UNIVERSITY OF TWENTE.

Psychology

Faculty of Behavioral, Management and Social Sciences
Psychology of Conflict, Risk and Safety

BACHELOR THESIS

André Schröder
s1370006

Effects of mimicry on behavior: Stereotype consistent behavior elicited through mimicking a person belonging to a specific social category

Enschede, Netherlands
26.01.2017

Supervisors:

Dr. Marielle Stel
Dr. Marco van Bommel
Faculty of Behavioral, Management and Social Sciences
Psychology of Conflict, Risk and Safety
University of Twente

Abstract

The purpose of the present study was to investigate if mimicking another persons gestures, mannerisms and facial expressions may influence behavior and if the multidimensional construct empathy is involved as an underlying mechanism. A study was conducted and 71 participants took part in the study. Mimicry was measured through a video recording of the reactions participants showed while watching a video showing a male person displaying movements that were non-stereotypical. The participants were told that the man in the video is a professor and it was assumed that when the stereotype of professors is activated, this activates related constructs like "intelligence" and "performing well", which in turn activates related behavioral representations to perform well on a general knowledge test. Furthermore, it was assumed that participants who score high on empathy are more likely to score high on mimicry, and hence perform better on a general knowledge test. To test this hypothesis, participants were asked to fill in a general knowledge questionnaire. Empathy was measured by the Toronto Empathy Questionnaire (TEQ). The investigation reveals that participants who score high on mimicry perform significantly better on a general knowledge test than participants who score low on mimicry. Unexpectedly, no significant effect was found between mimicry and empathy.

Effects of mimicry on behavior: Stereotype consistent behavior elicited through mimicking a person belonging to a specific social category

In the present study it was investigated if mimicking a person belonging to a specific social category elicit stereotype consistent behavior in the mimicker. Furthermore, it was investigated if empathy has an effect on the tendency to mimic another person and hence to perform stereotype consistent behavior.

In an extraordinary number of social interactions that most individuals have on a daily basis, people unintentionally and automatically mimic others' behavior (Van Baaren, Holland, Kawakami, & Knippenberg, 2004). Mimicry has been of interest to researchers for decades (Lakin, Jefferis, Cheng, & Chartrand 2003) and there is a large body of research on the convergence of nonverbal and verbal behaviors across interaction partners (Parrill & Kimbara, 2006) and the effects which come along with mimicking (see McIntosh, 2006; van Baaren et al., 2004).

Mimicry, has reference to non-conscious imitation „of the postures, mannerisms, facial expressions, and other behaviors of one's interaction partners, such that one's behavior passively and unintentionally changes to match that of others in one's current social environment" (Chartrand & Bargh, 1999). Stel and Vonk (2010) defined mimicry as „doing what others are doing" on a both verbal and nonverbal realm and mentioned that mimicry has an important purpose for us as human beings. For example in clinical settings, mimicry has beneficial effects for the therapeutic relationship in terms of a more positive, interpersonal relation between two people and enhance feelings of sensitivity for both the mimickers and the mimickees (Stel & Vonk, 2010). Furthermore, Stel and Vonk (2010) found in their experiment that mimickees and mimickers became more affectively attuned to each other and that both mimickees and mimickers reported more feelings of having bonded with each other. There is evidence that mimicry increases liking between two interaction partners and facilitates the smoothness of interactions (Chartrand & Bargh. 1999; van Baaren et al. 2004). Stel, van Baaren and Vonk (2008) mentioned that mimicry is proposed to play an important role when people are likely to come to personally experience the perceived emotions of others. This two-

step process is termed „emotional contagion“ in which mimicry has been hypothesized to play an important role. Mimicking automatically and unconsciously the other’s emotions leads to activated muscles due to mimicry which provides feedback to the brain evoking corresponding emotions in the mimicker. Thus, mimicry may facilitate the capability to understand the feelings of other people (Stel, van Dijk & Oliver, 2016).

As shown by the literature mentioned before, mimicry has several functions in social interactions. At a behavioral level, Chartrand and Bargh (1999) mentioned that mimicry increases prosocial behavior in mimickees and that mimickees were more helpful and generous. Stel et al. (2008) have demonstrated in their experiment that people who mimicked expressions of a person acted more prosocial. In their experiment, the participants were shown a video tape and participants who mimicked the expressions shown on this video tape donated more money to a charity. Van Baaren, Holland, Steenaert and Knippenberg (2002) found that waiters received larger tips when mimicking her customers. The results demonstrated that mimicking can make people more generous. It can be stated that people become more affectively and cognitively attuned to each other when they mimic each other’s behaviors and that mimicking may be of influence on people’s behavior.

An important aspect for the present study were the behavioral effects of stereotype activation. People tend to categorize other on the basis of their appearances and/or behavior into specific groups. Indeed, previous studies have not directly investigated the effects of mimicry on the elicitation of stereotypical behaviors. However, traits and stereotypes associated with a social category can become automatically activated when perceiving a person belonging to that specific social category (Devine, 1989) and this activation can influence people’s behavior. Bargh, Chen and Burrows (1996) demonstrated in their experiments the effects of priming on behavior. Dijksterhuis and van Knippenberg (1998) mentioned that priming someone with a stereotype or trait leads to behavioral patterns in line with the activated constructs. In one of the experiments from Bargh et al. (1996), participants for whom a senior stereotype was primed walked more slowly than did control participants. A study by Branaghan and Gray (2010) showed that driving speed and driving time in the elderly stereotype condition differs between participants in the elderly stereotype condition and the control

condition. Participants showed lower maximum speed and longer driving time in the elderly stereotype condition. The experiment by Branaghan and Gray (2010) as well as Bargh et al. (1996) demonstrated that the behavior was consistent with the content of a stereotype (Dijksterhuis, Spears and Le´pinasse. 2001).

