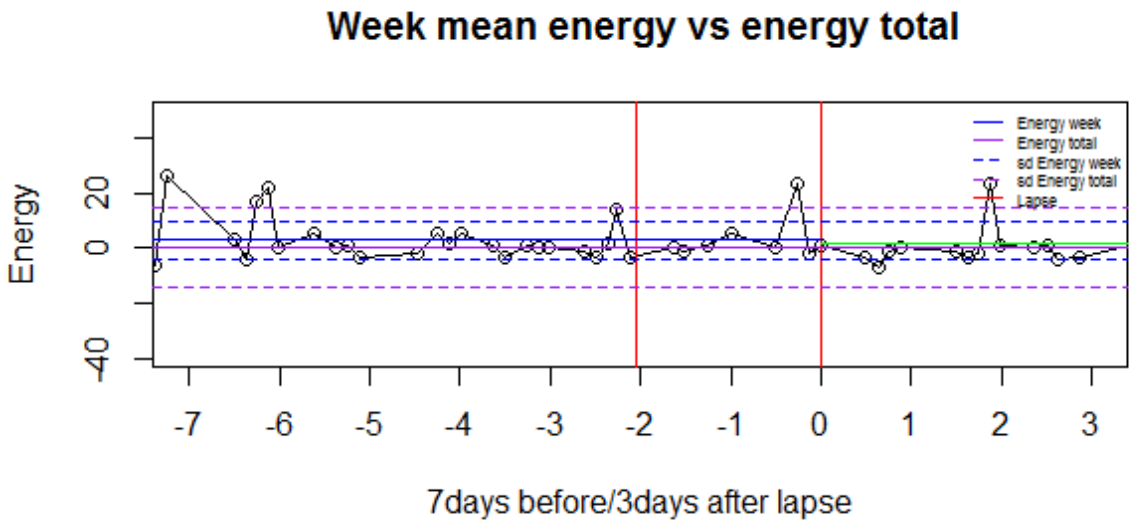

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

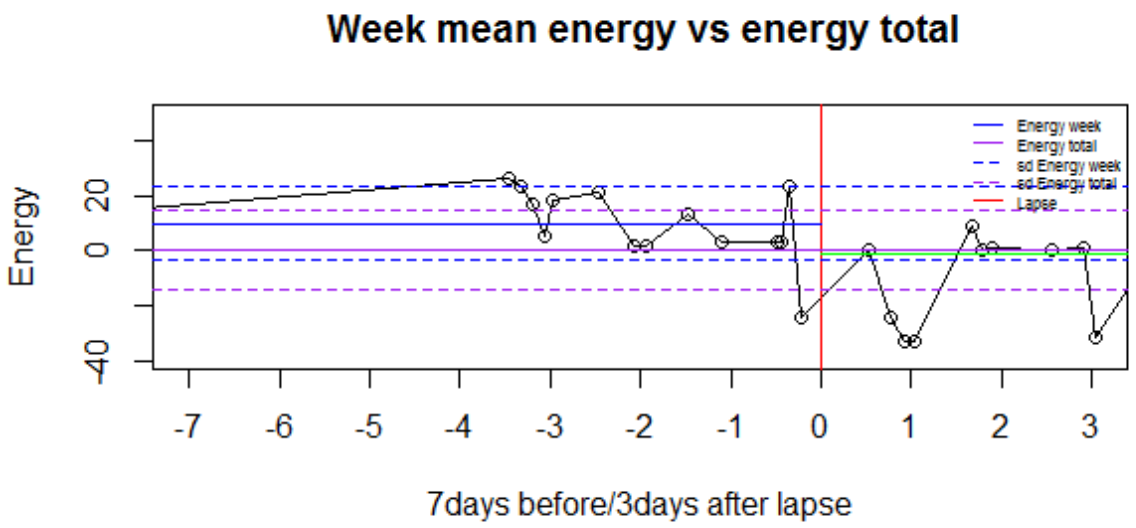

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

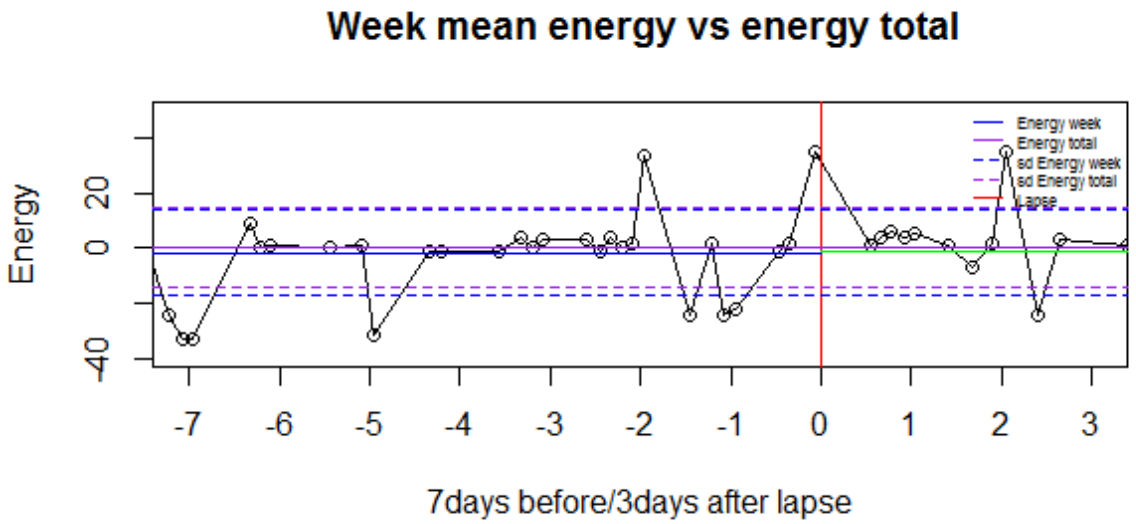

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

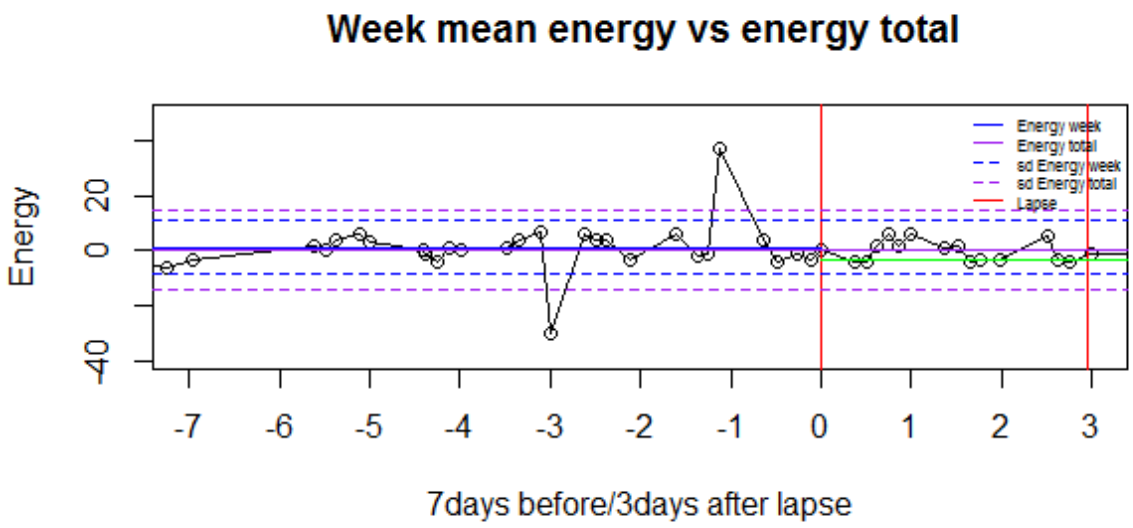

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

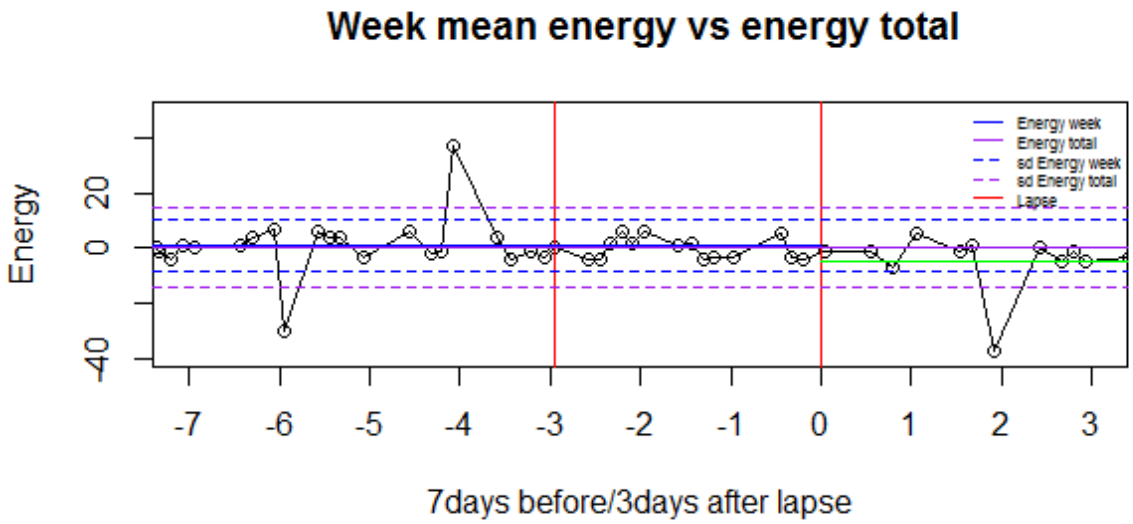

