Psychology Research and Behavior Management

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ORIGINAL RESEARCH

Negative Deviation Effect in Interpersonal Communication: Why People Underestimate the Positivity of Impression They Left on Others

This article was published in the following Dove Press journal:
Psychology Research and Behavior Management

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Background: Recently, a study revealed that people liked others significantly more than they estimated that others liked them. Thus, the study found that people tended to underestimate how much others liked them, a phenomenon the authors called the Liking Gap. However, the logic and testing of the study existed unclear nature. In order to show whether people underestimate the positivity of impression they left on others, we directly compare the estimate of the impression we left on others with others' actual impression of us, which make the logic clear. Besides, we explored the new findings with regard to the mechanism of the effect.

Methods: Based on this idea, in study 1, we explored whether there is indeed a negative deviation effect in the estimate of the impression people left on others in short interpersonal communication. In study 2, we investigated the potential psychological mechanisms of that effect.

Results: In Study 1, the results revealed that people estimated that others liked them significantly less than others actually liked them. That is, a negative deviation effect did occur, and even if people were clear about their liking for others, the effect still existed. In Study 2, we provided evidence that a negative deviation effect existed not just because people are too focused on their own-negative thoughts in conversational performance but rather because people had a psychological defense towards others in their first communication.

Conclusion: People significantly underestimate how much they are liked and its reason is that their psychological defense towards others in their initial communication. The results of the study are beneficial for people in social interaction and provide them with new ways of thinking in interpersonal communication and mutual contact.

Keywords: impression, negative deviation, negative thoughts, psychological defense

Introduction

Imagine you have a brief conversation with someone you do not know (ie, a stranger), and then leave. You leave a basic impression on the other person (first impression). Can you accurately estimate that impression? Is there a cognitive deviation between the impressions you left on others and your estimate of those impressions? This is a new problem about the study of impression formation in the field of social cognition.

Regarding impression, previous studies have mainly focused on people's initial impressions of others after their first contact, including impression formation and impression updating.

Since the 1940s, research on impression formation in the field of social cognition has aroused general interest.[1–8] The first impression was of significance in the research on impression formation, which was defined as the initial impression of

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DovePress
http://doi.org/10.2147/PRBM.S258057

others through initial contact. The main factors of initial impression formation include personal appearance, speech, non-verbal communication, behavior, information order and other clues.[9–11] The "primacy effect" of impression formation was proposed.[12,13] After the first impression is formed, primacy effect tends to make people know each other, and the overall impression of others is generally formed with the first impression at the center, which has a stronger influence on the overall impression of others than the information obtained in the future and even lasts for a long time. Subsequently, the "halo effect" of impression formation was put forward,[14] which means that if people have a good impression of someone in one aspect, they tend to think that he/she is equally good in other aspects. In their experiments, they found that subjects tended to rate beautiful people higher in other aspects, while they rated ugly people lower. People tend to form a more consistent evaluation of different traits, which is the main reason for the "halo effect".[15]

Further research suggests that with the influence of social classification, people form a fixed impression and view of certain social groups in life, and thus, they automatically form certain impressions of the members of these groups, which are known as "stereotypes".[16,17] The continuum model of impression formation argues that impression formation is a continuum, with one end being feature processing and the other end being classification processing.[18] There is an asymmetry in the impression people form of certain social groups (gender, religious beliefs, etc.) through public information, which can lead to the phenomenon of external group preference. The cognitive and motivational functions of gender stereotypes help us understand their effects on implicit beliefs and communication between men and women.[17,19,20]

A great deal of research has explored the overall impression of others and impression updating in academic circles.[21–24] A person always has both positive and negative qualities. Therefore, researchers have discussed the evaluation of people's overall impression of others. For instance, the cumulative model, average model and weighted average model can explain how to integrate the quality characteristics of people and form an evaluation of the overall impression of others.[25] Research reveals that when people encode information about others' behavior into their memories, people can also infer personality traits, goals, values and other characteristics from other people's behavior information without specific purposes, forming an impression of others.[26–30] Social interaction and communication are a complex and dynamic process, and thus individuals need to constantly update their initial impressions of others based on the new information they obtain.[31,32] However, sometimes people are clearly aware that their first impressions are wrong, but the effect of these impressions is also more difficult to eliminate because they rely more on the information they originally received from others and previous stereotypes than new behavioral information.[1,33] And under certain conditions, the impression is not invariable, and that impression updating does not completely replace the original impression, both of which seem to coexist.[34–37]