The question that may raise is if people show stereotypical behaviors consistent with the people they mimic? For example, when a person mimics a professor in his or her movements, would this person behave also more intelligently as a result? Since mimicking a person belonging to a specific category might activate this category more strongly, it is conceivable that the observer's behavior may be influenced accordingly. It will be investigated whether mimicking a person who belongs to a specific category elicits behavior in the mimicker that is in line with this category. Based on the previous discussed studies and findings from social and cognitive psychological literature it is to assume that when the stereotype of professors is activated, this activates related constructs like "intelligence" and "performing well", which in turn activates related behavioral representations to perform well on a general knowledge test. A study by Dijksterhuis and van Knippenberg (1998) demonstrated that the professor stereotype leads to a better performance. In the present study it is hypothesized that participants perform better on a general knowledge test when mimicking the behavior of the professor they see on the video. *Thus, when there is high mimicry of behavior, participants receive better results in the general knowledge test than participants in which there is less mimicry of behavior.*

Furthermore, effects of the multidimensional construct empathy will be examined. Spreng, McKinnon, Mar and Levine (2009) made a distinction between emotional and cognitive empathy components of the construct. An emotional reaction to another's emotional response is commonly termed as *emotional, or affective empathy*, whereas, by contrast, an intellectual or imaginative apprehension of another's emotional state is referred to *cognitive empathy* (Spreng, McKinnon, Mar & Levine, 2009). Facial mimicry is a fundamental component in the process of emotional empathy (de Wied, van Boxtel, Zaalberg, Goudena & Matthys, 2005). Sonnby-Borgström, Jönsson and Svensson (2003) found in their study a significant difference in facial mimicry reactions (automatic, spontaneous reactions) between participants who score high on empathy and

participants who score low empathy. High-empathy participants show a significant mimicking reaction compared to low-empathy participants.

Based on these findings *it will be assumed that people who score high on empathy are more likely to mimic other people's behavior. Additionally, it will be assumed that the participants hence are more likely to show behavior congruent to the activated construct.* It will be assumed that empathy has an effect on the activation of these categories and, accordingly, the observer's behavior may be influenced.

In the present study, participants watched a short video of a man talking about going to the supermarket. Their reactions while watching the video were recorded to investigate their mimicry level. Furthermore, empathy was assessed with the aid of the Toronto Empathy Questionnaire and the participants were asked to fill in a general knowledge test to investigate the relation between mimicry, empathy and the score on the general knowledge questionnaire.

Method

Design

The variables of interest of the study were the number of correct answers on a general knowledge test, the score on the Toronto Empathy Questionnaire and the amount of mimicry participants spontaneously demonstrated when watching the target video.

Participants

In total, 151 participants took part in the study. 55 of them did not fill in the questionnaire completely, so they were removed from the data. From the 96 participants who filled in the questionnaire completely, 25 did not provide a video recording of their reactions shown while watching the target video and were excluded from further analysis. So, 71 participants remained and were used for the analysis. 32 are from the University of Twente in the Netherlands majoring in bachelor psychology and took part for SONA credits (experimental subject hours). 34 are either from Lancaster University in the United Kingdom or Erasmus students from other universities around world. 5

participants were employees. 26 (36,6%) of them understood the Netherlands language and 45 (63,4%) did not understand the dutch language. Participants were recruited by *convenience sampling*. At the Lancaster University campus, the students were randomly asked if he or she would like to participate in a study. Furthermore, students of a student accommodation house at Lancaster were asked to take part in the study. Their age ranged from 18 to 48 years with an average of 20,3 years. Altogether, 53 participants were female (74,6%) and 18 were male (25,4%). 46 participants were German, 10 British and 6 Dutch. Two participants were Chinese, and respectively one was Greek, Indonesia, Italian, Lithuanian, Spain, Taiwanese and Turkish. In total, 66 (93%) were students, 5 (7%) employees and 0 (0%) unemployed. 56 (78,9%) attained an A-level degree or equivalent, 7 (9,9%) an undergraduate degree, 2 (2,8%) a Master's degree and 1 was a PhD student. They participated either voluntary or for experimental subject hours (SONA credits).

Materials

Video

All participants saw a short video of approximately 2 minutes showing a male person talking about going to the supermarket and showing head movements, eyebrow movements and gesturing that were non-stereotypical for professors and have could been shown by people belonging to other categories as well. The man also wore neutral clothes that are not associated with any specific social category. The language of the video was dutch.

The questionnaires

Based on Dijksterhuis and van Knippenberg (1998), the general knowledge questionnaire (see appendix C table 2) contained 50 multiple-choice questions of five question categories geography, history, biology, sports, and entertainment with four answer possibilities for each question, for example "What is the smallest country in the world?" with the answer possibilities Monaco, Nauru, Vatican City and Tuvalu. General questions were asked about the demographic background of the participants (age, nationality, occupation and education). Furthermore, participants were asked if he or she could understand the verbal content of the video and how much attention they had had

for the video to investigate whether this affected the mimicry scores and the scores on the general knowledge questionnaire.