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse

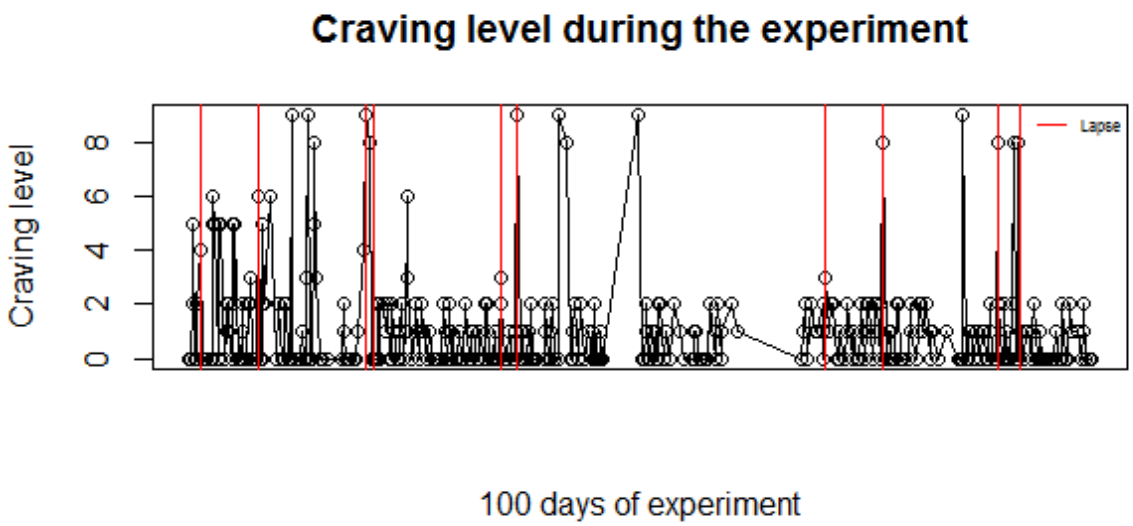

Week mean energy vs energy total
Energy week
Energy total
sd Energy week
sd Energy total
Lapse
Energy
-40
0
20
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse





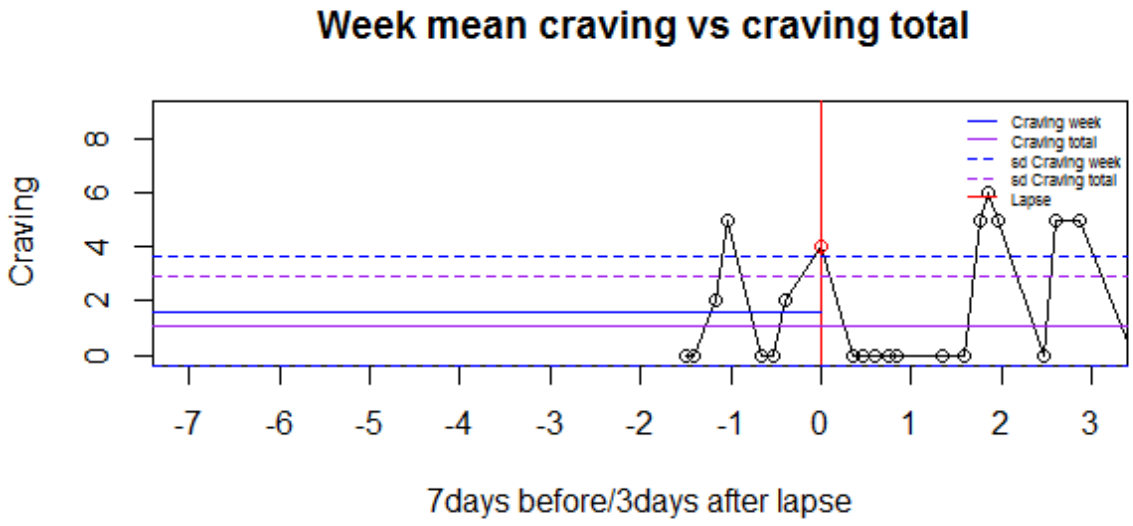
Craving

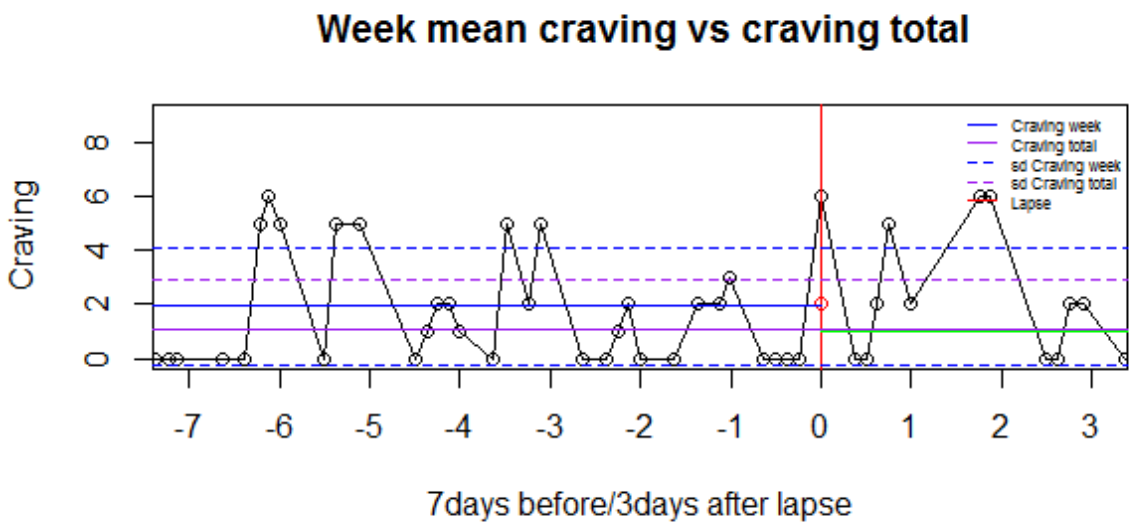
Figure 44 *Total number of all observation of craving during 100 days of the experiment and lapses ID923*