Subsequently, a growing body of research has revealed that impression formation is a dynamic curve, and our explicit and implicit impressions on others may be constantly updated according to the evaluation of new information that is inconsistent with previous information.[38–43] When people receive significantly inconsistent information that is subjectively assessed as very important, it is unpopular for people to accept it because it challenges people's belief and self-esteem; however, people still spend time and energy on further cognitive processing, which leads to stronger impression updating.[44] Moreover, if the new information is believable and diagnosed, and the evaluation meaning of the original information can be reinterpreted, then people can modify their implicit evaluation of the new individual.[45] Ma et al integrated inconsistent social behavior information into the paradigm of impression formation in the fMRI study and examined the brain activity mechanism of spontaneous, and conscious psychological processes when individuals updated their first impressions of others. The results showed that dmPFC played a role in the neuroimaging of impression updating.[46,47] Mende-Siedlecki and Todorov found that first impression and impression updating were two different stages of impression formation, involving different brain areas in the fMRI study. They also observed that left ventrolateral prefrontal cortex (vlPFC) and left inferior frontal gyrus (IFG) were preferred to be recruited for unexpected unethical behavior, while a group of separate areas (including dorsal buckle prefrontal cortex, posterior cingulate cortex and temporal parietal joint/inferior parietal lobule) preferred to recruit parietal lobule in response to more mundane behavior inconsistencies. The above results reveal a distributed system that supports impression updating.[42]

The research on impression formation mainly explored the formation and change of people's impression of others for a long time. Most notably, recent work[48] has shown that people estimate the impression they left on others

after initial communication, exploring impression formation in a new way. The experimenters asked the target participants to communicate with other participants who do not know each other and then asked both of them to rate how much they liked each other and estimated how much they were liked. The results revealed that the target participants liked other participants significantly more than they estimated that other participants liked them. Thus, they found that people tended to underestimate how much they were liked by others, a phenomenon they named the Liking Gap. Based on the results, they provided support for the suggestion that the Liking Gap was caused by people's own-negative thoughts of their conversational performance. The above study extends the traditional research on the formation of people's impression of others in interpersonal communication to the study of people's estimation of their own impression left on others, which is of great significance to promote the study of impression formation. However, there is an unclear nature of the testing of the study. The logic of the study may be confusing, and it is indistinct why Boothby et al did not use the target as the level of their hierarchical analysis. To make the logic and testing clear, we applied another analysis to test whether people underestimate the positivity of impression they left on others–comparing the estimate of the impression we left on others with others' actual impression of us. Moreover, it is worth discussing whether people's own-negative thoughts in conversation served as the reason for the Liking Gap. Because a consistent way of communication is based on emotional security,[49] they tend to hide their true feelings instead of expressing real feelings or expectations. Generally speaking, the emergence of psychological defense is a kind of self-defense, which refers to a kind of psychological state of general vigilance to the outside world, and the psychology of alertness and distrust caused by people's fear of being hurt. In general, people will maintain psychological alertness to prevent others from causing psychological harm to themselves. We believe that a spontaneous psychological defense by the initial contact due to a lack of emotional security may be another main reason for underestimating people's impression of themselves.

According to this idea, we design two series of studies to explore whether people will underestimate the impact of being liked by others after a brief communication, which is equal to exploring whether there is a negative deviation in people's estimate of impressions they left on others. Therefore, in study 1, we explored whether there is indeed a negative deviation effect. In study 2, we provided evidences for the effect. The studies that are reported in this paper were approved by the Ethics Review Committee of the School of Psychology at South China Normal University. All participants provided informed consent, and that this study was conducted in accordance with the Declaration of Helsinki. We report all measures, manipulations, and exclusions in these studies. Moreover, sample sizes were determined before any data analysis in these studies.