In a final step, the Toronto Empathy Questionnaire with 16-items was used to assess participants degree of empathy (see Appendix D table 3). The Toronto Empathy Questionnaire is a 5-point Likert scale where the participants were confronted with 16 statements such as, for example, „When someone else is feeling excited, I tend to get excited too“ and were asked to rate how frequently they feel or act in the manner described. They had a choice between „never“, „rarely“, „sometimes“, „often“ and „always“. The Toronto Empathy Questionnaire represents empathy as a primarily emotional process (Spreng, McKinnon, Mar & Levine, 2009) and Spreng et al. (2009) reported that the Toronto Empathy Questionnaire is a reliable and valid instrument for the assessment of empathy with strong convergent validity, good internal consistency and high test-retest reliability. Scores of the questions are summed to derive a total score for the Toronto Empathy Questionnaire. The higher the score the participant received, the more empathy a participant had. For the trivial pursuit questionnaire the participants get one point per right answer and the right answers were summed up.

Variables

The variable *mimicry* was measured through a short video recording of the reactions participants display while watching a short video of approximately 2 minutes that was presented to the participants during the study. The reactions (for instance facial expressions and eyebrow movements) of the participants were recorded with a webcam and afterwards scored. After the video was presented to the participants, they were asked to fill in a general knowledge questionnaire. The behavior „performance on a general knowledge test“, which is thought to be enhanced through, for instance, the activated constructs „intelligence“ and „well performance“, was measured through the general knowledge test.

Procedure

The study was designed in such a way that participants were able to fill in the questionnaire self without any attendance of an experimenter (see Appendix A). 34 participants were asked to fill in the questionnaire in the presence of an experimenter, and 32 participants took part within the scope of experimental subject hours at the University of Twente. The participants who filled in the questionnaire in the presence of an experimenter were recruited via convenience sampling at the Lancaster University in the United Kingdom. The study takes place in a silent place without any external disturbances and every participant run the study individually. In the beginning, the examiner asked the participant if he or she would like to take part in a study within the scope of a bachelor thesis and gave him or her a verbal instruction of the study. Then, the participant sat down on a chair in front of a laptop on the table. On the screen of the laptop, the participant got more information and an introduction about the study (see Appendix A). Furthermore, all participants agreed with the terms of participating in the study. The participants were told what he or she could expect in the following step and what he or she has to do during the measurements. Before watching the short video of approximately 2 minutes showing a male person talking about going to the supermarket, participants were told that the person in the video was a professor. During the video participants spontaneous level of mimicry was recorded with a webcam. After the participants saw the video, they were asked to fill in a general knowledge questionnaire consisting of 50 multiple-choice questions. Then, the participants were asked to fill in a short questionnaire with some demographical questions and the participants were asked if they could understand the verbal content of the video and, in a final step, were asked to fill in a short questionnaire of 16 items measuring participants degree of empathy (Toronto Empathy Questionnaire). At the end of the study the participants get the possibility to ask questions and/or to give some notes.

Data Preparation

Behavioral measures

The reactions of interest were the head movements (nod of the head, head-shaking, head movement laterally, head movement to the top and to the bottom), eyebrow movements

(eyebrow to the top and frown), smiling and hand movement towards the face. Table 1 (see Appendix D) summarizes the reactions shown by the professor during the short video and the time when performed that movement. Table 2 (see Appendix D) shows the coding scheme which was completed for every participant individually. In the coding scheme was noted if, when, and which of these movements occurred. As in Stel, Van Dijk, and Olivier (2009), the movements of the participants were compared with the movements of the professor shown in the video and was scored as mimicry if it matched a movement of the professor and occurred within 10 seconds after that movement. Then, the proportion of mimicry out of all the movements that could have been mimicked (see table 1) was calculated. 20% from the videos were scored from a second rater to calculate the interrater reliability which was very high with an alpha of .94.

Results

Participants' mimicry scores ranged from 0% to 19.20% and participants' scores on the general knowledge test ranged from 15 (30%) to 36 (72%) correct answers (M = 25.28, SD = 5.18). An interrater reliability analysis with 20% of the video recordings revealed a very good interrater reliability for the scoring (alpha = .94). The empathy score ranged from 40 to 55 (M = 46.87, SD = 2.98).

To look at how mimicry influence the performance on the general knowledge questionnaire, a regression analysis with the participant's mimicry scores and the scores on the general knowledge test was done and revealed a positive correlation between the correct answers on the general knowledge questionnaire and the mimicry level. So, the regression analysis revealed that the participants' spontaneous mimicry level was positively related to their performance on the knowledge test, r = .280, N = 67, p = .018.

Moreover, a regression analysis was done to investigate if empathy has an effect on the mimicry level and, unexpectedly, no significant effect was found between the empathy score a participant has and the level of mimicry he or she showed, r = .007, N = 71, p = .951, and no significant effect between the empathy score and the score on the general

knowledge questionnaire was found, r = .158, N = 71, p = .189. It was assumed that people who score high on empathy are more likely to mimic other people's behavior and hence are more likely to show behavior congruent to the activated construct. As shown by regression analysis, there is no effect of the empathy score on the mimicry score, and no effect of the empathy score on the general knowledge questionnaire score. People who score high on the empathy dimension are not more likely to score high on mimicry, and are not more likely to score high on the general knowledge questionnaire. The hypothesis that a high score on empathy correlates with a high score on mimicry was not confirmed.