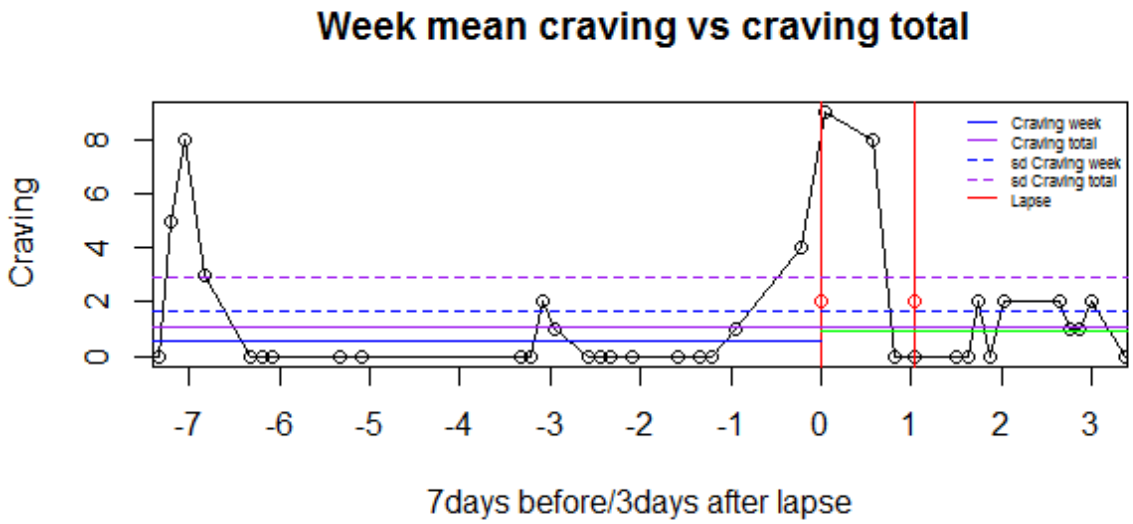


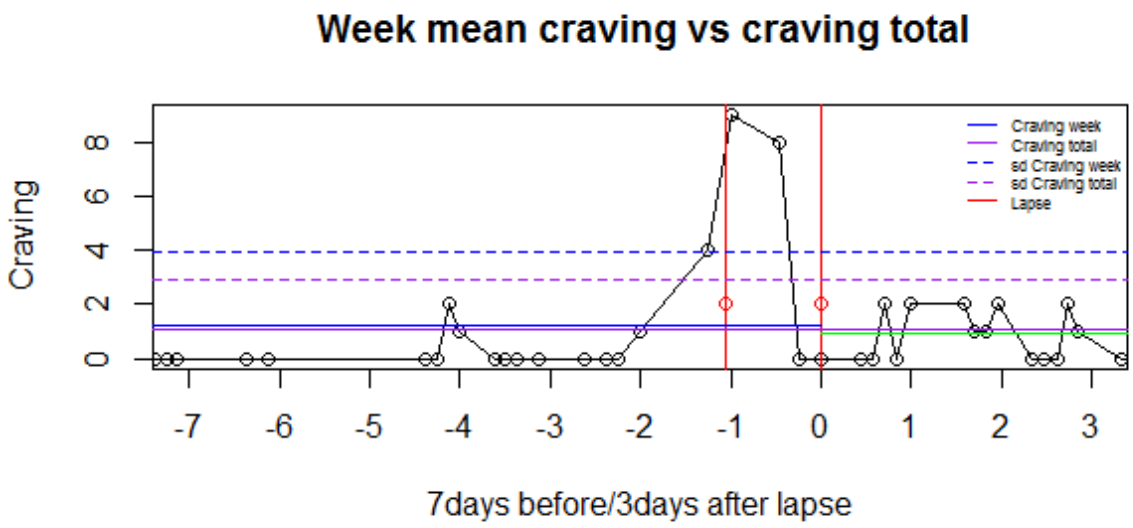
Craving levels during the weeks prior to lapses

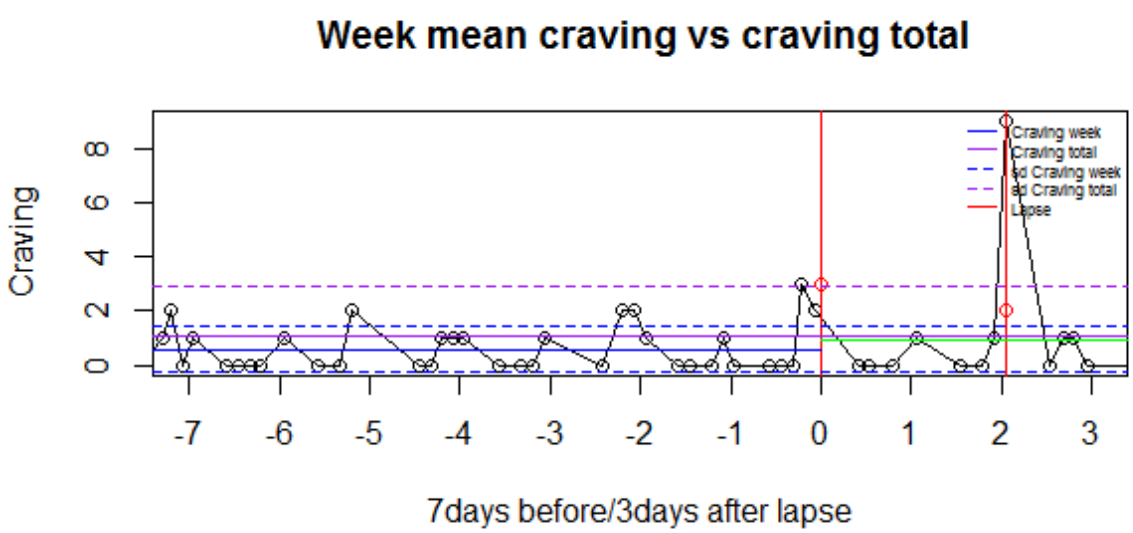
Figure 45 *Craving level before and after lapse (0)*