Study 1

Through Study 1 we aimed at exploring whether there was a negative deviation effect in people's estimate of impressions they left on others in initial communication.

Study 1a

Purpose

By comparing how much participants estimated that conversation partners liked them with how much conversation partners actually liked participants, we test whether there is a negative deviation effect in people's estimate of impressions they left on others.

Method

Participants

Eighty Chinese students volunteered to participate in the study, and eight of them were excluded because they knew each other. The remaining seventy-two participants (42% male, 58% female; age: M=22.24 years, SD=2.16) participated in the experiment in exchange for ¥ 10. We obtained the written informed consent from each of the participants. A sensitivity analysis conducted with G*Power,[50] showed that our sample size was sufficient to detect small-to-medium effects of d=0.40, assuming an alpha level of 0.05 and 80% power.

Procedure

As described in detail previously,[48] each conversation involved two participants who did not know each other. They were arranged to start a conversation face to face for 5 min. Randomly, one was considered the target participant, and consequently, the other was considered the conversation partner. To help the communication, every participant was given a sheet of paper with ice-breaker questions (eg, "What kind of exercise do you like?", "What is your favorite food?"). The experimenter would

tell both of them to answer the ice-breaker questions after he left. And 5 min later, the conversation ended. Then, the pair of participants were sent to two separate rooms to complete a computer-based 7-point Likert-type scale designed by Boothby, with the end points strongly disagree and strongly agree, to report the degree to which they agreed with the presented statements.

Importantly, in contrast to Boothby's research design (2018), the conversation partner was presented with only the first four statements (which aimed to measure how much the conversation partners actually liked the target participants): (a) "In general, I liked the conversation partner"; (b) "I wanted to know more about the conversation partner "; (c) "I looked forward to communicating with the conversation partner again"; and (d) "I would make friends with the conversation partner in the future". Correspondingly, the target participant in our study was presented with only the last four statements (which aimed to measure how much the target participants estimated that their conversation partners liked them): (e) "In general, the conversation partner liked me"; (f) "The conversation partner wanted to know more about me"; (g) "The conversation partner looked forward to communicating with me again"; and (h) "The conversation partner would make friends with me in the future."

Results and Discussion

Through statistical analysis of the results of the 7-point Likert-type scale, measures E to H which rated how much the participants estimated their conversation partners liked them were highly correlated (α =0.89). Accordingly, the average of the scores on these measures was designated as the indicator of the target participants' estimated liking. Likewise, measures A to D which rated how much their conversation partners actually liked the participants were also highly correlated (α = 0.88), and the average of the scores on these measures was regarded as the indicator of the conversation partners' actual liking. These two scores were jointly considered as a liking index and acted as our dependent variable. The rating type (conversation partners' actual liking vs target participants' estimated liking) acted as our independent variable. A paired samples *t*-test revealed a significant effect of rating type on liking, mean difference = 0.75, 95% CI = [0.39, 1.11], t (35) = 4.20, p< 0.001, d=0.70, with participants estimating their conversation partners liked them (M=4.71, SD=1.00) significantly less than their conversation partners actually liked them (M=5.46, SD=0.93), which indicated that a negative deviation effect existed (Figure 1).

Through Boothby's experimental paradigm (2018), Boothby et al concluded that people tended to underestimate others' liking them after a brief conversation. Admittedly, they did test what they claimed, with participants reporting liking their conversation partner significantly more than they perceived their conversation partner to like them. However, there is still an unclear nature of the testing of their work that may be confusing. Therefore, we used a more direct method to claim that people underestimate the positivity of impression they left on others. By comparing how much conversation partners liked the target participants with how much the target participants estimated that their conversation partners liked them, we also draw the above conclusion. Thus, our results revealed that participants estimated their conversation partners liked them significantly less than the conversation partners liked them. That is, a negative deviation effect did occur. Let us explore it further, according to the interactive effects on interpersonal attraction;[51] it is generally believed that people's liking of others is affected by their estimate of others' liking of them, which means the relationship is equivalent. Therefore, when the target participants liked their conversation partners and are clear about their actual liking for them, will the negative deviation effect still exist? This question will be discussed in study 1b.