To investigate if gender has an effect on the general knowledge questionnaire, the mimicry level and the empathy score, an independent sample t test was done and found no significant difference for gender for the scores on the general knowledge questionnaire (t [69] = .246, p = .577), the participant's mimicry scores (t [69] = -1.497, p = .142) and the empathy scores (t [69] = .664, p = .172). Males did not score less or higher on the general knowledge test and do not score less or higher on the mimicry level or on the empathy questionnaire.

Furthermore, an independent sample t-test was conducted to investigate if there is a difference in the mimicry level and the correct answers in the general knowledge questionnaire between participants who understand the dutch language and participants who do not understand the dutch language. No significant difference was found for either the mimicry level (t [69] = 2.168, p = .077) nor the correct answers on the general knowledge questionnaire (t [69] = -.263, p = .837). The fact that some participants did not understand what the person in the target video is talking about seems not to have an effect on the mimicry level and the correct answers on the general knowledge questionnaire.

It can be assumed that participants who score high on mimicry have shown more attention for the video, but a regression analyses reveled that the degree the participants show attention for the video seems to have no effect on the mimicry level, r = -.144, N = 71, p = .230. So, much attention to the video is not associated with a higher degree of mimicry or lower attention is not associated with a smaller score on the mimicry dimension.

To summarize, participants who score high on the mimicry condition perform better on the general knowledge test, and empathy seems to have no effect on the performance. Additionally, neither for the mimicry condition nor for the performance condition and the empathy condition a gender effect was found. The attention participants showed for the video also seems to have no effect on the mimicry condition.

Table 2

Results overview

Hypothesis/research question	Pearson r	t	Significance
H1 People who score high on the mimicry level score high on the general knowledge questionnaire	r = . 280		p = **. 018***
H2 People who score high on empathy are more likely to mimic the professor AND score better on the GKQ	r = . 007 r = . 158		p = . 951 p = . 189
Attention/Mimicry	r = - . 144		p = . 230
Gender/Mimicry		-1. 497	p = . 142
Gender/Empathy		. 664	p = . 172
Gender/GKQ		. 246	p = . 577
Dutch/Mimicry		2. 168	p = . 077
Dutch/GKQ		- . 263	p = . 837

** significant on a p < . 05 level*

Discussion

Mimicry, empathy and the general knowledge questionnaire

The purpose of the study was to investigate if mimicking another persons gestures, mannerisms and facial expressions may influence behavior and if the multidimensional construct empathy is involved as an underlying mechanism. In social interactions people automatically and unintentionally mimic other people's behavior (Van Baaren, Holland, Kawakami, & Knippenberg, 2004). In the present study, behavior which may be influenced by mimicking a professor was measured through a general knowledge questionnaire consisting of 50 trivial pursuit questions. Based on the discussed studies and findings from social and cognitive psychological literature it can be assumed that when the stereotype of professors is activated, this activates related constructs like "intelligence" and "performing well", which in turn activates related behavioral representations to perform well on a general knowledge test.

Mimicry has an important purpose for us as human beings and several functions in social interactions, for example facilitates mimicry the capability to understand the feelings of other people through a two-step process called emotional contagion (Stel, van Baaren and Vonk, 2008) and, in clinical settings, has mimicry beneficial effects for a therapeutic relationship in terms of a more positive, interpersonal relation between two interaction partners (Stel & Vonk, 2010).

As shown in the present study, participants veritably score better on the general knowledge questionnaire when mimicking the professor, so the idea derived from social and cognitive psychological literature that when the stereotype of professors is activated, this activates related constructs like "intelligence" and "performing well", which in turn activates related behavioral representations to perform well on a general knowledge test has been confirmed.

Besides the previous mentioned findings from the literature show also the findings from the present study how influential mimicry actually is. To mimic a person belonging to a specific social category influence the behavior of the mimickees in such a way that the

behavior is congruent with the associated stereotypical characteristics of that specific social category. When mimicking a professor leads to better results on a general knowledge test through an activation of stereotypical constructs and, accordingly, an activation of stereotypical related behavioral representations to perform well (a stereotype of professors), the questions that may raise is if these findings can be transferred also to other social categories, for example, if mimicking a hooligan leads to more aggressive behavior in the mimickees because stereotypical constructs of hooligans such as aggression and rioting behavior leads to the activation of stereotypical related behavioral representations to act more aggressive. An alternative explanation could be that participants who score higher on mimicry are more intelligent (because they score better on the general knowledge test). The question that may rise is if people who score higher on mimicry, or are more likely to mimic another person, are smarter. than people who are less likely to mimic another person. As shown, the findings from the present study have important implications for further research.

It was assumed that people who score high on empathy are more likely to mimic other people's behavior and hence are more likely to show behavior congruent to the activated construct. Unexpectedly, people who score high on empathy are not more likely to mimic other people's behavior, and no positive or negative relation between empathy and the performance on the general knowledge questionnaire was found. The results confirm hypothesis one, that people who score high on mimicking a professor perform better on a general knowledge test, and do not confirm hypothesis two, that empathy plays a role in the form of an underlying mechanism which influence the mimicry condition and hence the performance.

In contrast, Sonnby-Borgström, Jönsson and Svensson (2003) found in their study a significant difference in facial mimicry reactions (automatic, spontaneous reactions) between participants who score high on empathy and participants who score low empathy. High-empathy participants show a significant mimicking reaction compared to low-empathy participants. However, there are some important differences between the present study and the study conducted by Sonnby-Borgström, Jönsson and Svensson (2003). Sonnby-Borgström, Jönsson and Svensson (2003) used electromyography (EMG) to measure participants facial muscle reactions shown while looking at the target pictures. A registration of the electric activity at the zygomaticus major side

indicated positive affects (a smile, for example) and a registration of electric activity at the corrugator supercilii site indicated negative affects (the corrugator supercilii muscle knits the eyebrow in negative facial expressions) (Sonnby-Borgström, Jönsson and Svensson, 2003).