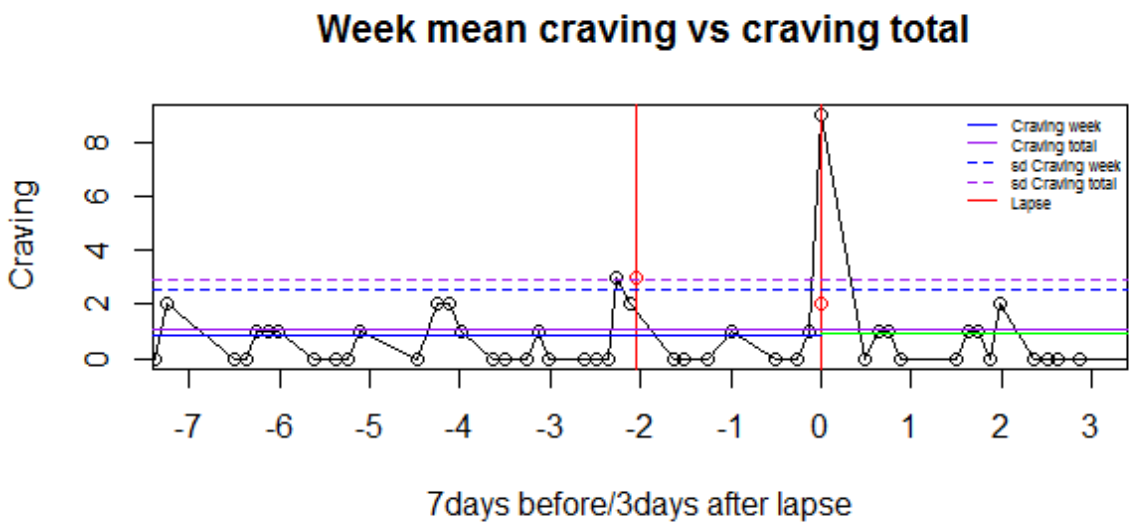


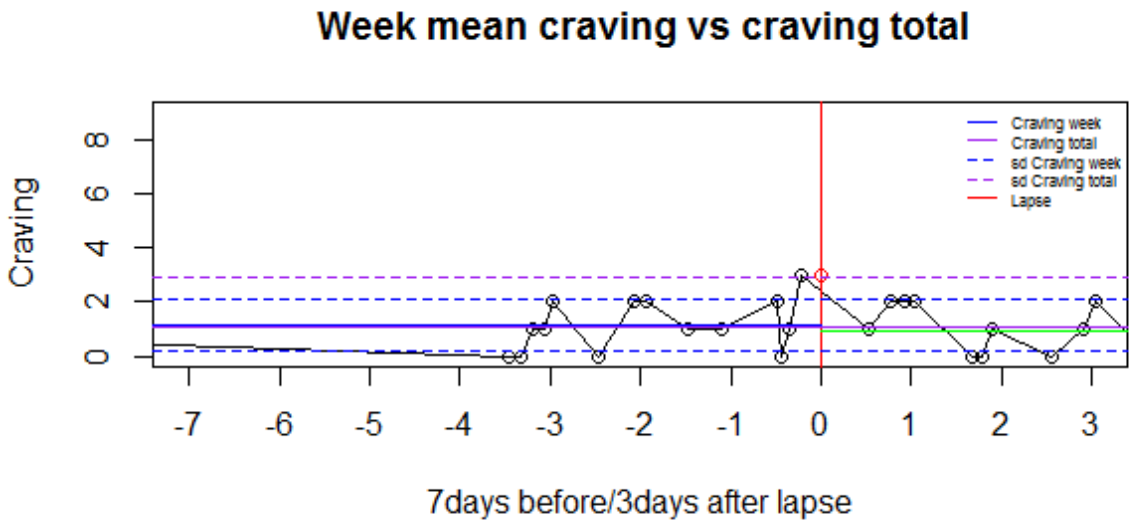

Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse

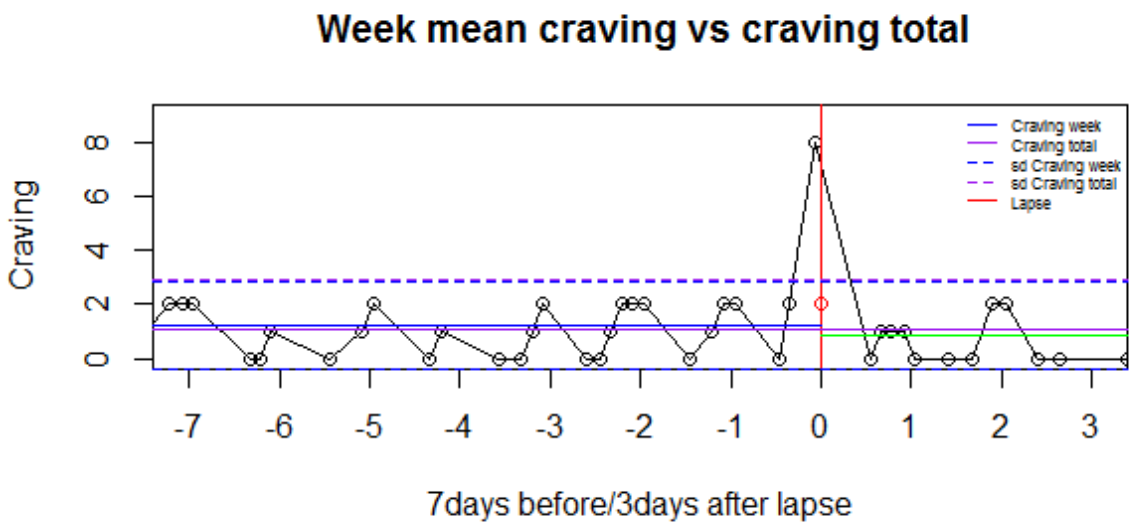

Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0 2 4 6 8
-7 -6 -5 -4 -3 -2 -1 0 1 2 3
7days before/3days after lapse

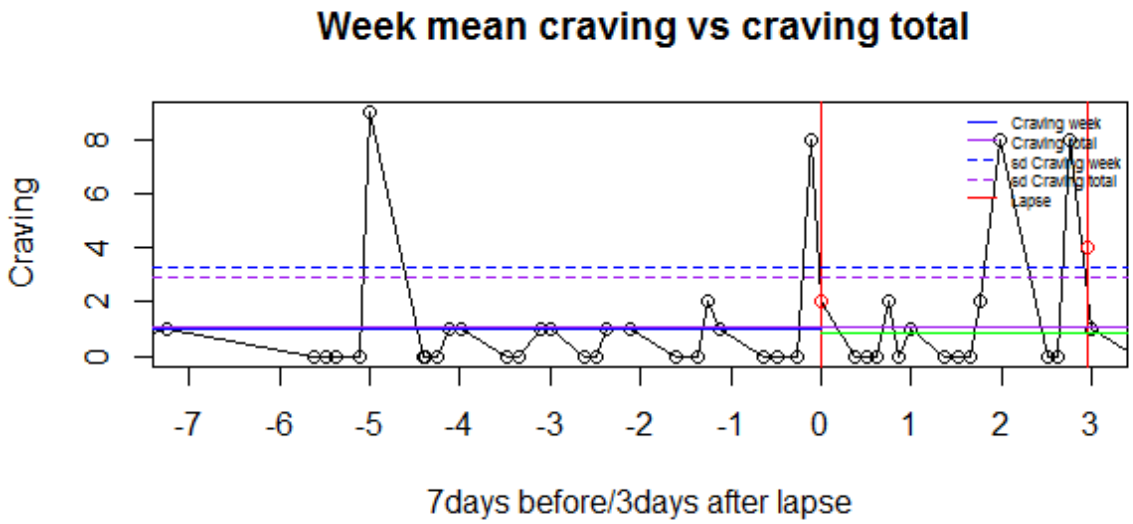

Week mean craving vs craving total
Craving
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse

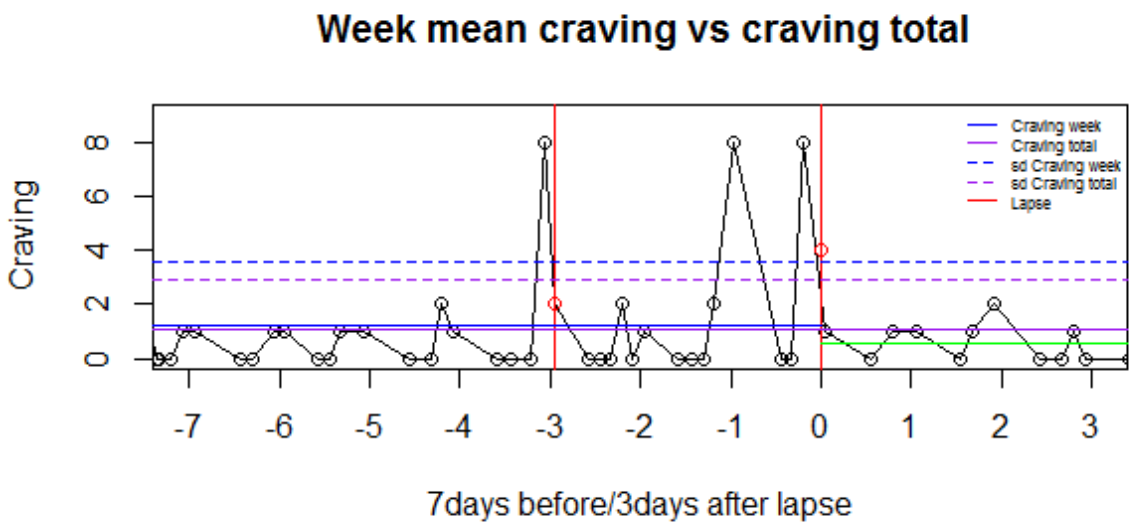

Week mean craving vs craving total
Craving
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse
Craving week
Craving total
sd Craving week
sd Craving total
Lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse


Week mean craving vs craving total
Craving week
Craving total
sd Craving week
sd Craving total
Lapse
Craving
0
2
4
6
8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
7days before/3days after lapse



6.5 Correlation between variables

Table 13 *Pearson's correlation between two variables with a confidence interval of 95%*

Participants	ID429	ID590	ID624	ID923
Stress&Craving	0.02	0.02	0.14	0.29
Stress&Self-efficacy	-0.25	-0.37	-0.57	-0.31
Stress&Affect	-0.02	-0.09	-0.19	0.14
Craving& Self-efficacy	-0.06	-0.14	-0.07	-0.37
Craving&Affect	-0.04	-0.01	-0.06	0.06
Affect&Self-efficacy	-0.05	0.04	0.20	0.00
Number of excluded observations/Total number of observations	1/331	1/442	11/331	1/429

6.6 Codebook exit interviews

Participants	Topic	Sub-Topic	Sub-sub Topic	Examples
	Predictors	Stress		
			Stress regarding tolapse	Stress weg. Je drinkt niet omdat je het lekker vindt, maar om dat effect. Maar ik denk dat die van stress- Ik denk dat je die minder snel aan ziet komen dan die als je, een beloning.
		Self-efficacy		Y: Het is niet dat iemand dan eentje voor me neerzet en wegloopt en niemand is om me heen, zolang ik niet wegloop. Ik heb wel in de situatie ingevuld hoe ik was.
			Self-efficacy regard	Een beetje alles in samenhang. Maar ik had ook weleens bijvoorbeeld een twee of een drie trek. Dan was ik gewoon aan het werk, maar toen dacht daaraan. O, dat zou wel lekker zijn om iets te drinken, dus. Als ik alleen was had ik wel een paar keer tien, toen ik gedronken had.