Study 1b

Purpose

To verify the universality of negative deviation effect, this study aimed to explore whether people underestimated their conversation partners liking for them when they

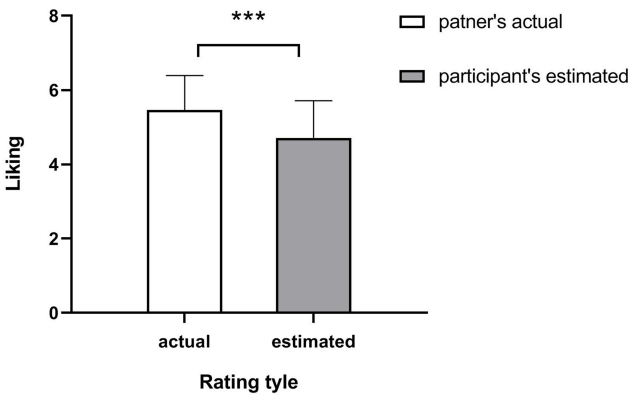

Figure 1 The results of study 1a: mean ratings of actual liking of conversation partners and estimated liking of target participants.

were clear about their actual liking for others. Thus, after we asked the target participants to determine the exact sense of how much they liked their conversation partners, we again compared conversation partners' actual liking with the target participants' estimated liking. According to that design, we can further test whether there is a negative deviation effect.

Method

Participants

We aimed to collect the same number of participants employed in Study 1a. Therefore, seventy-two Chinese students (38% male, 42% female; age: M= 22.31 years, SD= 2.32) who were not involved in Study 1a participated in this study for ¥ 10. All participants signed informed consent forms. A sensitivity analysis also suggested that our study was adequately powered (80%) to detect the small-medium effects of d=0.40.

Procedure

The procedure was the same as Study 1a except that all eight questions (measures A to H) were presented only for the target participants to complete, with the former four statements (measures A to D) presented before the latter ones (measures E to H). For the conversation partners, only measures A to D were presented.

The statement of measures A to H were as follows: (a) "In general, I liked the conversation partner"; (b) "I wanted to know more about the conversation partner"; (c) "I looked forward to communicating with the conversation partner again"; (d) "I would make friends with the conversation partner in the future"; (e) "In general, the conversation partner liked me"; (f) "The conversation partner wanted to know more about me"; (g) "The conversation partner looked forward to communicating with me again"; (h) "The conversation partner would make friends with me in the future."

Results and Discussion

We performed a statistical analysis of the results of the 7-point Likert-type scale. First, it was found that measures A to D which rated how much the target participants actually liked their conversation partners highly correlated (α = 0.90), so we regarded the average of the scores on these measures as the indicator of the target participants' actual liking. Second, measures E to H which rated how much target participants estimated their conversation partners liked them were highly correlated (α =0.89), and so the average of the scores on these measures was designated again as the indicator of the target participants' estimated liking. Third, measures A to D which rated how much their conversation partners actually liked the target participants were highly correlated (α = 0.89), so the average of the scores on these measures was regarded again as the indicator of the conversation partners' actual liking.

These three indicators, jointly considered as the liking index, and served as our primary dependent variable. In the first part of our statistical analysis, rating type 1 (target participants' actual liking vs target participants' estimated liking) served as our independent variable. A paired samples *t*-test revealed a significant effect of rating type 1 on liking, mean difference = 0.63, 95% CI = [0.33, 0.92], t (35) = 4.33, $p< 0.001$, d=0.73, with the target participants reporting an estimate that their conversation partners liked them (M=4.79, SD=0.95) significantly less than they liked their conversation partners (M=5.42, SD=0.96).