In the present study, the scoring of facial reactions was done by a rater and a second rater rates 20% of the data to calculate interrater reliability. The results revealed a very good interrater reliability and indicate a valid measurement, but the measure by Sonnby-Borgström et al. (2003) may be much more precisely because the electromyography may also detect subliminal stimulation which may be overlooked by a scoring method on a more subjective basis (when an examiner scores the facial expressions).

Furthermore, to assess the construct empathy Sonnby-Borgström, Jönsson and Svensson, 2003 used the Questionnaire Measure of Emotional Empathy (QMEE) scale, which is especially designed to measure emotional, rather than cognitive aspects of empathy. An emotional reaction to another's emotional response is commonly termed as emotional, or affective empathy, whereas, by contrast, an intellectual or imaginative apprehension of another's emotional state is referred to cognitive empathy (Spreng, McKinnon, Mar & Levine, 2009). In the present study, the Toronto Empathy Questionnaire was used to assess participants degree of empathy, which see empathy as a primarily emotional process (Spreng, McKinnon, Mar, & Levine, 2009). Both questionnaires assess emotional aspects of empathy, but the use of two different questionnaires to assess empathy may influence the results as well.

Gender, language and attention

No significant difference for gender was found for the scores on the general knowledge questionnaire, the participants mimicry scores and the empathy scores. Males do not score less or higher on the general knowledge test and do not score less or higher on the mimicry level or on the empathy questionnaire. The analysis was done with 53 female participants (74,6%) and 18 male participants (25,4%). The ratio is 1/4, so this may be influence the results as well and conclusions should be drawn only carefully. Next to this, there was investigated if there is a difference in the mimicry level and the correct

answers in the general knowledge questionnaire between participants who understand the dutch language and participants who do not understand the dutch language.

It could be assumed that people who do not understand what the person in the video is talking about score worse on the mimicry level, because they can not link the verbal with the nonverbal and so may be less inclined to mimic the professor. As a result, they perform worse on the general knowledge test, because mimicry seems to have an effect on the performance on the general knowledge test. The fact that some participants do not understood what the person in the target video was talking about seems not to have a significant effect on the results. No significant difference was found for neither the mimicry level nor the correct answers on the general knowledge questionnaire. Although no significant effect was found, a tendency was found that participants who understood what the person in the target video was talking about are more likely to mimic the professor. It can be assumed that participants who understood what the professor in the target video was talking about can link the verbal with the nonverbal and are more inclined to mimic the professor. Certainly, they do not perform better on the general knowledge questionnaire.

Furthermore, the effect which could have had the degree the participants show attention for the video was investigated. However, much attention to the video is not associated with a higher degree of mimicry or lower attention is not associated with a smaller score on the mimicry dimension. Indeed, the observations during the experiment let suppose that there is an effect, because participants who have had much attention for the video appealed very concentrated and nearly sclerotic. It is thought that it is important that the participant is relaxed and easy-going while looking the target video, so for further investigations it will be advised to ensure that participants are not tense.

Strength and limitations

The study show that mimicking another person has an effect on how someone behave. Participants who mimic the professor in the video to a high degree are more likely to behave in a stereotype consistent way. Participants who score high on mimicry score

higher on the general knowledge questionnaire than participants who score less on mimicry.

The study has some limitations as well. The first limitation of the present study is the relatively small sample size of 71 suitable datasets. More than one hundred participants took part in the study, but plenty of them were not suitable for further analysis because of the missing video recording of the reactions the participant show while looking the target video. The questionnaire was constructed in such a manner that participants could fill in the questionnaire independent of any attendance of an examiner. So, first, because many participants had not done a video recording, it can be assumed that the instruction at the beginning of the questionnaire was not read carefully and therefore the information that the person in the video was a professor was probably not internalized. As result, many data were useless for the present study. In a further study it is to recommend to do the questionnaire in the presence of an examiner to assure that the participant internalize the fundamental informations (such as that the man in the video was a professor).

A second limitation of the study has reference to the scoring of the video recordings of the participant. The movements of the participants were compared with the movements of the professor shown in the video and was scored as mimicry if it matched a movement of the professor and occurred within 10 seconds after that movement. The decision which movement has to be scored as mimicry should have been defined beforehand. Is a small slight and hardly smile scored as mimicry when the professor smiled extensive or not is an important question which has to be defined in further research. A second rater was honed to calculate interrater reliability and the results revealed a good interrater reliability. So, although it may be a little limitation of the present study, the study had a good interrater reliability and hence no subjective character with reference to the scoring method.

All in all, the present study confirmed the expected hypothesis that people who mimic the professor perform better on a general knowledge questionnaire (when the stereotype of professors is activated, this activates related constructs like “intelligence” and “performing well”, which in turn activates related behavioral representations to perform well on a general knowledge test). Unexpectedly, hypothesis two was not confirmed.

The construct empathy seems, according to the present study, to have no effect on the mimicry level and no effect on the results participants receive on the general knowledge questionnaire. The present findings implicate that mimicking a person who belongs to a specific social category leads to stereotype congruent behaviors associated with that category.

References

Bargh, J. A., Chen, M., & Burrows, L. (1996). *Automaticity of Social Behavior: Direct Effects of Trait Construct and Stereotype Activation on Action,* 71(2), 230–244.

