**Mimicry and Deceit: A Facial Expression Analysis Experiment**

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**Abstract**

Deception is happening everywhere in the world. There is a knowledge gap between the research on how to recognize deception in deceivers compared to recognizing deception in the receiver of messages. To implicate the veracity of messages by looking at the receiver of a message and the mimicry they display is what this research is about. This was done using video stimuli of people trying to deceive the audience and video stimuli in which people were genuine. The participants (N=65) watched the videos and had to decide if they believed the person in the video to be truthful or not. The facial expressions of the participants were then compared to the facial expressions of the people in the videos to see how much mimicry was displayed. A significant effect was found in people's mimicry of the people in the guilty video condition. This suggests that people looking at a deceiver will display more mimicry than when looking at an honest person. Since there is not much research, in the field of deception detection, on mimicry of a person receiving a message, more research will be needed to confirm these findings and expand on them.

*Keywords:* deception detection, facial mimicry, veracity judgements

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**Introduction**

As deception belongs to everyday human social interaction, everybody has experienced being lied to and has experienced lying themselves in different situations. Through TV, e.g., series like "Lie to me", deception was also used for entertainment in which the main character has the special ability to detect deception by watching other people's facial expressions. The ability to detect lies is something everyone would like to have, and it can be especially important to the police or courts when they judge suspects solely based on their words. One of the first published research articles about deception detection is from the early 20th century by Larson (1921). The author studied the correlation between blood pressure and deceptive activities and concluded that there are differences in blood pressure (Larson, 1921). However, the author goes on to state that the misinterpretation of the variation in blood pressure can be cause for false conclusions (Larson, 1921). Different aspects of the behaviour of deceivers and responses of receivers of messages were investigated in the past like body expressions or eye movements. One of these aspects is the mimicry of facial expressions which this paper will be focused on. While past research usually focused their attention on the sender of the message, this research will focus on the receiver, as the research in that area lacks. Furthermore, in real life, the receiver could be easier to study, because in some situations it can be harder to convince somebody to submit to a way in which lies could be detected. That is why the following thesis will try to answer the question: What is the impact of factual veracity of messages on the mimicry of facial expressions of a person receiving a message?

**Theoretical Framework**

*Deception detection*

Deception was defined in different ways over the time, but the essence is mostly the same (Zuckerman et al., 1981). The core of deception is the conscious and deliberate effort to make another person believe something that the deceiver believes to be wrong (Zuckerman et al., 1981). For the human eye the detection of deceptions is not possible and is mostly based on guessing, leaving a 50% chance of being correct (Porter & ten Brinke, 2008; Stel et al., 2009; van't Veer et al., 2015). The important aspects here are that there is a choice of the deceiver to deceive, that this action is aimed at another person, and that the deceiver believes the information they are presenting to be false. Zuckerman et al. (1981) state that a deceiver's nonverbal channels could be hard to control while trying to deceive someone. This is something that could be used in deception detection, as a deceiver displays different behaviours or responses as someone who tells the truth. Deception detection can be described as noticing the

truthfulness or deceitfulness of another person (Levine, 2014). Ten Brinke and Porter (2012) state that facial expressions could not be easily adjusted to the emotions a person wants to display. In contrast to that, Zuckerman et al. (1981) state that facial movements are easy to control. Therefore, they assumed that it was harder to detect deception by just looking at someone's face (Zuckerman et al., 1981). Ten Brinke and Porter (2012) suggest multiple area analysis for the detection of deception. Looking at multiple factors can increase reliability of lie detection, which they did by looking at the upper face, lower face, word count and percentage of tentative words. To record and analyse these different factors, tools are being developed more and more. Furthermore, the authors state that facial expression and tools to analyse facial expressions got better and can be used more easily nowadays (ten Brinke & Porter, 2012). Another important factor in deception detection studies can be people's judgements of whether someone is honest or deceitful.

### *Veracity judgements*

In some studies, about deception detection, direct and indirect veracity questions were asked of the participants to get an indication on how believable a person appears (van't Veer et al., 2015). Studies about deception detection often ask for the veracity judgments participants make to not only get an indication of whether they believe a person or not but also to get an indication of the cues that were used to make that decision (Schimmel, 2021). These cues are linked to deception detection research as observable nonverbal behaviours and body movements. Direct veracity judgments are made by answering a question about the extent to which a person is estimated to be truthful for example 'The target lied about the colour of the car'. Indirect veracity judgments can be inferred by asking questions about psychological constructs, like acting cooperatively, related to deception such as 'Lisa seemed cooperative.', which measures the construct of being cooperative (Schimmel, 2021). Judgements about the truthfulness of another person are common in studies about lie detection (Levine et al., 1999; Schimmel, 2021). Results of the study by Levine et al. (1999) showed a higher accuracy for detecting truth than for detecting lies. This was found due to the truth bias, that according to Levine et al. (1999) is very common. Veracity judgements are asked of the participants of a study to assess to what extent they believe another person to be truthful and honest. The indirect variation of those judgements let the researchers get a more reliable score of whether people believe another person or not, since they are measuring more observable actions (Schimmel, 2021). One aspect a person is often looking at while making veracity judgements is the head and the expression on the face (Schimmel, 2021). The percentage of time the face is being looked at is even higher when looking at people in a video (Schimmel, 2021). This can be a

reason why facial expressions could be considered important to look at by receivers of a message.

### Facial expression

People use facial expressions to show their own emotions, also referred to as facial emotions, since the expressions found in faces can infer that a person is experiencing a specific emotion (Porter & ten Brinke, 2008). One example of this is when people lower their eyebrows, flare their nostrils, and flash their eyes which are signs of anger (Darwin, 1872 as cited in Porter & ten Brinke, 2008). Some of these expressions are only visible for less than a fifth of a second, which are called micro expressions (Porter & ten Brinke, 2008). Micro expressions are important for deception detection because the person displaying them cannot control them (Porter & ten Brinke, 2008). Porter and ten Brinke (2008) analysed the emotions happiness, sadness, fear, and disgust for the upper and lower face. Furthermore, they distinguished the veracity of the expressions in the categories genuine, simulated, and masked (Porter & ten Brinke, 2008). Ten Brinke and Porter (2012) hypothesised that facial expressions could be an important indicator to identify whether someone is lying or not. The authors studied around 80 videos of genuine and deceptive people's facial expressions who plead for their children's unharmed return home (ten Brinke & Porter, 2012). The hypothesis was tested and confirmed by ten Brinke and Porter (2012) through their study in which they found that facial emotions like sadness and distress were more often displayed by genuine people and disgust was more likely displayed by deceptive people. In contrast to this, Ekman (2006) found that the micro expressions anger, sadness and enjoyment are displayed more by people who are being questioned. This would mean that these emotions could be more likely to be found when analysing facial expressions. Ten Brinke and Porter (2012) studied real expressions and emotions, which is different from many other studies who asked participant to react in a specific way or show certain emotions (Porter & ten Brinke, 2008). This increases the reliability and validity of the data they have collected and analysed. In addition, people in their videos displayed different facial emotions, depending on the truthfulness of their statements (ten Brinke & Porter, 2012). These studies confirm that analysing facial expressions is an important part when looking at deception.