			ingtolapse	
		Affect		Fysieke. En positief, bij mij is dat heel erg makkelijk, want ik slik antidepressiva. Dus als ik echt een moment heb dat ik niet lekker ga, dan heb ik gewoon negatief. Maar dat kwam niet heel vaak voor. Dat heeft ook met antidepressiva's denk ik
			Affect regardingtolapse	Toen ik vier en een half maand dus niet heb gedronken, daarvoor slikte ik ook antidepressiva, maar die werkten niet goed, omdat die, drank maakt dat eigenlijk overbodig. Sinds ik gestopt was, toen sloeg dat bij mij heel goed aan. Alleen als het toen een paar keer mis is gegaan dan merk je wel meteen
		Craving		weleens trek gehad en dat ik gewoon weet van, ik kan vanavond niet of het lukt niet. Ik heb ook weleens trek gehad dat ik weet dat het lukt Ja, op een gegeven moment dan heb je zoiets ja, pff. Je lichaam wil dat gewoon of de trek wordt soms is trek moeilijk te

				beschrijven
			Craving regarding to lapse	Maar denk ook dat je verschillende soorten trek hebt. Als ik stress heb, is de trek hoger dan als ik blij ben. Als ik blij ben, neig je ook om jezelf te belonen, maar als je stress hebt, dan is de trek gewoon hoger. Is een verschillende soort trek, vind ik
	Dependent variable	(re)Lapse		Twee maandjes, twee en een halve maandjes dat het weer een paar keer mis is gegaan, laat ik het zo zeggen. Maar niet echt uit de hand zoals het eerst weleens gebeurde