Branaghan, R. J., & Gray, R. (2010). *Nonconscious activation of an elderly stereotype and speed of driving. Perceptual and Motor Skills,* 110(2), 580–92. doi:10.2466/PMS.110.2.580-592

Chartrand, T. L., & Bargh, J. a. (1999). *The chameleon effect: The perception-behavior link and social interaction*. Journal of Personality and Social Psychology, 76(6), 893–910. doi:10.1037/0022-3514.76.6.893

Devine, P. G.(1989). *Stereotypes and prejudice: Their automatic and controlled components*. Journal of Personality and Social Psychology, 56, 5–18. doi: 10.1037/0022-3514.56.1.5

Dijksterhuis, A., Spears, R., & Lépinasse, V. (2001). *Reflecting and Deflecting Stereotypes: Assimilation and Contrast in Impression Formation and Automatic Behavior.* Journal of Experimental Social Psychology, 37(4), 286–299. doi: 10.1006/jesp.2000.1449

Dijksterhuis, A., & van Knippenberg, A. (1998). *The relation between perception and behavior, or how to win a game of Trivial Pursuit.* Journal of Personality and Social Psychology, 74(4), 865–877. doi:10.1037/0022-3514.74.4.865

Lakin, J., & Jefferis, V. (2003). *The chameleon effect as social glue: Evidence for the evolutionary significance of non-conscious mimicry.* Journal of Nonverbal Behavior, 27(3), 145–162. Retrieved from http://link.springer.com/article/10.1023/A:1025389814290

Mcintosh, D. N., & Knippenberg, V. (2006). *Original Papers 2006,* 37(1), 31–42.

Park, D., Hill, D., & Street, D. (2004). *Measuring empathy: reliability and validity of the Empathy Quotient,* 911–924.

Parrill, F., & Kimbara, I. (2006). *Seeing and Hearing Double: The Influence of Mimicry in Speech and Gesture on Observers.* Journal of Nonverbal Behavior, 30(4), 157–166. doi:10.1007/s10919-006-0014-2

Sonnby-Borgström, M., Jönsson, P., Svensson, Owe., (2003). *Emotional Empathy as Related to Mimicry Reactions at Different Levels of Information Processing,* Journal of Nonverbal Behavior, Volume 27, Issue 1, pp 3–23, doi:10.1023/A:1023608506243

Sonnby-Borgström, M., Jönsson, P., & Svensson, O. (2003). *Emotional empathy as related to mimicry reactions at different levels of information processing.* Journal of Nonverbal behavior, 27(1), 3-23.

Stel, M., & Vonk, R. (2010). *Mimicry in social interaction: benefits for mimickers, mimickees, and their interaction.* British Journal of Psychology (London, England : 1953), 101(Pt 2), 311–23. doi:10.1348/000712609X465424

Stel, M., Baaren, R. Van, & Vonk, R. (2008). *Effects of mimicking: Acting prosocially by being emotionally moved.* European Journal of Social Psychology, 976(April 2007), 965–976. doi:10.1002/ejsp

Stel, M., Dijk, E. Van, & Olivier, E. (2016). *You want to know the truth? Then don't mimic!* Psychological Science, 693–699. Retrieved from http://pss.sagepub.com/content/20/6/693.short

Spreng, R. N., Mckinnon, M. C., Mar, R. A., & Levine, B. (2009). *The Toronto Empathy Questionnaire: Scale development and initial validation of a factor-analytic solution to multiple empathy.* NIH Public Access, 91(1), 62–71. doi: 10.1080/00223890802484381.

Van Baaren, R. B., Holland, R. W., Kawakami, K., & Knippenberg, A. Van. (2004). *Mimicry and Prosocial Behavior.* Psychological Science, 15(1), 71–74. doi: 10.1111/j.0963-7214.2004.01501012.x

Van Baaren, R. B., Holland, R. W., Steenaert, B., & van Knippenberg, A. (2003). *Mimicry for money: Behavioral consequences of imitation.* Journal of Experimental Social Psychology, 39(4), 393–398. doi:10.1016/S0022-1031(03)00014-3

Appendix A

First, the participants were welcomed and asked to choose an ID number to be able to assign the video later to the data. The participants saw the following instruction on the screen of the notebook:

Dear participant,

Welcome to the experiment of the Department of Psychology of the University of Twente. You are about to participate in a scientific study within the scope of a bachelorthesis.

Please enter an ID number below. You can choose a 6-figure ID number composed of numbers, capital letters and small letters, for example K8u7Zh. Please keep the ID number in mind, you will need it later.

If applicable, please enter your SONA number. If not, enter 0.

To maintain high level of research it is very important that research is conducted in a correct and proper manner.
We try to do so by providing clear instructions to the participants in our study. If you have any questions or comments with regard to the research you can report this at the end of the research. Of you as a participant, we ask that you are as focused and serious as possible when participating in the study. It is important not to stop during the different parts of the study. In total, it will take approximately 15 minutes, so make sure you have 20 minutes available now. Of course, when you would like to stop the experiment, you can stop any time you like to, but cannot proceed again afterwards. Only this way we can use the results of our study.

Important: *During the experiment you will watch a short video (approximately 2 minutes) of a Professor talking about going to the supermarket. The video will be in Dutch, so you will probably have no idea what he is talking about. This is no problem as this is the purpose of the study. The objective of the study is to record the participants reaction while watching the video, so you have to make a video recording of yourself.*

Please read this information carefully!