### Facial expression analysis

Analysing facial expressions is often done by looking at the upper and the lower part of the face separately (Cohen et al., 2007; Porter & ten Brinke, 2008). Research found that detecting deception just by watching an interaction is considered to be impossible, as studies state that humans have a 50/50 chance to detect a deception (Porter & ten Brinke, 2008; Stel et

al., 2009; van't Veer et al., 2015). This led to the development and improvement of tools to help measuring bodily reactions and facial reactions to lying which can be described as facial expression analysis (FEA). One of these tools is called Electromyography (EMG) which was widely used in the past to detect facial muscle contractions which can then be used as an indication for emotions (Kulke et al., 2020). This tool works by putting electrodes on the subject's face while they display certain emotions (Kulke et al., 2020). The Facial Action Coding System (FACS) developed by Hjortsjö (1970) and improved by Ekman and colleagues (1978; 2002 as cited by Cohn et al., 2007) can be used to analyse facial expressions by comparing them to so called action units. Action units are described by Cohn et al. (2007) as the smallest visible facial movements that can be distinguished. With these action units, researchers can then make inferences about what emotions were displayed (Cohen et al., 2007). This was mostly done by people at first, but since software was developed that could do the coding of facial expressions itself, it can be done by these different programs (Kulke et al., 2020). In the article by Kulke et al. (2020), the researchers explored a tool that could accurately measure the same facial expressions as the EMG but without the use of electrodes on a subject's face and furthermore could be used on video recordings, which expands its usefulness. This can be done with an iMotion software called Affectiva which was developed to detect the facial expressions of people, to further analyse them (Pedersen & Seernani, 2023; Kulke et al., 2020). It can be used on videos without any other hardware, which makes it an easy-to-use tool for studies (Pedersen & Seernani, 2023). There are two software options to analyse facial expressions. RealEyes can measure attention and the emotions displayed as a reaction to a message (Farnsworth et al., 2023). Affectiva can analyse deliberate as well as intuitive facial expressions and emotions (Farnsworth et al., 2023). While a lot of studies in which these tools were used focused on the facial expressions of the deceiver, there is not much research about the mimicry that the receiver is displaying. This could however be important to study, because while it can be difficult in some circumstances to get approval for recording and analysing the facial expressions of another person, it could be in some instances much easier to get this approval from a person perceiving the sender's message. That could mean that a receiver of a message from a deceiver could mimic their facial expressions and give clues about the truthfulness of the uttered message.

*Mimicry*

Mimicry can be described as the copying of facial expressions, movements, and postures from another person in an interaction (van der Zee et al., 2021). Usually, mimicry is not consciously perceived by either of the interacting parties (Duffy & Chartrand, 2015; Chartrand

& van Baaren, 2009). This makes it less likely to be consciously altered. Van der Zee et al. (2021) state in their article that the sender's mimicry of posture and movements increased when a lie was more complex. This can be an important finding for deception detection research. Combined with research found about the expressions of liars as previously stated, it could mean that certain facial expressions are more strongly displayed by liars during their vocalisation of a deceptive message. This could mean that the facial expressions more likely displayed will be also mimicked to a greater extend. The authors elaborate that the finding is not caused by an interviewee trying to increase their own mimicry and that the finding is not caused by the interviewer's belief in the truthfulness of the interviewee (van der Zee et al., 2021). These findings suggest that the increased cognitive load of a person telling a lie will increase the chances for them to fall back on intuitive actions like mimicry (van der Zee et al., 2021). Cognitive load describes the sum of tasks for the working memory storage and the information processing tasks (Schnotz & Kürschner, 2007). Furthermore, building a rapport and liking another person can result in increased mimicry (Chartrand & van Baaren, 2009). When focusing on the mimicry of the receiver, an article by Hess and Fischer (2014) states further that mimicry is inhibited when a person does not feel positively about a sender of messages. This is very important when looking at the mimicry the receiver displays because it could mean that the amount of mimicry displayed varies with the extent to which a receiver feels about another person. Mimicry can therefore be important in deception detection research, which previous research showed as well.

**Present study**

Unlike a lot of previous research, this research will focus on the person who receives a message. The message can either be true or false and the veracity judgements of the person receiving a message can either be high or low. Combined with the rate of mimicry that the person is displaying is what will be investigated in this study. There has been research on verbal communication as well as nonverbal communication in deception detection and some studies even tried to analyse both communication channels (Vrij et al., 2010). However, this research will focus on nonverbal communication, which can be an important aspect when detecting deception (Sebanz & Shiffrar, 2009). Since studies like the one by van der Zee et al. (2021) found significant results of increased mimicry in the sender of information when they lied, it could be interesting to see whether studying facial expressions of the receiver of a message will find similar results. This could be important to study since it is not always possible to legally record and analyse a person's facial expressions. If this study can find indications of a possible correlation between the mimicry of a person and the truthfulness of a message from another

person, it could help in different areas of society. One of those areas could be the interviews of suspects in a police investigation. Since the suspects probably do not want to be recorded and analysed, the mimicry of police officers who are conducting the interview could be analysed to find out if the suspects are more likely to deceive or to tell the truth. The mimicry could be analysed once for the amount that is displayed and secondly for the emotions which were shown more often.

Based on the theoretical constructs and research the following research question was formulated: What is the impact of factual veracity of messages on the mimicry of facial expressions of a person receiving a message? Prior research states that humans have a 50% chance of accurately telling if someone is lying or telling the truth (Porter & ten Brinke, 2008; Stel et al., 2009; van't Veer et al., 2015). However, articles by Chartrand and van Baaren (2009) and Hess and Fischer (2014) suggest that innocent people display more mimicry. Van der Zee et al. (2021) state that there can be a difference in measuring mimicry using programs compared to manual measuring of mimicry. Combined with the use of different stimuli in this study and a different facial analysis than previous research it is firstly hypothesised that: People will show more mimicry of facial expressions when they are presented with truthful statements compared to deceptive statements. The authors Hess and Fischer (2014) mentioned in their article that negative emotions about another person can inhibit mimicry. Additionally, the article by Chartrand and van Baaren (2009) showed that liking another person increases the mimicry and it is expected that truthfulness will evoke more positive feelings in another person. Therefore, it is secondly hypothesised that: People who are showing more facial mimicry have a higher veracity judgement than people showing less facial mimicry. An article by Saberi, DiPaola and Bernardet (2021) states that extraverted people show more facial expressions than introverted people. It is therefore hypothesised that: People who have a higher score on extraversion in the personality questionnaire display more mimicry than people who have a lower score on extraversion.

## Methods

### Participants

The participants in this study were recruited with the convenience sampling method and via the Sona systems, a participant pool used by the University of Twente. While there was no intentional focus on university students, with the convenience of getting a lot of participants quickly participants ended up being solely university students. In total, 65 participants took part in the study. Before the data was exported, the recorded video of the participants was checked, in which one participant had to be excluded due to the camera not being focused on the

participant and therefore the iMotion software was unable to obtain data. The mean age of participants was 21 years while the youngest person was 18 years old and the oldest 26 years old (SD=1.72). 20 participants stated that they were male and 43 stated that they were female. One participant indicated that they defined as non-binary. The sample consisted of 10 different nationalities in which most participants indicated that they came from Germany and the Netherlands. Most participants highest education was high school which was indicated by 56 participants, while only five participants already finished a bachelor's degree and three indicated secondary school as their highest education. Participants were rewarded two credits through the Sona system if they participated in the study. Psychology students at the University of Twente need 15 Sona points to successfully complete the bachelor degree of Psychology.

Participants in this study had to be over 18 years old and had to speak sufficient English to understand the content of the videos. This experimental study has been approved by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

**Materials**

The first thing used in this study were eight videos of people, expressing their thoughts and emotions to the public about their lost children (Appendix 1). The videos were recorded via news agencies. Ten Brinke and Porter (2012) used these videos previously but some of them were shortened to make it feasible for this study, since the videos were not similar in length and therefore difficult to compare. For the stimuli, videos who showed parents were chosen to keep the variable of relationship to the missing child similar. The videos showed mostly the upper bodies of either one or both parents. During the videos, parents were pleading for the public to assist in the search for their children. There were four videos in which the parents were being sincere and four in which the parents were deceptive. Ten Brinke and Porter (2012) did extensive research on the videos and the missing children's cases and only chose cases in which undisputable evidence was found of whether the parents were sincerely trying to get their children back or deceiving the public, because they themselves abducted or murdered their children. Demographic data was gathered using five questions (Appendix 2). A short personality questionnaire of the Big Five (BFI-S) by Lang et al. (2011) consisting of 15 statements was used to assess the participants personality traits (Appendix 5). Eight slightly different questionnaires by Schimmel (2021) each consisting of one direct and five indirect questions were used to find out whether the participant judged the parents' veracity higher or lower on a 7-point Likert-Scale (Appendix 6). Participants had to indicate to what extend they agreed with statements like: "The people in the video were being truthful and honest." and "The

people in the video were thinking hard before speaking." All the videos and questionnaires were displayed on an AOC 24-inch computer screen with 144Hz refresh rate. A HP Z1 tower computer with a Logitech brio streamer 4k edition webcam was used to record the participants. The computer had the iMotion software version 9.3.15 installed, which was used to capture and analyse the facial expressions of both stimuli videos and participants. The experiment took place in the Cubicus building of the University of Twente, where participants were alone in a quiet room to minimize distractions. For the analysis of the gathered data, the statistical analysis programs R version 4.3.0, R-Studios version 2023.3.1.446 and Microsoft Excel version 2303 were used.