6.7 R Script

```
#-----------------------------------------------------------------------------------------
#*****Set WD
#-----------------------------------------------------------------------------------------
setwd("C:/Users/Sandra/Desktop/Uni/Master/MasterThese/R_Analyse")
#-----------------------------------------------------------------------------------------
#*****Read Data
#-----------------------------------------------------------------------------------------
daily_diary =
        read.csv("C:/Users/Sandra/Desktop/Uni/Master/MasterThese/R_Analyse/Daily_Diary.
        csv",header=T)
prompt_results =
        read.csv("C:/Users/Sandra/Desktop/Uni/Master/MasterThese/R_Analyse/Prompt_resu
        lts.csv",header=T)
#-----------------------------------------------------------------------------------------
#*****Identifying lapses
#-----------------------------------------------------------------------------------------
subset_lapse <- subset(daily_diary,daily_diary$Eenheden1 > 0 | ### create one variable for
        lapse
                daily_diary$Eenheden4 > 0 |
```

```
                daily_diary$Eenheden7 > 0 |
                daily_diary$Eenheden10 > 0 |
                daily_diary$Eenheden13 > 0 |
                daily_diary$Eenheden16 > 0 |
                daily_diary$Eenheden19 > 0 |
                daily_diary$Eenheden22 > 0)

user <- summary(subset_lapse$gvUser)  ### identifying user which reported lapses

ID="ID923"     ####each participant will be analyzed seperatly
#-------------------------------------------------------------------------------------------
#*****Create Subsets_ID
#-------------------------------------------------------------------------------------------
subset_ID <- subset(prompt_results, prompt_results$gvUser == ID)
#-------------------------------------------------------------------------------------------
#*****Plots Craving
#-------------------------------------------------------------------------------------------
Craving_temp <- data.frame(Trek1=subset_ID$ATrek1, ### creating one craving variable out
        of 8
                Trek4=subset_ID$ATrek4,
                Trek7=subset_ID$ATrek7,
                Trek10=subset_ID$ATrek10,
                Trek13=subset_ID$ATrek13,
                Trek16=subset_ID$ATrek16,
                Trek19=subset_ID$ATrek19,
                Trek22=subset_ID$ATrek22)

Craving <- data.frame(Trek=subset_ID$ATrek1,
        Datum=strptime(subset_ID$Handover,format="%d.%m.%Y %H:%M:%S"))
        ###create table with two columns (Trek & Datum)
for(i in c(1:nrow(Craving))) ### i = col, j= row
{
  for(j in c(1:8))
  {
    if(is.na(Craving_temp)[i,j] == FALSE)
    {
      Craving[i,1] = Craving_temp[i,j]       #first col: craving value
    }
  }
}

Craving<- Craving[complete.cases(Craving), ] ### exclude NA's

plot(Craving[,2], Craving[,1], type="o",xaxt='n',xlab = "100 days of
        experiment",ylab="Craving level",xaxt='n',main = "Craving level during the
        experiment")
points(Lapse$Datum,Lapse$Eenheden1, col="red")
abline(v=Lapse$Datum, col="red")
legend("topright", inset = 0,c("Lapse"),col=c("red"),lty=c(1),cex=0.5,bty="n")
#-------------------------------------------------------------------------------------------
#*****plots   stress
```

```
#-----------------------------------------------------------------------------------------
Stress <-data.frame(Stress=subset_ID$Stress,
        Datum=strptime(subset_ID$Handover,format="%d.%m.%Y %H:%M:%S"))
Stress<- Stress[complete.cases(Stress), ]

plot(Stress[,2], Stress[,1], type="o",xlab = "100 days of experiment",ylab="Stress
        level",xaxt='n',main = "Stress level during the experiment")
points(Lapse$Datum,Lapse$Eenheden1, col="red")
abline(v=Lapse$Datum, col="red")
legend("topright", inset = 0,c("Lapse"),col=c("red"),lty=c(1),cex=0.5,bty="n")

#-----------------------------------------------------------------------------------------
#*****plots Self-efficacy
#-----------------------------------------------------------------------------------------
Self_efficacy <- data.frame(Self_efficacy=subset_ID$Coping,
        Datum=strptime(subset_ID$Handover,format="%d.%m.%Y %H:%M:%S"))
Self_efficacy <- Self_efficacy[complete.cases(Self_efficacy), ]

plot(Self_efficacy[,2], Self_efficacy[,1], type="o",xaxt='n',xlab = "100 days of
        experiment",ylab="Self-efficacy level",xaxt='n',main = "Self-efficacy level during the
        experiment")
points(Lapse$Datum,Lapse$Eenheden1, col="red")
abline(v=Lapse$Datum, col="red")
legend("topright", inset = 0,c("Lapse"),col=c("red"),lty=c(1),cex=0.5,bty="n")
#-----------------------------------------------------------------------------------------
# plots mood
#-----------------------------------------------------------------------------------------
Mood_1 <-data.frame(Mood_1=subset_ID$Mood_1_1,
        Datum=strptime(subset_ID$Handover,format="%d.%m.%Y %H:%M:%S"))
Mood_1<- Mood_1[complete.cases(Mood_1), ]

plot(Mood_1[,2], Mood_1[,1], type="o",xaxt='n',xlab = "100 days of
        experiment",ylab="Affect level",xaxt='n',main = "Affect level during the experiment")
        ### Mood_1 becomes Mood
points(Lapse$Datum,Lapse$Eenheden1, col="red")
abline(v=Lapse$Datum, col="red")
legend("topright", inset = 0,c("Lapse"),col=c("red"),lty=c(1),cex=0.5,bty="n")

Mood_2 <-data.frame(Mood_2=subset_ID$Mood_1_2,
        Datum=strptime(subset_ID$Handover,format="%d.%m.%Y %H:%M:%S"))
Mood_2<- Mood_2[complete.cases(Mood_2), ]

plot(Mood_2[,2], Mood_2[,1], type="o",xaxt='n',xlab = "100 days of
        experiment",ylab="Energy level",xaxt='n',main = "Energy level during the
        experiment") ### Mood_2 becomes Energy
points(Lapse$Datum,Lapse$Eenheden1, col="red")
abline(v=Lapse$Datum, col="red")
legend("topright", inset = 0,c("Lapse"),col=c("red"),lty=c(1),cex=0.5,bty="n")
#-----------------------------------------------------------------------------------------
#*****create new subset2 for Lapse
#-----------------------------------------------------------------------------------------
```

```
subset2_ID <- subset(daily_diary, daily_diary$gvUser == ID)
#-------------------------------------------------------------------------------------------
#*****create new subset2 for Lapse
#-------------------------------------------------------------------------------------------
Lapse_Temp <- data.frame(Lapse1=subset2_ID$Eenheden1,
                         Lapse4=subset2_ID$Eenheden4,
                         Lapse7=subset2_ID$Eenheden7,
                         Lapse10=subset2_ID$Eenheden10,
                         Lapse13=subset2_ID$Eenheden13,
                         Lapse16=subset2_ID$Eenheden16,
                         Lapse19=subset2_ID$Eenheden19,
                         Lapse22=subset2_ID$Eenheden22)

Lapse <- data.frame(Eenheden=subset2_ID$Eenheden1,
          Datum=strptime(subset2_ID$End,format="%d.%m.%Y %H:%M:%S"))  ###create
          table with two columns (Trek & Datum)

for(i in c(1:nrow(Lapse))) ### i = col, j= row
{
  for(j in c(1:8))
  {
    if(is.na(Lapse_Temp)[i,j] == FALSE)
    {
      Lapse[i,1] = Lapse_Temp[i,j]
    }
  }
}
plot(Lapse[,2], Lapse[,1],xlab = "100 days of experiment",ylab="Number of alcohol
          consumption",main = "Total number of Lapses")

Lapse<- Lapse[complete.cases(Lapse), ] ### exclude NA's
#plot(Lapse[,2], Lapse[,1],xlab = "Time",ylab="Lapse",main = "All Lapses") ###plot all
          lapses
###-----------------------------------------------------------------------------------
# Time related lapse analysis
###-----------------------------------------------------------------------------------
mean_TBL <- data.frame(matrix(ncol = 5 , nrow = nrow(Lapse)))
colnames(mean_TBL) <- c("Stress","Self_efficacy","Mood_1","Mood_2", "Craving")