It is important that you follow these instructions: The instruction is to video record yourself while watching to the video (your face is sufficient). You can use your webcam or any other device. Please make sure that your video recording begins BEORE the video of the professor starts and ends AFTER the video of the professor ends. So, your video recording should take approximately two minutes.

Please send the video recording with your previously chosen ID number to: a.schroder@student.utwente.nl

It's really important for our research that this instruction is correctly carried out.

Thank you for your participation.

The participants were then asked to agree by clicking the „agree" option. By clicking the „agree“ option the participant indicate that he or she has read and understood the above consent form and that he or she would like to participate out of his or her own free will. After clicking the „agree“ option, the participant saw the following instruction on the screen of the notebook:

Watch the video with your full attention. Do not pause the video or look at it more than one time. The video will take approximately two minutes.

The video will be in Dutch, so you will probably have no idea what he is talking about. This is no problem as this is the purpose of the study.

Once you click on the „>>" button, you will go to the video. You can turn on the video itself. So, start your video recording and go to the video.

By clicking the „> >“ button, the participants saw a short video of approximately two minutes. The video can be seen online via: link

After the participant has seen the video, he or she was asked to fill in a questionnaire with 50 trivial pursuit questions (see Appendix A) and saw the following instruction:

You have finished watching the video. Later, you will be asked questions about the video.

Now, we will ask you to answer 50 questions.
These questions are Trivial Pursuit questions. We are interested in the knowledge of people about different topics. To be able to investigate this, you should answer these questions without the help of other people or of the internet. It is important to keep to those instructions, otherwise the study is of no use for us. To facilitate this, you will have 20 seconds to fill in the answer.

Please indicate below that you understood the instructions presented above.

After the participant indicates that he or she has understood the instructions and states that he or she will not get help from other people or the internet when answering the 50 Trivial Pursuit questions, the first question was shown on the screen op the notebook (see Appendix A). After that, the participants were asked some demographical questions. These include gender, age and nationality, and highest education and occupation. Furthermore, the participants were asked if they understand the dutch language, how much attention they did have had for the video and on how many Trivial Pursuit questions they did got help from other people or the internet. Finally, the participants were asked to fill in the Toronto Empathy Questionnaire (see Appendix C) and saw the following instruction.

 *Finally, there is a list of statements. Please read each statement carefully and rate how frequently you feel or act in the manner described. There are no right or wrong answers. Please answer each question as honestly as you can.*

After completion of these questions you have finished the questionnaire.

After completing the questionnaire, the participants were asked if they have any questions regarding the online experiment and were thanked for participation. They saw the following text:

 *You have finished the questionnaire, thank you very much for participation!*

Please note: It is essential for our research to get your video recording. When we do not have your video recording your data were useless for us. So, please take care that we receive your video recording. Send it to: a.schroder@student.utwente.nl. If you take part as a psychology student and wants to receive SONA credits please note that we can only credit your credits when we received your video recording.