**Design**

To study the research question and hypotheses mentioned above, an experimental, within-subjects design was chosen. The first dependent variable of the study was veracity judgements, which participants made based on the videos. That includes direct as well as indirect veracity judgements. The second dependent variable was the rate of mimicry of facial expressions. Participants were exposed to eight videos of people asking the public for help in finding their missing loved ones. The independent variable was the truthfulness of the people in the videos. In four of the videos, the person was guilty and in the other four the people were innocent.

**Procedure**

After the participants arrived, the researcher had to enter the room in which the study was done to start the study in the iMotion program. This had to be done before the participants entered the room since the program showed parts of the videos which could influence the participants. Then the participants were allowed to enter the room where they were told the instructions before leaving them alone in front of the computer with the webcam. On the table, the participant number was written on a piece of paper, which the participant had to mention in each questionnaire so the questionnaires can be linked back to the participant who watched the video. After agreeing to the privacy terms and briefing of the study (Appendix 2), questions concerning the demographic data were asked (Appendix 4). This was followed by a short personality questionnaire (Appendix 5). Next, the eight videos were shown in a random order and after each one, participants had to fill out a short questionnaire regarding their judgement on veracity of the people in the videos (Appendix 6). After approximately 20 minutes the participants finished the last questionnaire and saw a screen of the iMotion program on which the setup of the study could be seen. This meant that the study ended. The participants were debriefed orally for between one and ten minutes depending on their interest in the study.

**Data Preparation**

The mimicry of facial expressions was captured using the iMotion program to get a score for each video. In a preview, one could see that the iMotion program did in fact gather data. A threshold between 1 and 100 of what is counted as a facial emotion and facial expression had to be determined so that the data gathered can be quantified. Since the analysed data did not show strong emotions for neither the video stimuli nor the participants, a low threshold of 25 was chosen. This low threshold enabled mild facial expressions to show in the dataset as well and should therefore help to get a more complete dataset that could be analysed better. In turn this also means that the dataset will show more facial expressions which were not actually displayed to a great extent. This threshold was chosen since the videos were not of a high quality themselves, which means that the program could not work to its full capabilities. Another reason why a low threshold was chosen was because the quality of the videos led the researcher to assume that they would not create a strong enough reaction from the participants (Antons et al., 2015). Furthermore, videos were used instead of real-life stimuli which was also assumed to make participants react less strongly. The threshold is always displayed as 25 except for the negative frames, where the threshold had to be -25 because the data collected was negative. For neutral frames, the threshold was in a range from -25 to 25. An article by van Baaren et al. (2003) analysed mimicry by comparing the frequency with which specific behaviour was displayed. This is an efficient way to analyse the collected data, as the iMotion program can already analyse the frequency with which a specific facial emotion or facial expression was displayed. The data was exported from the iMotion program using CSV-files that could be opened with Microsoft Excel. Two datasets were exported, since the videos had to be analysed separately in the program from the participants. The analysis of the gathered data was conducted using Microsoft Excel, R and R-Studios. Firstly, the gathered data was cleaned by excluding participants who did not agree to the informed consent, did not finish the study or participants who had problems during the study. The video file contained one video which had to be split into two, since the iMotion software couldn't analyse the facial expressions of two people simultaneously. This split was reversed by adding the two parts into one again and adding up the counted facial expressions. The Excel files showed all 32 facial emotions and facial expressions with each threshold in a total number and a percentage compared to the total frames for each video. An article by Ekman (2006) states that emotions associated with not easily inhibited and real feelings are anger, sadness, and enjoyment. Since the facial analysis did not specify enjoyment as an emotion, joy was chosen to represent this emotion. With these three emotions that will most likely be displayed by the videos since they are not easily hidden, the

participants' mimicry was assessed. All other variables, for example count frames, threshold for each emotion, all facial expression frames, etc., were deleted to leave only the columns necessary for the analysis that was planned. For the Qualtrics questionnaires, each one was exported in an Excel file and cleaned by removing any participant who did not agree to the informed consent or did not finish all questionnaires. The participant whose facial expressions were not recorded was also removed from the datasets of the questionnaires. The datasets showing the facial expressions of the participants and the other 9 datasets showing the Qualtrics veracity judgement questionnaires, the demographic questionnaire and the personality questionnaire were put into one complete dataset to facilitate the analysis. In the next step, the data was analysed. Firstly, the veracity judgements were analysed using descriptive statistics and then compared between videos in which people were innocent and videos in which people were guilty. Descriptive statistics were used again to compare the facial mimicry of a person for videos in which the people were telling the truth and videos in which people were trying to deceive their audience. A third comparison was done, in which the mimicry of facial expressions was compared to the veracity judgements a person made.

**Data analysis**

The analysis started with the descriptive statistics of the demographics. After that, data about the personality of the participants were analysed. The data exported from the iMotion program was analysed by comparing the number of facial expressions and facial emotions displayed by the participants in comparison to the people in the videos. This was done using delta, which describes the differences in facial emotion frames between the participants and the people in the video stimuli. To test the first hypothesis and analyse the differences between the videos with innocent people and the videos with guilty people, the delta scores of the four videos with guilty people were added into a new variable. The same was done with the delta scores for the four videos with innocent people. These two new variables were showing the delta score for the total mimicry displayed by the participants and made it comparable.

To test the first hypothesis, if the differences between the total mimicry displayed in the four videos which showing honest people and the four videos showing dishonest people was significant, a paired samples t-test was chosen. First the assumption of normality was checked, using histograms (Appendix 8) and the Shapiro Wilk normality test, to see if the paired t-test can be used. After the results, the non-parametric Wilcoxon Signed-Rank test was run. For the second hypothesis, if the veracity judgement of a person correlates positively with the mimicry they display, the normality was checked using the Shapiro-Wilk normality test and histograms for each variable. Because of the results of these tests, the Spearman correlation coefficient was

chosen for each of the eight videos. Here, the p-value was checked, to see if the correlation was significant and the correlation coefficient was checked to see if the correlation was positive or negative. The third hypothesis, if extraversion correlates with the mimicry that a person displays was tested with the Spearman correlation again, since the normality was already checked for the mimicry, it did not have to be repeated. To see if there was a significant positive correlation between the extraversion score of the personality questionnaire and the mimicry displayed for each video the p-value was checked.

<div align="center">

**Results**

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**Descriptive statistics**

Firstly, the iMotion program analysed the videos stimuli the same way as the recorded participants. After cleaning the datasets, the dataset showing the facial analysis of the video stimuli was reviewed. This dataset showed that for videos 1, 2, 3 and 7 the iMotion program did not count any facial expressions for any of the three emotions chosen for this analysis. While videos 4 and 6 showed facial expressions only for joy, video 5 showed anger and joy and video 8 showed all three emotions (see Table 1).