TBL <- 7*24*60*60          #timeperiod before lapse [in seconds]
TAL <- 3*24*60*60          #timeperiod after lapse [in seconds]

### Stress
acf_stress <- data.frame(matrix(ncol = nrow(Lapse) , nrow = 50))
colnames(acf_stress) <- c(1:nrow(Lapse))

for(i in c(1:nrow(Lapse)))
{
  Stress_TL <- Stress[Stress$Datum <= Lapse$Datum[i]+TAL,]     # limit time after lapse (
          from TAL to neg infinity)
```

```
 Stress_TL <- Stress[Stress$Datum > (Lapse$Datum[i]-TBL),]    # limit time before lapse
       (from TBL to pos infinity)
 Stress_TBL <- Stress_TL[Stress_TL$Datum <= Lapse$Datum[i],] ###stress before lapse
 Stress_TAL <- Stress_TL[Stress_TL$Datum > Lapse$Datum[i],]  ###stress before lapse

 mean_TBL$Stress[i]  <- mean(Stress_TBL$Stress)

 seq_time <- seq(from=as.POSIXct(Lapse$Datum[i]-
       TBL),to=as.POSIXct(Lapse$Datum[i]+TAL), by=24*60*60)

 plot(Stress$Datum,Stress$Stress,
     xlim=c(Lapse$Datum[i]-TBL,Lapse$Datum[i]+TAL), type="o",xaxt='n',xlab = "7days
       before/3days after lapse",ylab="Stress level",xaxt='n',main = " Week mean stress vs
       stress total ")
 axis(1, at=seq_time, labels=c(-7:3))
 points(Lapse$Datum,Lapse$Eenheden1, col="red")
 abline(v=Lapse$Datum, col="red")
 lines(c(Stress_TL$Datum[1]-
       TBL,Lapse$Datum[i]),c(mean(Stress_TBL$Stress),mean(Stress_TBL$Stress)),col="b
       lue")

       lines(c(Lapse$Datum[i],Stress_TL$Datum[nrow(Stress_TL)]+TAL),c(mean(Stress_T
       AL$Stress),mean(Stress_TAL$Stress)),col="green")
 abline(h=mean(Stress$Stress),col="purple")
 abline(h=(mean(Stress$Stress)+sd(Stress$Stress)),col="purple",lty=2)
 abline(h=(mean(Stress$Stress)-sd(Stress$Stress)),col="purple",lty=2)
 abline(h=(mean(Stress_TBL$Stress)+sd(Stress_TBL$Stress)),col="blue",lty=2)##### bis
       jetzt nur stress TBL / to do: Stress
 abline(h=(mean(Stress_TBL$Stress)-sd(Stress_TBL$Stress)),col="blue", lty=2)
 legend("topright", inset = 0,c("Stress week", "Stress total", "sd Stress week", "sd Stress
       total","Lapse"),col=c("blue","purple","blue","purple","red"),lty=c(1,1,2,2,1),cex=0.5,b
       ty="n")

 # Fill matrix Stress_TBL/Lapse
 for(j in c(1:nrow(Stress_TBL)))
 {
  acf_stress[j,i] <- Stress_TBL$Stress[j]
 }

}

### self efficacy

acf_Self_efficacy <- data.frame(matrix(ncol = nrow(Lapse) , nrow = 50))
colnames(acf_Self_efficacy) <- c(1:nrow(Lapse))

for(i in c(1:nrow(Lapse)))
{
 Self_efficacy_TL <- Self_efficacy[Self_efficacy$Datum <= Lapse$Datum[i]+TAL,]    #TL
       = Time Lapse
 Self_efficacy_TL <- Self_efficacy[Self_efficacy$Datum > (Lapse$Datum[i]-TBL),]
```

```
 Self_efficacy_TBL <- Self_efficacy_TL[Self_efficacy_TL$Datum <= Lapse$Datum[i],]
        ###means  before lapse
 Self_efficacy_TAL <- Self_efficacy_TL[Self_efficacy_TL$Datum > Lapse$Datum[i],]
        ###means  before lapse

 mean_TBL$Self_efficacy[i]  <-  mean(Self_efficacy_TBL$Self_efficacy)

 seq_time <- seq(from=as.POSIXct(Lapse$Datum[i]-
        TBL),to=as.POSIXct(Lapse$Datum[i]+TAL), by=24*60*60)

 plot(Self_efficacy$Datum,Self_efficacy$Self_efficacy,
     xlim=c(Lapse$Datum[i]-TBL,Lapse$Datum[i]+TAL), type = "o",xaxt='n',xlab = "7days
        before/3days after lapse",ylab="Self-efficacy",xaxt='n',main = " Week mean self-
        efficacy vs self-efficacy total")
 axis(1, at=seq_time, labels=c(-7:3))
 points(Lapse$Datum,Lapse$Eenheden1, col="red")
 abline(v=Lapse$Datum, col="red")
 lines(c(Self_efficacy_TL$Datum[1]-TBL,Lapse$Datum[i]),c(
        mean(Self_efficacy_TBL$Self_efficacy),
        mean(Self_efficacy_TBL$Self_efficacy)),col="blue")
 lines(c(Lapse$Datum[i],Self_efficacy_TL$Datum[nrow(Self_efficacy_TL)]+TAL),c(
        mean(Self_efficacy_TAL$Self_efficacy),
        mean(Self_efficacy_TAL$Self_efficacy)),col="green")
 abline(h=mean(Self_efficacy$Self_efficacy),col="purple")

        abline(h=(mean(Self_efficacy$Self_efficacy)+sd(Self_efficacy$Self_efficacy)),col="p
        urple", lty=2)
 abline(h=(mean(Self_efficacy$Self_efficacy)-sd(Self_efficacy$Self_efficacy)),col="purple",
        lty=2)

        abline(h=(mean(Self_efficacy_TBL$Self_efficacy)+sd(Self_efficacy_TBL$Self_effic
        acy)),col="blue", lty=2 )
 abline(h=(mean(Self_efficacy_TBL$Self_efficacy)-
        sd(Self_efficacy_TBL$Self_efficacy)),col="blue", lty=2 )
 legend("topright", inset = 0,c("Self-efficacy week", "Self-efficacy total", "sd Self-efficacy
        week", "sd Self-efficacy
        total","Lapse"),col=c("blue","purple","blue","purple","red"),lty=c(1,1,2,2,1),cex=0.5,b
        ty="n")
 for(j in c(1:nrow(Self_efficacy_TBL)))
 {
   acf_Self_efficacy[j,i] <- Self_efficacy_TBL$Self_efficacy[j]
 }

}
###Mood1
acf_Mood_1 <- data.frame(matrix(ncol = nrow(Lapse) , nrow = 50))
colnames(acf_Mood_1) <- c(1:nrow(Lapse))

for(i in c(1:nrow(Lapse)))
{
 Mood_1_TL <- Mood_1[Mood_1$Datum <= Lapse$Datum[i]+TAL,]     #TL = Time Lapse
```

```
 Mood_1_TL <- Mood_1[Mood_1$Datum > (Lapse$Datum[i]-TBL),]
 Mood_1_TBL <- Mood_1_TL[Mood_1_TL$Datum <= Lapse$Datum[i],] ###means  before
       lapse
 Mood_1_TAL <- Mood_1_TL[Mood_1_TL$Datum > Lapse$Datum[i],] ###means  before
       lapse

 mean_TBL$Mood_1[i]  <-  mean(Mood_1_TBL$Mood_1)

 seq_time <- seq(from=as.POSIXct(Lapse$Datum[i]-
       TBL),to=as.POSIXct(Lapse$Datum[i]+TAL), by=24*60*60)

 plot(Mood_1$Datum,Mood_1$Mood_1,
     xlim=c(Lapse$Datum[i]-TBL,Lapse$Datum[i]+TAL), type = "o",xaxt='n',xlab = "7days
       before/3days after lapse",ylab="Affect",xaxt='n',main = " Week mean affect vs affect
       total")
 axis(1, at=seq_time, labels=c(-7:3))
 points(Lapse$Datum,Lapse$Eenheden1, col="red")
 abline(v=Lapse$Datum, col="red")
 lines(c(Mood_1_TL$Datum[1]-
       TBL,Lapse$Datum[i]),c(mean(Mood_1_TBL$Mood_1),mean(Mood_1_TBL$Mood_
       1)),col="blue")

       lines(c(Lapse$Datum[i],Mood_1_TL$Datum[nrow(Mood_1_TL)]+TAL),c(mean(Mo
       od_1_TAL$Mood_1),mean(Mood_1_TAL$Mood_1)),col="green")
 abline(h=mean(Mood_1$Mood_1),col="purple")
 abline(h=(mean(Mood_1$Mood_1)+sd(Mood_1$Mood_1)),col="purple", lty=2)
 abline(h=(mean(Mood_1$Mood_1)-sd(Mood_1$Mood_1)),col="purple", lty=2)
 abline(h=(mean(Mood_1_TBL$Mood_1)+sd(Mood_1$Mood_1)),col="blue", lty=2 )
 abline(h=(mean(Mood_1_TBL$Mood_1)+sd(Mood_1_TBL$Mood_1)),col="blue", lty=2 )
 abline(h=(mean(Mood_1_TBL$Mood_1)-sd(Mood_1_TBL$Mood_1)),col="blue", lty=2 )
 legend("topright", inset = 0,c("Affect week", "Affect total", "sd Affect week", "sd Affect
       total","Lapse"),col=c("blue","purple","blue","purple","red"),lty=c(1,1,2,2,1),cex=0.5,b
       ty="n")
 for(j in c(1:nrow(Mood_1_TBL)))
 {
  acf_Mood_1[j,i] <- Mood_1_TBL$Mood_1[j]
 }

}

###Mood2
acf_Mood_2 <- data.frame(matrix(ncol = nrow(Lapse) , nrow = 50))
colnames(acf_Mood_2) <- c(1:nrow(Lapse))

for(i in c(1:nrow(Lapse)))
{
 Mood_2_TL <- Mood_2[Mood_1$Datum <= Lapse$Datum[i]+TAL,]     #TL = Time Lapse
 Mood_2_TL <- Mood_2[Mood_1$Datum > (Lapse$Datum[i]-TBL),]
 Mood_2_TBL <- Mood_2_TL[Mood_2_TL$Datum <= Lapse$Datum[i],] ###means  before
       lapse
```

```
 Mood_2_TAL <- Mood_2_TL[Mood_2_TL$Datum > Lapse$Datum[i],] ###means  before
       lapse

 mean_TBL$Mood_2[i]  <-  mean(Mood_2_TBL$Mood_2)


 seq_time <- seq(from=as.POSIXct(Lapse$Datum[i]-
       TBL),to=as.POSIXct(Lapse$Datum[i]+TAL), by=24*60*60)

 plot(Mood_2$Datum,Mood_2$Mood_2,
     xlim=c(Lapse$Datum[i]-TBL,Lapse$Datum[i]+TAL), type = "o",xaxt='n',xlab = "7days
       before/3days after lapse",ylab="Energy",xaxt='n',main = " Week mean energy vs
       energy total")
 axis(1, at=seq_time, labels=c(-7:3))
 points(Lapse$Datum,Lapse$Eenheden1, col="red")
 abline(v=Lapse$Datum, col="red")
 lines(c(Mood_2_TL$Datum[1]-
       TBL,Lapse$Datum[i]),c(mean(Mood_2_TBL$Mood_2),mean(Mood_2_TBL$Mood_
       2)),col="blue")

       lines(c(Lapse$Datum[i],Mood_2_TL$Datum[nrow(Mood_2_TL)]+TAL),c(mean(Mo
       od_2_TAL$Mood_2),mean(Mood_2_TAL$Mood_2)),col="green")