End of survey

Appendix B

Table 2

The general knowledge questionnaire

Question	*Answer possibilities*
1. What's the smallest country in the world?	*1. Mo*naco, Nauru, Vatican City, Tuvalu
2. Who said, „Vini, vidi, vici“?	*2.* Plato, Caesar, Aristotele, Socrates
3. How many tentacles does an Octopus have	*3.* 6,8,10,12
4. Who starts first in chess?	*4.* Black, White, Both, Based on the toss
5. What group were George Harrison, Paul Mcartney, and John Lennon in together as well as the beatles?	*5.* The Quarrymen, The Quarteitmen, The Beach Boys, The Beatles Junior
6. What's the highest mountain in the world?	6. Kangchenjunga, Lhotse, Makalu. Everest
7. What religion was Adolf Hitler?	7. Orthodox, Catholic, Protestant, Jews
8. What is the world’s smallest bird?	8. Hummingbird, Linnet, Pied wagtail, Cuckoo
9. What sport used the term "home run" long before baseball?	9. Softball, Lacrosse, Cricket, Rounders
10. What drug did Sherlock Holmes take?	10. Heroin, Ecstasy, Cocaine, Marijuana
11. Which is the smallest ocean?	11. Arctic, Antarctic, Indian, Atlantic
12. Which nation gave women the right to vote first?	12. Rwanda, United Kingdom, USA, New Zealand
13. What animal is a Canus Lupus?	13. Dog, Wolf, Fox, Coyote
14. What sport company's logo is called the „swoosh“?	14. Nike, Reebok, Adidas, Puma
15. What was Fred Flintstones Best friend called?	15. Pearl Slaghoople, Captain Caveman, Dino, Barney Rubble
16. Which river's waters carry over half of all Russian river commerce?	16. Mius, Volga, Narva, Pechora
17. Who was the goddess of Love in Roman Myth?	17. Venus, Aphrodite, Cupid, Athena
18. What is fastest animal on earth	18. Lion, Pronghorn antelope, Cheetah, Thompson’s gazelle
19. Who is the only tennis player to have won each of the four grand slam events at least four times?	19. Andree Agassi, Steffi Graf, Pete Sampras, Margaret Court
20. What is the third part in JRR Tolkins Lord of the Rings trilogy.	20. The Deathly Hollows, The return of the king, The Two Towers, The Fellowship of the ring
21. Which Ocean goes to the deepest depths?	21. Atlantic, Pacific, Arctic, Antarctic
22. What Western Hemisphere people spoke Nahuatl?	22. Mayans, Aztecs, Lemurians, Babylonian
23. What is the only mammal without wings that cannot fly but does fly?	23. Homo Sapiens, Marsupial, Chiroptera, Pinguins
24. What recreational activity is second on popularity only to walking in the U.S.?	24. Running, Shopping, Swimming, Video gaming
25. Who lived at 221b Baker Street?	25. Hercule Poirot, Sherlock Holmes, Harry Potter, Edward Cullen
26. What is the most common Element on Earth?	26. Helium, Nitrogen, Oxygen, Hydrogen
27. Who gave his name to the month of July?	27. Julius Caesar, Socrates, Alexander the Great, Augustus Caesar
28. What is the world’s largest mammal?	28. Southern Elephant Seal, Blue Whale, Hippopotamus, Whale Shark
29. What is the most common nickname for a major league baseball pitcher?	29. Pitchy, Campy, Rollie, Lefty
30. Which City in USA is Graceland the former home of Elvis Presley?	30. Tupelo. Texarkana, Houston, Memphis
31. Which country is further from the equator?	31. Tasmania, Tanzania, Transylvania, Zambia
32. What was collapsed in London at 3.45 on August 5th, 1975?	32. Big Ben, London Bridge, The Metro, Buckingham Palace
33. Which birds have been trained to tend sheep?	33. Penguin, Flamingo, Swan, Geese
34. What's the highest score in a gymnastics exercise?	34. 1,3,10,100
35. Who wrote Alice's Adventures in Wonderland?	35. Hans Christian Andersen, Astrid Lindgren, Lewis Carroll, Walt Disney
36. What U.S. state boasts a town called Captain Cook?	36. Florida, Hawaii, North Carolina, California
37. Which Italian leader was terribly afraid of the evil eye?	37. Benito Mussolini, Cesare Manzella, Giovanni Falcone, Paolo Borsellino
38. Which dog has the best eyesight?	38. Pit Bulls, Rottweilers, Doberman Pinscher, The Greyhound
39. How many coloured balls are there in billiards?	39. 5,9,10,15
40. Who is Luke Skywalkers Father?	40. Yoda, Darth Vader, Chewbacca, Obi-Wan
41. What European country does Aruba maintain the strongest ties to?	41. The Netherlands, United Kingdom, Germany, France
42. Did Neil Armstrong put his left or his right foot on the moon first?	42.
43. What is world’s largest snake?	43. King Cobra, Python, Anaconda, Boa
44. How many squares are there on a chess board?	44. 49, 64, 100, 144
45. Which book by Ian Fleming did James Bond first appear?	45. Hans Christian Andersen, Astrid Lindgren, Lewis Carroll, Walt Disney
46. What European country uses its Latin name, Helvetia, on its stamps?	46. Switzerland, Denmark, United Kingdom, Lithuania
47. Who was the first president of America?	47. Adams, Washington, Jefferson, Madison
48. What color is Yak's milk?	48. White, Yellow, Pink, Brown
49. What activity other than jumping are kangaroos good at?	49. Boxing, Swimming, Running, Eating
50. Which Planet did Superman come from?	50. Cryptext, Krypton, Earth, Saturn

Appendix C

Table 3
The Toronto Empathy Questionnaire

Question	Never	Rarely	Sometimes	Often	Always
1. When someone else is feeling excited, I tend to get excited too	O	O	O	O	O
2. Other people's misfortunes do not disturb me a great deal	O	O	O	O	O
3. It upsets me to see someone being treated disrespectfully	O	O	O	O	O
4. I remain unaffected when someone close to me is happy	O	O	O	O	O
5. I enjoy making other people feel better	O	O	O	O	O
6. I have tender, concerned feelings for people less fortunate than me	O	O	O	O	O
7. When a friend starts to talk about his\her problems, I try to steer the conversation towards something else	O	O	O	O	O
8. I can tell when others are sad even when they do not say anything	O	O	O	O	O
9. I find that I am "in tune" with other people's moods	O	O	O	O	O
10. I do not feel sympathy for people who cause their own serious illnesses	O	O	O	O	O
11. I become irritated when someone cries	O	O	O	O	O
12. I am not really interested in how other people feel	O	O	O	O	O
13. I get a strong urge to help when I see someone who is upset	O	O	O	O	O
14. When I see someone being treated unfairly, I do not feel very much pity for them	O	O	O	O	O
15. I find it silly for people to cry out of happiness	O	O	O	O	O
16. When I see someone being taken advantage of, I feel kind of protective towards him/her	O	O	O	O	O

Appendix D

Code schema

ID-number:
Gender:
Chew the participant gum? Yes/No
Is the participant concentrated? Yes/No
Other particularities:

Movement	Time (in seconds)
	5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 110
Nod of the head	x x
head-shaking	x x x
head movement laterally	x x x x
head movement to the top	x x
head movement to the bottom	x
eye brow to the top	x x x x
frown	x x x x
smiling	x x
hand in the face	x x x x

Table 1

Reactions shown by the professor in second

Behavior	Seconds
Nod of the head	9, 74 - 75
head-shaking	10, 35 - 36, 102 - 103
head movement laterally	43 - 44, 50 - 51, 58 - 59, 100
head movement to the top	22, 64
head movement to the bottom	40 - 41
eye brow to the top	5 - 6, 28 - 29, 31, 41 - 42, 83 - 84
frown	9, 60 - 61, 71, 94 - 95
laugh	37, 80 - 81
hand in the face	14 - 15, 52 - 53, 77 - 78, 88 - 89