**Table 1**

*Frames which Showed Emotions in Each Video Stimuli*

|                    | Anger Frames | Sadness Frames | Joy Frames |
|--------------------|--------------|----------------|------------|
| Video 1 (Guilty)   | 0            | 0              | 0          |
| Video 2 (Guilty)   | 0            | 0              | 0          |
| Video 3 (Guilty)   | 0            | 0              | 0          |
| Video 4 (Guilty)   | 0            | 0              | 26         |
| Video 5 (Innocent) | 81           | 0              | 26         |
| Video 6 (Innocent) | 0            | 0              | 58         |
| Video 7 (Innocent) | 0            | 0              | 0          |
| Video 8 (Innocent) | 32           | 5              | 117        |

This means that more facial expressions got recorded for the innocent video condition compared to the guilty video condition. After that, the dataset of the facial analysis of the participants reviewed at which showed a similar outcome. The number of participants showing the three emotions chosen for this analysis was very low (see Figure 1).

**Figure 1**

*Histogram of Emotions Shown by Participants*
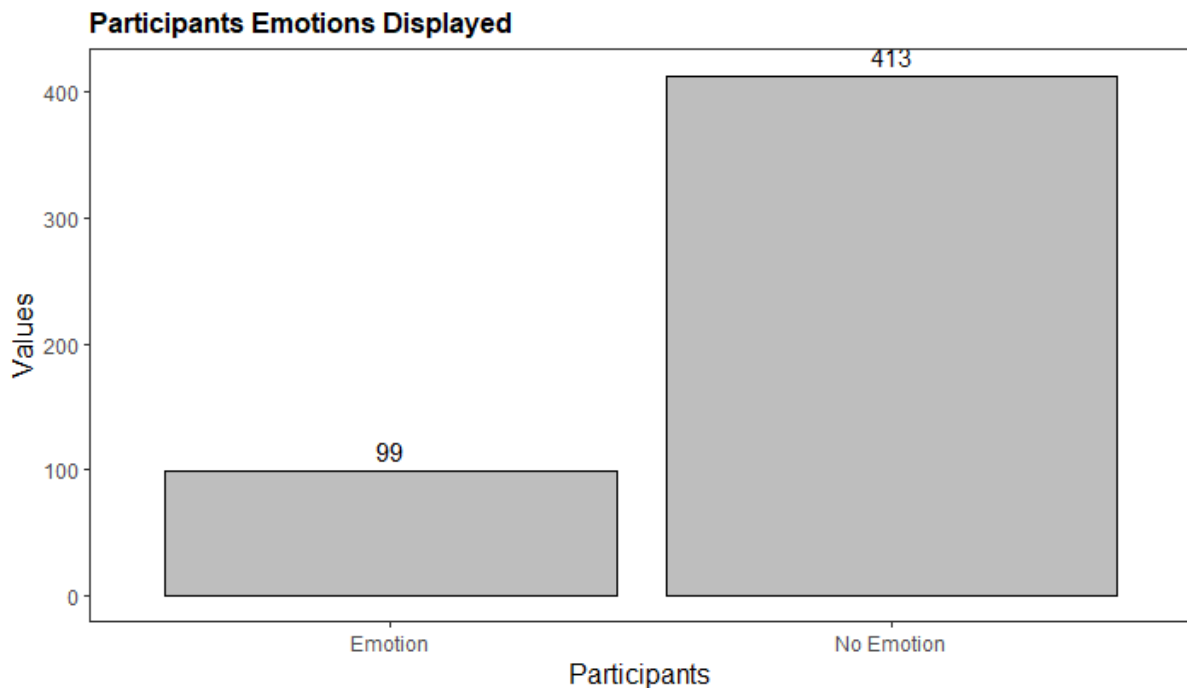


Note. The number shows the times at least one frame of emotion was counted in a participant during a video compared to the times in which no frames were counted as emotions displayed. In percentages, this means that 19.34% of the time, participants showed at least one frame of emotion that the software counted while 80.66% of the time, participants did not show any emotions.

After looking at the two datasets separately, they were compared in the next step and the delta was calculated which describes the difference in facial emotions between the videos and the participants for that specific video.

**Inferential statistics**

It was firstly hypothesised that the videos in which people were being honest would stimulate more mimicry. The two variables that showed the summed delta scores for the videos in which the people were innocent and the videos in which the people were guilty were compared using the mean. The value for the innocent video condition was 326.797 while the guilty video condition showed a value of 54.891. These indicate that more mimicry was displayed in the guilty video condition. The histograms showed a highly skewed distribution which indicated a violation of normality (Appendix 8). The same was found when running the Shapiro Wilk normality test which showed a significant deviation from a normal distribution for the innocent video mimicry variable (W=0.327, p<.001). For the guilty video mimicry

variable, the Shapiro Wilk normality test showed a significant violation of normality as well (W=0.468, p<.001). A Wilcoxon Signed-Ranks test indicated that the total mimicry displayed in the guilty videos was significantly higher than the total mimicry displayed in the innocent videos (r=0.125, p<0.05). This indicates that the differences between the video conditions are small but significant, and the first hypothesis can be rejected, since the guilty video condition showed overall a higher amount of mimicry than the innocent video condition.

Secondly, it was hypothesised that people who have a higher veracity judgment, will show more mimicry than people who have a lower veracity judgement. A large standard deviation for each mimicry variable was noticed (Appendix 9). The normality was checked using a Shapiro-Wilk normality test. The results showed that only the veracity judgment scores of video 1 (W=0.982, p=0.477), video 5 (W=0.979, p=0.343) and video 6 (W=0.987, p=0.756) were normally distributed. All other veracity judgement variables and mimicry variables did not meet the standards for normality. The Spearman's correlation coefficient was computed to examine the relationship between the total mimicry displayed and the veracity judgement scores for each video (Appendix 10). The analysis showed no significant values below the threshold of p<.05 with degrees of freedom (df)=62. For video 8 the Spearman correlation coefficient for the variable total mimicry (M=153.766, SD=41.38) and the variable veracity judgement (M=24.813, SD=1.332) found the p-value closest to the threshold, r(62)=0.224, p=0.075. This indicates a positive correlation between the delta scores and the veracity judgements which is in contrast to the second hypothesis. The higher the delta scores are, the lower the amount of mimicry displayed but the higher the veracity judgement in the participants. Since the p-value was not significant, the correlation between veracity judgements of the participants and the mimicry score is not significant. Therefore, the second hypothesis can be rejected.

To analyse the third hypothesis and therefore the correlation between the extraversion scores (M=15.125, SD=3.302) and the mimicry displayed by the participants in each video, Spearman's correlation coefficient was chosen again (Appendix 11). The p-values for all videos were above the threshold of 0.05. This means that there was no significant correlation between a participants extraversion score and their displayed mimicry. Therefore, the third hypothesis was rejected.

## Discussion

The goal of this research was to study if the mimicry of a person can give insights into whether a message uttered by another person is truthful or not. The findings of this study indicate that there was a relationship between the mimicry of a person and the truthfulness of a message they received. This was unexpected since it was not in line with existing research.

Prior research by ten Brinke and Porter (2012) suggested that facial expressions can be used to make implications of whether someone is deceptive or genuine. Furthermore, the authors also stated in another article that facial expressions are sometimes not easily controlled (Porter & ten Brinke, 2008). Since this study used a different method than previous research, and Chartrand and van Baaren (2009) suggest that liking another person will increase mimicry, it was hypothesised that more mimicry will be shown by people watching genuine statements compared to deceptive statements. The opposite was found in this study. A significant difference between the mimicry displayed by the participants in the guilty video condition compared to the innocent video condition was shown by the analysis. Therefore, the first hypothesis had to be rejected but the findings leave the question why this difference was found. One reason for this finding could be the increased facial expressions in the innocent video condition. If the videos did not evoke a strong reaction of the participants, the iMotion program would not show the facial expressions of the participants for either video condition in the dataset. Since the iMotion program captured more facial expressions for the innocent video stimuli, it could explain the reason for the higher delta scores in the innocent video condition and the conclusion that less mimicry was displayed in this condition. However, the reason for these findings could also be that participants did in fact mimic the facial expressions of the people in the guilty video condition more. Since the people in the guilty videos were not exhibiting strong facial expressions, the participants mimicked them, and they both cannot be seen in the iMotion program.