 abline(h=mean(Mood_2$Mood_2),col="purple")
 abline(h=(mean(Mood_2$Mood_2)+sd(Mood_2$Mood_2)),col="purple", lty=2)
 abline(h=(mean(Mood_2$Mood_2)-sd(Mood_2$Mood_2)),col="purple", lty=2)
 abline(h=(mean(Mood_2_TBL$Mood_2)+sd(Mood_2_TBL$Mood_2)),col="blue", lty=2 )
 abline(h=(mean(Mood_2_TBL$Mood_2)-sd(Mood_2_TBL$Mood_2)),col="blue", lty=2 )
 legend("topright", inset = 0,c("Energy week", "Energy total", "sd Energy week", "sd Energy
       total","Lapse"),col=c("blue","purple","blue","purple","red"),lty=c(1,1,2,2,1),cex=0.5,b
       ty="n")
 for(j in c(1:nrow(Mood_2_TBL)))
 {
  acf_Mood_2[j,i] <- Mood_2_TBL$Mood_2[j]
 }

}

###Craving
acf_Craving <- data.frame(matrix(ncol = nrow(Lapse) , nrow = 50))
colnames(acf_Craving) <- c(1:nrow(Lapse))

for(i in c(1:nrow(Lapse)))
{
 Craving_TL <- Craving[Craving$Datum <= Lapse$Datum[i]+TAL,]     #TL = Time Lapse
 Craving_TL <- Craving[Craving$Datum > (Lapse$Datum[i]-TBL),]
 Craving_TBL <-Craving_TL[Craving_TL$Datum <= Lapse$Datum[i],] ###means before
       lapse
 Craving_TAL <- Craving_TL[Craving_TL$Datum > Lapse$Datum[i],] ###means before
       lapse

 mean_TBL$Craving[i]  <-  mean(Craving_TBL$Trek)
```

```
  seq_time <- seq(from=as.POSIXct(Lapse$Datum[i]-
        TBL),to=as.POSIXct(Lapse$Datum[i]+TAL), by=24*60*60)

  plot(Craving$Datum,Craving$Trek,
      xlim=c(Lapse$Datum[i]-TBL,Lapse$Datum[i]+TAL), type = "o",xaxt='n',xlab = "7days
        before/3days after lapse",ylab="Craving",xaxt='n',main = " Week mean craving vs
        craving total")
  axis(1, at=seq_time, labels=c(-7:3))
  points(Lapse$Datum,Lapse$Eenheden, col="red")
  abline(v=Lapse$Datum, col="red")
  lines(c(Craving_TL$Datum[1]-TBL,Lapse$Datum[i]),c( mean(Craving_TBL$Trek),
        mean(Craving_TBL$Trek)),col="blue")

        lines(c(Lapse$Datum[i],Craving_TL$Datum[nrow(Craving_TL)]+TAL),c(mean(Crav
        ing_TAL$Trek),mean(Craving_TAL$Trek)),col="green")
  abline(h=mean(Craving$Trek),col="purple")
  abline(h=(mean(Craving$Trek)+sd(Craving$Trek)),col="purple", lty=2)
  abline(h=(mean(Craving$Trek)-sd(Craving$Trek)),col="purple", lty=2)
  abline(h=(mean(Craving_TBL$Trek)+sd(Craving_TBL$Trek)),col="blue", lty=2 )
  abline(h=(mean(Craving_TBL$Trek)-sd(Craving_TBL$Trek)),col="blue", lty=2 )
  legend("topright", inset = 0,c("Craving week", "Craving total", "sd Craving week", "sd
        Craving
        total","Lapse"),col=c("blue","purple","blue","purple","red"),lty=c(1,1,2,2,1),cex=0.5,b
        ty="n")

  for(j in c(1:nrow(Craving_TBL)))
  {
    acf_Craving[j,i] <- Craving_TBL$Trek[j]
  }

}

###Plot of all means before lapses (mean_TBL)

#Plot variables range from 0-10 (stress,craving)
plot(c(1:(nrow(Lapse))),mean_TBL$Stress,type="o",ylim=c(0,6),xlab = "Participants
        lapses",ylab=" Stress/Craving level",xaxt='n',main = "Mean stress/craving level prior
        to lapse")
axis(1, at=c(1:(nrow(Lapse))), labels=c(c(1:nrow(Lapse))))
abline(h=mean(Stress$Stress),col="black", lty=2)
grid()
points(c(1:(nrow(Lapse))),mean_TBL$Craving,type="o",col="green")
abline(h=mean(Craving$Trek),col="green", lty=2)
legend("topright", inset = 0,c("Stress","Craving", "Stress total", "Craving
        total"),col=c("black","green","black","green"),lty=c(1,1,2,2),cex=0.5,bty="n")

#Plot variables range from 0-10 (self_efficacy)
plot(c(1:(nrow(Lapse))),mean_TBL$Self_efficacy,type="o",col="blue",ylim=c(5.5,10),xlab =
        "Participants lapses",ylab="Self-efficacy level",xaxt='n',main = "Mean self-efficacy
        level prior to lapse")
```

```
axis(1, at=c(1:(nrow(Lapse))), labels=c(c(1:nrow(Lapse))))
grid()
abline(h=mean(Self_efficacy$Self_efficacy),col="blue", lty=2)
legend("topright", inset = 0,c( "Self_efficacy", "self-efficacy total"),col=c("blue",
        "blue"),lty=c(1,2),cex=0.5,bty="n")

#Plot variables range from -50 to 50 (Mood 1&2)
plot(c(1:(nrow(Lapse))),mean_TBL$Mood_1,type="o",ylim=c(-20,30),xlab = "Participants
        lapses",ylab="Affect level",xaxt='n',main = "Mean affect level prior to lapse")
axis(1, at=c(1:(nrow(Lapse))), labels=c(c(1:nrow(Lapse))))
abline(h=mean(Mood_1$Mood_1),col="black", lty=2)
grid()
points(c(1:(nrow(Lapse))),mean_TBL$Mood_2,type="o",col="red")
abline(h=mean(Mood_2$Mood_2),col="red", lty=2)
legend("topright", inset = 0,c("Affect", "Energy", "Affect total", "Energy
        total"),col=c("black","red","black","red"),lty=c(1,1,2,2),cex=0.5,bty="n")

### descriptive statistics of variables
summary(Stress[1])
sapply(Stress[1],quantile, na.rm=TRUE)
sapply(Stress[1],sd, na.rm=TRUE)
sapply(Stress[1],var, na.rm=TRUE)
sapply(Stress[1],range, na.rm=TRUE)

summary(Self_efficacy[1])
sapply(Self_efficacy[1],quantile, na.rm=TRUE)
sapply(Self_efficacy[1],sd, na.rm=TRUE)
sapply(Self_efficacy[1],var, na.rm=TRUE)

summary(Mood_1[1])
sapply(Mood_1[1],quantile, na.rm=TRUE)
sapply(Mood_1[1],sd, na.rm=TRUE)
sapply(Mood_1[1],var, na.rm=TRUE)

summary(Mood_2[1])
sapply(Mood_2[1],quantile, na.rm=TRUE)
sapply(Mood_2[1],sd, na.rm=TRUE)
sapply(Mood_2[1],var, na.rm=TRUE)

summary(Craving[1])
sapply(Craving[1],quantile, na.rm=TRUE)
sapply(Craving[1],sd, na.rm=TRUE)
sapply(Craving[1],var, na.rm=TRUE)

summary(Stress_TBL[1])
sapply(Stress_TBL[1],sd, na.rm=TRUE)

###Autocorrelation
lag <- 1    # Autocorrelation Lag 1
p <- FALSE  #FALSE=no acf plots
table_acf <- data.frame(matrix(ncol = 5 , nrow = nrow(Lapse)+1))
```

```
colnames(table_acf) <- c("Stress","Self_efficacy","Mood_1","Mood_2", "Craving")
rownames(table_acf) <- c("acf_total",c(1:nrow(Lapse)))

table_acf[1,1] <- acf(Stress[1],20)[lag]
table_acf[1,2] <- acf(Self_efficacy[1],20)[lag]
table_acf[1,3] <- acf(Mood_1[1],20)[lag]
table_acf[1,4] <- acf(Mood_2[1],20)[lag]
table_acf[1,5] <- acf(Craving[1],20)[lag]

for(i in c(1:nrow(Lapse)))
{
  table_acf[i+1,1] <- acf(acf_stress[,i],20,na.action = na.pass, plot = p,
          main=paste0("acf_stress_Lapse_",i))[lag]
  table_acf[i+1,2] <- acf(acf_Self_efficacy[,i],20,na.action = na.pass, plot = p,
          main=paste0("acf_self_efficacy_Lapse_",i))[lag]
  table_acf[i+1,3] <- acf(acf_Mood_1[,i],20,na.action = na.pass, plot = p,
          main=paste0("acf_Mood_1_Lapse_",i))[lag]
  table_acf[i+1,4] <- acf(acf_Mood_2[,i],20,na.action = na.pass, plot = p,
          main=paste0("acf_Mood_2_Lapse_",i))[lag]
  table_acf[i+1,5] <- acf(acf_Craving[,i],20,na.action = na.pass, plot = p,
          main=paste0("acf_Craving_Lapse_",i))[lag]
}

plot(c(1:(nrow(Lapse)+1)),table_acf$Stress,type="o",ylim=c(min(table_acf),max(table_acf)),
          xlab = "Lapse",ylab="acf",xaxt='n',main = "Autocorrelation of independent
          variables(Lag1)")
axis(1, at=c(1:(nrow(Lapse)+1)), labels=c("Total",c(1:nrow(Lapse))))
grid()
points(c(1:(nrow(Lapse)+1)),table_acf$Self_efficacy,type="o",col="red")
points(c(1:(nrow(Lapse)+1)),table_acf$Mood_1,type="o",col="blue")
points(c(1:(nrow(Lapse)+1)),table_acf$Mood_2,type="o",col="orange")
points(c(1:(nrow(Lapse)+1)),table_acf$Craving,type="o",col="green")
legend("topright", inset = 0,c("Stress",
          "Self_efficacy","Mood_1","Mood_2","Craving"),col=c("black","red", "blue",
          "orange","green"),lty=c(1,1),cex=0.5,bty="n")

####################Correlations between predictors
drops <- c()
Stress <- Stress [-drops,]
Self_efficacy<- Self_efficacy[-drops,]
Craving<- Craving[-drops,]
cor.test(Stress$Stress,Craving$Trek, method = "pearson",use = 'complete.obs')
cor.test(Mood_1$Mood_1,Craving$Trek, method = "pearson",use = 'complete.obs')
cor.test(Self_efficacy$Self_efficacy,Craving$Trek, method = "pearson",use = 'complete.obs')
cor.test(Self_efficacy$Self_efficacy,Stress$Stress, method = "pearson",use = 'complete.obs')
cor.test(Self_efficacy$Self_efficacy,Mood_1$Mood_1, method = "pearson",use =
          'complete.obs')
cor.test(Stress$Stress,Mood_1$Mood_1, method = "pearson",use = 'complete.obs')
```