The second hypothesis, that participants with a higher veracity judgement would display more mimicry was made based on two articles by Chartrand and van Baaren (2009) and Hess and Fischer (2014) which stated that the more positive a person feels about another, the more mimicry will be displayed. This relationship was not found in this study as the analysis showed no significant values. Reasons for these results could be explained by the video stimuli being not long enough or without a high enough quality to elicit a reaction (Antons et al., 2015). However, the results, while not being significant, support the results of the first hypothesis, as they state that more mimicry was displayed by participants while watching the guilty video stimuli.

The results of the third hypothesis gave more clues about why the analysis of this study did not find the results that were hypothesised. Since the article by Saberi et al. (2021) stated that extraversion has an influence on the display of facial expressions, it was hypothesised that this study would find a similar effect. However, the results showed no significant correlation between extraversion and mimicry. As the sample of the study by Lang et al. (2011) showed a

lower mean extraversion score than the sample of this study, the low facial expressions cannot be explained by this. This supports the suggestion that the videos or the iMotion program could have been the reason for the low amount of facial expressions displayed by the participants.

For this study, the iMotions program was displaying many facial expressions in neither the videos nor the participants datasets. This was unexpected, since the article by ten Brinke and Porter (2012) showed that the videos were well analysed and showed facial expressions. For the selected emotions, half of the videos showed no facial expressions at all while the other half showed only little amounts and only one video showed all three emotions. This made the analysis difficult since the aim was to see mimicry. For that, facial expressions need to be visible for the participants to be able to mimic them. Video 8 was the video which showed the most facial expressions and was also the video in which more participants showed emotions. An argument could be made for the iMotions software be good and participants did in fact mimic the facial expression of the videos, but since there were not many facial expressions shown in the video stimuli, the participants did not show many facial expressions either. All in all, this research had to reject all hypotheses. There are different reasons that could explain these findings.

**Limitations**

One reason for the results of this study were the video stimuli. The videos were chosen because of them being available and tested before. However, the quality of some of the videos, as indicated earlier, was not satisfying, which could be the reason for the low facial emotion count that the participants displayed. The iMotion program showed that it captured the faces and their expressions, but the accuracy of the expressions seen in the video did not always match the data recorded which could also be caused by the low quality of the videos. Adding to the low quality of the videos were watermarks which were visible in some videos. That the iMotion software did not capture a lot of facial expressions can also be caused by the people in the video stimuli who did not always look in the camera or covered their faces with their hands, which made it hard to see their entire faces. Interesting to note here is that the videos of guilty people were more likely to look away or cover their faces than innocent videos, which could explain the less emotional frames shown in the dataset. This made the comparison between the videos and the participants difficult, since the participants' faces were mostly looking into the direction of the camera and therefore their faces were better visible. The length of the videos could have been a problem as well, since an article by Chartrand and van Baaren (2009) explained that mimicry increased over time when a person had more time getting familiar with another person. Some video stimuli had two or more people in them, and it was assumed that

participants mostly looked at the person who spoke but that was not checked using eye tracking. Therefore, the mimicry of facial expression might have been for a different person than the one speaking in the videos. However, the videos were chosen specifically because ten Brinke and Porter (2012) tested them. This should have ensured that the videos were good enough to be analysed by the iMotion program.

Another limitation of the study was choosing a threshold of 25 for the analysis. The threshold could be chosen to be even lower to increase the amounts of facial expressions the iMotion software counted as such. This could have increased the amounts of data from the output of the iMotion program. With an increased number of facial expressions, the data could have been better to analyse. Since the data showed a really low number of emotional frames even with the threshold of 25, the calculated delta scores do not represent what they should. A 0 would have displayed perfect mimicry but since the videos as well as the participants did not display any emotions, the 0 usually indicates that neither one displayed any emotions and therefore it cannot be said if mimicry was displayed or not. However, the threshold of 25 was chosen because even mild facial expressions could be counted as such by the iMotion program with this threshold.

Furthermore, the emotions chosen for this analysis could have been the wrong ones or could have been analysed separately instead of added together. Even though both articles of Porter and ten Brinke (2008) and Ekman (2006) mention sadness to be an emotion most likely displayed, the emotions anger and enjoyment which were chosen for this study were only based on the article by Ekman (2006). However, this was also checked, as the emotions fear and disgust were most likely to be displayed during the videos, according to Porter and ten Brinke (2008). Nevertheless, fear was only found in 2 video stimuli with a very low amount and the emotion disgust was also found in only 2 video stimuli with an even lower amount. This means that the emotions chosen for this analysis were most likely not the reason for the results.

Lastly, an article by Seibt et al. (2015) describes the inhibition of facial mimicry due to the task participants had to perform while their facial expressions were analysed. Since participants of this study also had to judge the people in the video on their truthfulness while their faces were recorded and analysed, their facial expressions could have been inhibited as well. However, this does not explain the low facial expression count in participants in general and it does not explain the low facial expression count in the video conditions.

**Future research**

While this research had videos as stimuli, future research could do a similar study with a real person as a stimulus, since a real person could evoke stronger emotions than a video.

Furthermore, the emotions analysed in this study were only the three that according to Ekman (2006) were supposed to be especially difficult to inhibit. Future research could however focus on the individual facial expression muscles to get a more accurate display on what happens when a person is mimicking a person who is lying compared to a person who is telling the truth since the data could be more accurate than the combined facial expressions that are displayed as emotions. Additionally, the analysis could be done with the emotion's happiness, sadness, fear and disgust on the upper and lower face separately like ten Brinke and Porter (2012) did in their research but with the focus on the mimicry participants displayed while watching the videos. Another possibility is to use different videos from the study by ten Brinke and Porter (2012) to see if other videos evoke more mimicry in participants than the ones chosen for this study. Furthermore, the length of the videos could be increased to have more time for the participants to get familiar with the people in the videos and more opportunities for the display of mimicry. This in turn could increase the data that can then be analysed. Lastly, an analysis with an even lower threshold than 25 could show even milder facial expressions of participants and could reveal differences in the amount of facial expressions of the participants. This could be done to see if the significant differences in the delta scores came from the increased mimicry of participants or the absence of facial expressions in all participants for all video conditions. Another option would be to choose different videos and repeat the study. However, since a significant effect was found, further research could try to reproduce this effect and then focus on reasons for this effect.

**Conclusion**

All in all, this study built on previous research that suggested the mimicry of a receiver of a message could implicate the truthfulness of the person uttering the message. Although all hypotheses had to be rejected, the results of this study suggest that there is a relationship between the truthfulness of a sender's message and the mimicry of the receiver of that message since a significant effect was found. The finding that more mimicry was displayed with the guilty video condition is contrary to the hypothesised outcome but nevertheless interesting because it shows that the mimicry of a receiver of a message could give indications about the truthfulness of the sender's message. However, to be able to draw any final conclusions, more research is needed.

**References**

Antons, J. N., Arndt, S., De Moor, K., & Zander, S. (2015, May). Impact of perceived quality and other influencing factors on emotional video experience. In *2015 Seventh International Workshop on Quality of Multimedia Experience (QoMEX)* (pp. 1-6). IEEE.

Chartrand, T. L., & van Baaren, R. (2009). Chapter 5 Human Mimicry. *Advances in Experimental Social Psychology*, *41*, 219–274. https://doi.org/10.1016/S0065-2601(08)00405-X

Cohn, J. F., Ambadar, Z., & Ekman, P. (2007). Observer-based measurement of facial expression with the Facial Action Coding System. The handbook of emotion elicitation and assessment, 1(3), 203-221

Duffy, K. A., & Chartrand, T. L. (2015). Mimicry: Causes and consequences. Current Opinion in Behavioral Sciences, 3, 112–116. https://doi.org/10.1016/J.COBEHA.2015.03.002

Ekman, P. (2006). Darwin, deception, and facial expression. *Annals of the New York Academy of Sciences*, *1000*(1), 205–221. https://doi.org/10.1196/annals.1280.010

Farnsworth, B., Seernani, D., & Pedersen, M. (2023, February 14). Imotions Online. iMotions. Retrieved February 17, 2023, from https://imotions.com/products/imotions-online/

Hess, U., & Fischer, A. (2014). Emotional mimicry: Why and when we mimic emotions. Social and Personality Psychology Compass, 8(2), 45–57. https://doi.org/10.1111/spc3.12083

Kulke, L., Feyerabend, D., & Schacht, A. (2020). A Comparison of the Affectiva iMotions Facial Expression Analysis Software With EMG for Identifying Facial Expressions of Emotion. Frontiers in Psychology, 11. https://doi.org/10.3389/fpsyg.2020.00329

Lang, F. R., John, D., Lüdtke, O., Schupp, J., & Wagner, G. G. (2011). Short assessment of the Big Five: Robust across survey methods except telephone interviewing. *Behavior Research Methods*, *43*(2), 548–567. https://doi.org/10.3758/s13428-011-0066-z

Larson, J. A. (1921). Journal of the American Institute of Criminal Law and Criminology.

Levine, T. R. (2014). Truth-Default Theory (TDT): A Theory of Human Deception and Deception Detection. Journal of Language and Social Psychology, 33(4), 378–392. https://doi.org/10.1177/0261927X14535916

Levine, T. R., Park, H. S., & McCornack, S. A. (1999). Accuracy in detecting truths and lies: Documenting the "veracity effect." Communication Monographs, 66(2), 125–144. https://doi.org/10.1080/03637759909376468

Pedersen, M., & Seernani, D. (2023, January 27). Powering human insights. iMotions. Retrieved February 17, 2023, from https://imotions.com/

Porter, S., & ten Brinke, L. (2008). Reading Between the Lies Identifying Concealed and Falsified Emotions in Universal Facial Expressions. https://journals.sagepub.com/doi/pdf/10.1111/j.1467-9280.2008.02116.x

Saberi, M., DiPaola, S., & Bernardet, U. (2021). Expressing personality through non-verbal behaviour in real-time interaction. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.660895

Schimmel, J. M. (2021). Improving veracity judgement accuracy: an eye-tracking study. [Master Thesis, University of Twente]. University of Twente Student Theses. http://essay.utwente.nl/86174/

Schnotz, W., & Kürschner, C. (2007). A eeconsideration of cognitive load theory. *Educational Psychology Review*, *19*(4), 469–508.
https://doi.org/10.1007/s10648-007- 9053-4

Sebanz, N., & Shiffrar, M. (2009). Detecting deception in a bluffing body: The role of expertise. Psychonomic Bulletin and Review, 16(1), 170–175. https://doi.org/10.3758/PBR.16.1.170

Seibt, B., Mühlberger, A., Likowski, K. U., & Weyers, P. (2015). Facial mimicry in its social setting. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/FPSYG.2015.01122/ABSTRACT

Stel, M., van Dijk, E., & Olivier, E. (2009). You Want to Know the Truth? Then Don't Mimic!

ten Brinke, L., & Porter, S. (2012). Cry me a river: Identifying the behavioral consequences of extremely high-stakes interpersonal deception. Law and Human Behavior, 36(6), 469–477. https://doi.org/10.1037/h0093929

van Baaren, R. B., Maddux, W. W., Chartrand, T. L., de Bouter, C., & van Knippenberg, A. (2003). It takes two to mimic: Behavioral consequences of self-construals. *Journal of Personality and Social Psychology*, *84*(5), 1093–1102. https://doi.org/10.1037/0022-3514.84.5.1093

van der Zee, S., Taylor, P., Wong, R., Dixon, J., & Menacere, T. (2021). A liar and a copycat: Nonverbal coordination increases with lie difficulty. Royal Society Open Science, 8(1). https://doi.org/10.1098/rsos.200839

van 't Veer, A. E., Gallucci, M., Stel, M., & Beest, I. van. (2015). Unconscious deception detection measured by finger skin temperature and indirect veracity judgments-Results

of a registered report. *Frontiers in Psychology, 6*(JUN). https://doi.org/10.3389/fpsyg.2015.00672

Vrij, A., Anders Granhag, P., & Porter, S. (2010). Pitfalls and Opportunities in Nonverbal and Verbal Lie Detection. *Psychological Science in the Public Interest, 11*(3), 89–121. https://doi.org/10.1177/1529100610390861

Zuckerman, M., DePaulo, B. M., & Rosenthal, R. (1981). Verbal and nonverbal communication of deception. *Advances in Experimental Social Psychology, 14*, 1-59. https://doi.org/10.1016/S0065-2601(08)60369-2

# Appendices

## Appendix 1

## Table 2

*Videos chosen as stimuli out of the list from ten Brinke and Porter (2012)*

| Name of the missing person | Name of Pleader | Relationship to Missing Person | Country of Origin | Innocent/ Guilty | Source | Renamed |
|---|---|---|---|---|---|---|
| Linda Flemming | Derek Flemming | Father | United Kingdom | Guilty | ITN Source | Video 1 |
| Louise Brown | Paul Brown | Father | United Kingdom | Guilty | ITN Source | Video 2 |
| Sharon Malone | Harry Clinch | Father | United Kingdom | Innocent | BBC | Video 7 |
| Sarah Payne | Sara Payne | Mother | United Kingdom | Innocent | BBC | Video 6 |
| Karissa Boudreau | Penny Boudreau | Mother | Canada | Guilty | Voxant – Global News | Video 4 |
| Shannon Matthews | Karen Matthews | Mother | United Kingdom | Guilty | ITN Source | Video 3 |
| Victoria Stafford | Tara MacDonald | Mother | Canada | Innocent | Voxant - CTV | Video 8 |
| Jessica Chapman | Leslie Chapman, Sharon Chapman | Father, Mother | United Kingdom | Innocent | BBC | Video 5 |

**Appendix 2**

Welcome Information:

Welcome!

You are invited to take part in a study investigating what a person's mimicry of facial expression can say about the other persons veracity (truthfulness). The project is conducted by Nick Nau (BSc Psychology students at University of Twente) and supervised by Peter Slijkhuis, MSc and Dr. Steven Watson (Department of Psychology of Conflict, Risk and Safety, University of Twente). The study is approved by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at University of Twente.

Please take time to read the following information carefully before you decide whether or not to take part, it is important for you to understand what participation in the study will involve.

Who can take part?

We are looking for women and men who are at least 18 years old. Your English language skills need to be sufficient in order to understand instructions, the videos you will watch and answer the questionnaires. Participation is completely voluntary and anonymous.

What is involved?

If you decide to take part, you are asked to watch 10 videos, using a desktop computer. After each video, you are asked to fill in a short questionnaire. Instructions on completing the questionnaires are provided. You can stop participating at any point of the study, without giving any reason.

The videos will show people who have just lost a family member. The questionnaire includes questions about veracity judgments of the people you will see in the videos. The answers to the questionnaires will be recorded as well as the upper body including your face will be recorded during the study. Therefore, we ask you to keep your hands on the desk.

What happens with the data?

All data collected during the study will be kept strictly confidential and anonymous. That is, your responses cannot and will not be traced to your person and no identifying information will appear in any documents or in the final report. We ask you to answer as honestly as possible.

Before you can start with the survey, we ask you to read the information on the next page carefully and agree by clicking 'YES'.

Thank you in advance for your participation! Should you have any questions about this study, please feel free to contact the researcher.

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n.nau@student.utwente.nl

Peter Slijkhuis, MSc
p.j.h.slijkhuis@utwente.nl

**Appendix 3**

Informed Consent

By clicking YES below, I agree to the following:

I understand that my participation is voluntary. I also understand that I have the right to withdraw my consent at any time without needing to give a reason, if I experience any discomfort or distress.

Furthermore, the following points are clear to me:

All data that are collected by the researcher are treated with caution. The researcher will record the answers to the questionnaires and my upper body including my face.

I understand the purpose of the current study. I understand that after completion of the study I will receive a debriefing.

I agree to keep the procedures and explanation of this study to myself and will not pass this information on to others because this might negatively influence the study results.

I agree to participate in the study:

- Yes, I will consent to the above stated information stated above.
- No, I will not consent and do not want to continue the study.

**Appendix 4**

Demographic questions:

1. What is your age?

    [Text entry]

2. What is your gender?

    - Male

    - Female

    - Other

3. What is your nationality?

    - Dutch

    - German

    - Other [Text entry]

4. What is your highest academical achievement?

    - Secondary school

    - High school

    - University Bachelor

    - University Master or higher

    - Other [Text entry]

**Appendix 5**

Personality Questionnaire:

Short personality questionnaire of the Big Five (BFI-S) by Lang et al. (2011).

Statements to be rated on a 7-point Likert-Scale in which 1 equals Strongly disagree and 7 Strongly agrees:

I see myself as someone who…

1. … worries a lot. (Neuroticism)
2. … gets nervous easily. (Neuroticism)
3. … remains calm in tense situations. (Neuroticism, reversed)
4. … is talkative. (Extraversion)
5. … is outgoing and sociable. (Extraversion)
6. … is reserved. (Extraversion, reversed)
7. … is original and comes up with new ideas. (Openness)
8. … values artistic and aesthetic experiences. (Openness)
9. … has an active imagination. (Openness)
10. … is sometimes rude to others. (Agreeableness, reversed)
11. … has a forgiving nature. (Agreeableness)
12. … is considerate and kind to almost everyone. (Agreeableness)
13. … does a thorough job. (Conscientiousness)
14. … tends to be lazy. (Conscientiousness, reversed)
15. … does things efficiently. (Conscientiousness)

**Appendix 6**

Veracity judgement questionnaire:

Derived originally from the questions by Schimmel (2021) but altered to fit to the videos in this study.

Please indicate on a scale from 1-7 how much you agree with the statements made below. 1 equals disagree completely and 7 equals agree completely.

DVJ = Direct Veracity Judgement

IVJ = Indirect Veracity Judgement

TH = Thinking hard

ID = Indifferent

VI = Verbal immediacy

CO = Cooperativeness

BC = Behavioural change

First stack of questions:

1. DVJ: The people in the video were being truthful and honest.
2. IVJ-TH: The people in the video were thinking harder before speaking. (reversed)
3. IVJ-ID: The people in the video seemed NOT interested. (reversed)
4. IVJ-VI: The people in the video seemed to distance themselves from the messages they uttered. (reversed)
5. IVJ-CO: The people in the video seemed cooperative.
6. IVJ-BC: The people in the video changed their behaviour after a while. (reversed)

Second stack of questions:

1. DVJ: The people in the video were NOT being truthful and honest. (reversed)
2. IVJ-ID: The people in the video seemed proactive.
3. IVJ-TH: The people in the video spoke immediately, without thinking long.
4. IVJ-BC: The people in the video did NOT change their behaviour after a while.
5. IVJ-VI: The people in the video seemed to distance themselves from the messages they uttered. (reversed)
6. IVJ-CO: The people in the video seemed cooperative.

Third stack of questions:

1. DVJ: The people in the video were telling the truth to the audience.
2. IVJ-VI: The people in the video uttered personal messages.
3. IVJ-ID: The people in the video seemed uninterested. (reversed)
4. IVJ-TH: The people in the video fluently formulated messages.

5. IVJ-CO: The people in the video seemed NOT very cooperative. (reversed)

6. IVJ-BC: The people in the video changed their behaviour after a while. (reversed)

Fourth stack of questions:

1. DVJ: The people in the video were lying to the audience. (reversed)

2. IVJ-BC: The people in the video behaved differently compared to the beginning of the video. (reversed)

3. IVJ-ID: The people in the video seemed genuine.

4. IVJ-TH: The people in the video had to think hard before uttering a message. (reversed)

5. IVJ-CO: The people in the video seemed willing to help.

6. IVJ-VI: The people in the video seemed to distance themselves from the messages they uttered. (reversed)

Fifth stack of questions:

1. DVJ: The people in the video were lying. (reversed)

2. IVJ-ID: The people in the video seemed proactive.

3. IVJ-TH: The people in the video spoke without thinking long.

4. IVJ-BC: The people in the video changed their behaviour after a while. (reversed)

5. IVJ-VI: The people in the video seemed to distance themselves from the uttered message. (reversed)

6. IVJ-CO: The people in the video seemed cooperative.

Sixth stack of questions:

1. DVJ: The people in the video were lying. (reversed)

2. IVJ-VI: The people in the video distanced themselves from their messages. (reversed)

3. IVJ-ID: The people in the video seemed uninterested. (reversed)

4. IVJ-TH: The people in the video seemed to think carefully before uttering a message. (reversed)

5. IVJ-CO: The people in the video seemed NOT very cooperative. (reversed)

6. IVJ-BC: The people in the video changed their behaviour after a while. (reversed)

Seventh stack of questions:

1. DVJ: The people in the video were being truthful.

2. IVJ-BC: The people in the video behaved differently after a while. (reversed)

3. IVJ-CO: The people in the video seemed willing to help.

4. IVJ-ID: The people in the videos were proactive.

5. IVJ-TH: The people in the video uttered messages without thinking long.

6. IVJ-VI: The people in the video seemed to distance themselves from the messages they uttered. (reversed)

Eighth stack of questions:

1. DVJ: The people in the video were lying. (reversed)
2. IVJ-ID: The people in the video seemed indifferent. (reversed)
3. IVJ-TH: The people in the video did NOT have to think hard before they spoke.
4. IVJ-VI: The people in the video uttered personal messages.
5. IVJ-BC The people in the video behaved differently after a while. (reversed)
6. IVJ-CO: The people in the video seemed cooperative.

**Appendix 7**

Recoding the data:

Videos renamed:

Linda Flemming-Guilty (Guilty): Video 1

Louise Brown-Guilty (Guilty): Video 2

Shannon Mathews-Guilty (Guilty): Video 3

Karissa Boudreu - Guilty (Guilty): Video 4

Jessica Chapman – Innocent – Man + Jessica Chapman – Innocent - Woman (Innocent): Video 5

Sarah Payne - Innocent (Innocent): Video 6

Sharon Malone-Innocent (Innocent): Video 7

Victoria Stafford - Innocent (Innocent): Video 8

Gender:

Male(20): 1

Female(43): 2

Other/nonbinary(1): 3

Nationality:

German(30): 1

Dutch(24): 2

Romanian(1); Spanish(2); Salvadoran(1); Kazakh(2); Luxembourg(1); Polish(1); Hungarian(1); Other(1): 3

Education:

High school(56): 1

Secondary school(3): 2

University Bachelor(5): 3

**Appendix 8**

**Figure 2**

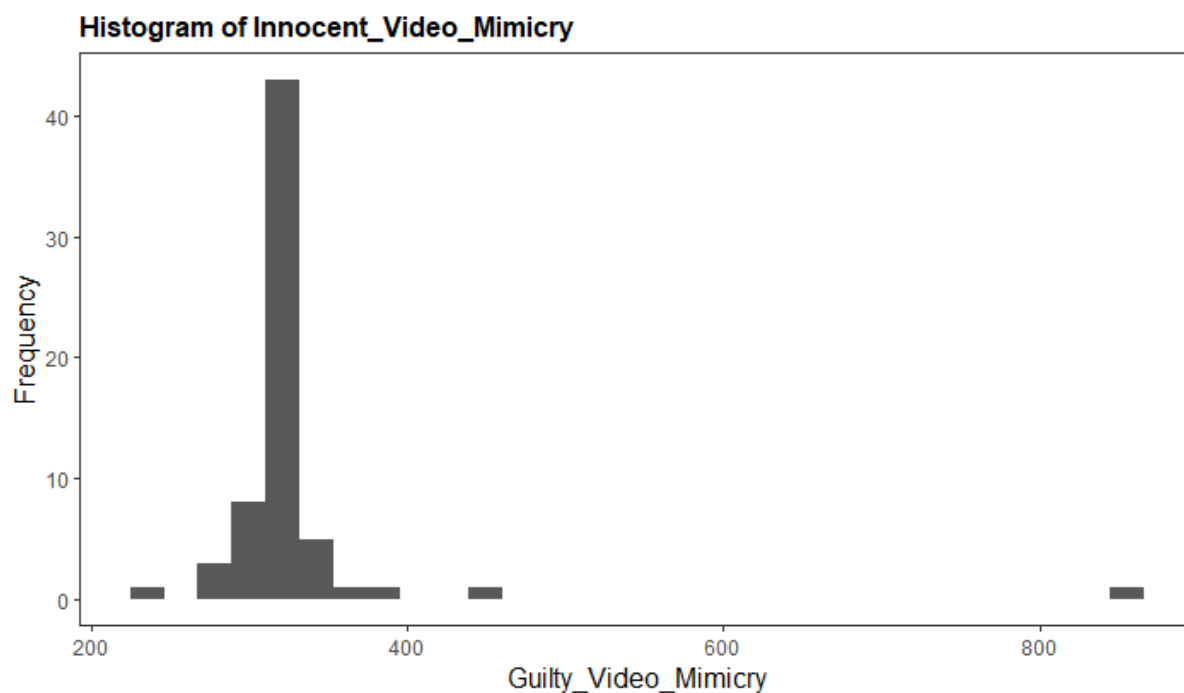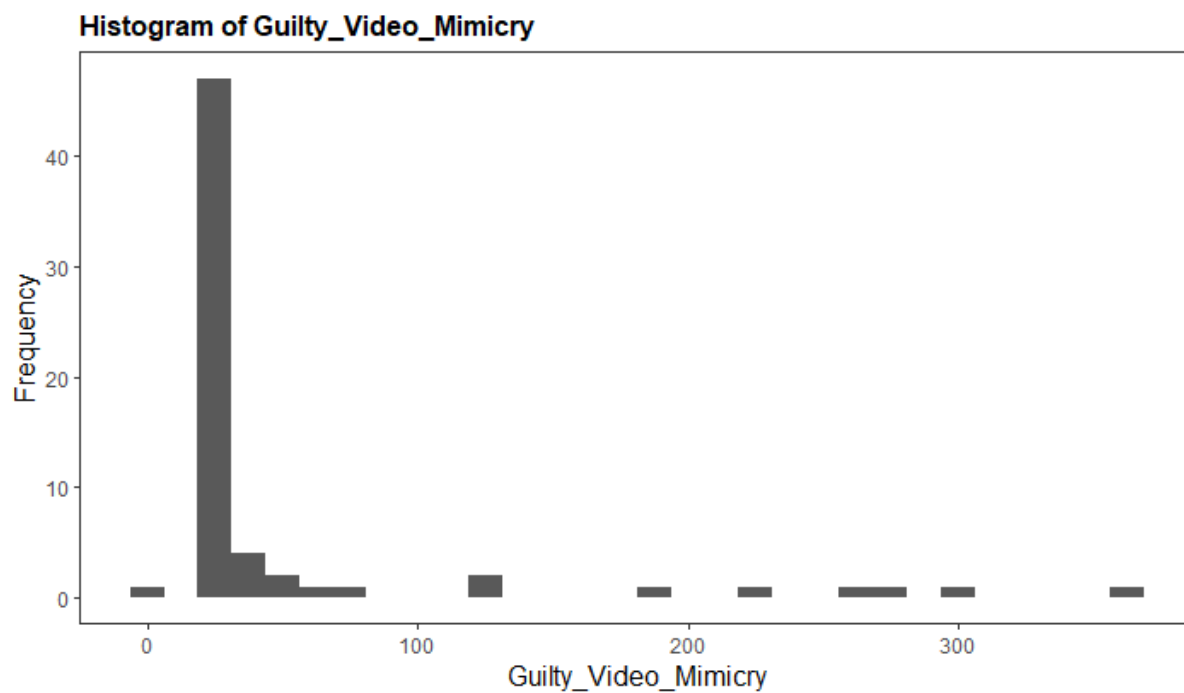*Histogram about Mimicry of Participants Watching Innocent Videos*



**Figure 3**

*Histogram of Mimicry of Participants Watching Guilty Videos*

**Appendix 9**

**Table 3**

*Means and Standard Deviations*

| Variable | Mean | Standard Deviation |
|---|---|---|
| Video 1 Total Mimicry | 5.875 | 30.555 |
| Video 1 Veracity Judgement | 28.609 | 5.221 |
| Video 2 Total Mimicry | 13.156 | 46.286 |
| Video 2 Veracity Judgement | 24.094 | 4.034 |
| Video 3 Total Mimicry | 3.859 | 15.387 |
| Video 3 Veracity Judgement | 26.578 | 4.723 |
| Video 4 Total Mimicry | 32 | 31.76 |
| Video 4 Veracity Judgement | 27.125 | 4.053 |
| Video 5 Total Mimicry | 106.078 | 3.977 |
| Video 5 Veracity Judgement | 27.19 | 4.594 |
| Video 6 Total Mimicry | 64.234 | 30.663 |
| Video 6 Veracity Judgement | 28.672 | 4.622 |
| Video 7 Total Mimicry | 2.719 | 13.056 |
| Video 7 Veracity Judgement | 23.984 | 2.278 |
| Video 8 Total Mimicry | 153.766 | 41.38 |
| Video 8 Veracity Judgement | 24.813 | 1.332 |

**Appendix 10**

**Table 4**

*Table of Spearman's Correlation Coefficient for Mimicry and Veracity Judgement*

| Variables | Spearman's correlation coefficient | p-value |
|---|---|---|
| Video 1 Mimicry and Veracity Judgement | -0.089 | 0.485 |
| Video 2 Mimicry and Veracity Judgement | 0.201 | 0.111 |
| Video 3 Mimicry and Veracity Judgement | 0.036 | 0.776 |
| Video 4 Mimicry and Veracity Judgement | 0.03 | 0.813 |
| Video 5 Mimicry and Veracity Judgement | -0.039 | 0.762 |
| Video 6 Mimicry and Veracity Judgement | -0.026 | 0.837 |
| Video 7 Mimicry and Veracity Judgement | 0.037 | 0.77 |
| Video 8 Mimicry and Veracity Judgement | 0.224 | 0.075 |

**Appendix 11**

**Table 5**

*Table of Spearman's Correlation Coefficient for Extraversion and Mimicry*

| Variables | Spearman's correlation coefficient | p-value |
|---|---|---|
| Extraversion and Video 1 Mimicry | -0.023 | 0.859 |
| Extraversion and Video 2 Mimicry | 0.143 | 0.26 |
| Extraversion and Video 3 Mimicry | 0.155 | 0.222 |
| Extraversion and Video 4 Mimicry | 0.136 | 0.284 |
| Extraversion and Video 5 Mimicry | -0.054 | 0.672 |
| Extraversion and Video 6 Mimicry | 0.116 | 0.361 |
| Extraversion and Video 7 Mimicry | 0.131 | 0.3 |
| Extraversion and Video 8 Mimicry | 0.026 | 0.836 |