In the second part of our statistical analysis, rating type 2 (conversation partners' actual liking vs target participants' estimated liking) served as our independent variable, and the liking index served again as our primary dependent variable. A paired samples *t*-test revealed a significant effect of rating type 2 on liking, mean difference = 0.72, 95% CI = [0.38, 1.07], $t(35) = 4.22$, $p< 0.001$, d=0.70, with the target participants estimating their conversation partners liked them (M=4.79, SD=0.95) significantly less than their conversation partners liked them (M=5.51, SD=0.89). The above results revealed that people tended to underestimate how much others liked them, even though it was under the condition that they were clear about their actual liking for their conversation partners. Therefore, the negative deviation effect was quite stable (Figure 2).

The interactive effect of interpersonal attraction indicated that people's liking of others is affected by their estimate of others' liking of them, which means the relationship is equivalent.[34,52–54] As Chinese live by the principle: nice to me and I will be nicer to you. In theory, therefore, there should be no significant difference between the above two rating types of liking. However, the results conflicted with our inference. Hence, why does the negative deviation effect exist? Is it appropriate to attribute this effect to the hypothesis that people are too focused on their negative thoughts of themselves to notice the signals of their mutual liking, as described in research previously[48]? If there are no negative thoughts in the interpersonal communication, will

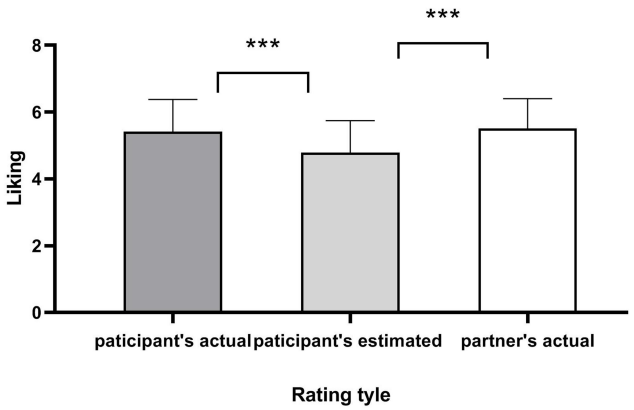

Figure 2 The results of study 1b: mean ratings of actual liking of conversation partners, actual and estimated liking of target participants.

there still be a negative deviation effect? Study 2 will explore the main reasons for the negative deviation effect.

Study 2

Study 2 provided evidence of the negative deviation effect in the estimate of the impression people left on others.

Study 2a

Purpose

In Study 2a we mainly explored whether people's negative thoughts of themselves during interpersonal communication were the reason behind the negative deviation effect. We made some changes to the method used in Boothby's research; that is, we just analyzed the data of the participants who had no own-negative thoughts in their communications. We made the prediction that if there are no negative thoughts in interpersonal communication, the negative deviation effect would still exist. This prediction was tested in Study 2a.

Method

Participants

Eighty-six Chinese students volunteered to participate in the study, and four of them were excluded because they knew each other. The remaining eighty-two participants (41% male, 59% female; age: M= 23.04 years, SD= 2.08) participated in the experiment in exchange for ¥ 10. Each participant signed an informed consent form. A sensitivity analysis conducted with G*Power showed that the sample size was sufficient to detect small-to-medium effects of d=0.40 or greater, assuming an alpha level of 0.05 and 80% power.

Procedure

The procedure was the same as Study 1a. That is, only four statements that tested target participants' estimated liking (measures E to H) were presented for the target participants to complete, while the other four statements that tested conversation partners' actual liking (measures A to D) were presented for the conversation partners to complete. What was different is that, after answering the above questions, the target participants also answered the negativity or positivity of their thoughts when they were forming their conversation partners' impressions of them (measure I: "What are the three important moments that you estimate you left impression on the other participant during your communication?"). While the conversation partners answered what thoughts went into forming their impression of the target participants (measure J: "What are the three important moments that the other participant left impression on you?"). Importantly, these two groups of participants were asked to write as specifically as possible about every moment and then to rate the negativity or positivity of every moment on a 7-point Likert-type scale with the end points extremely negative and extremely positive.

Results and Discussion

The results of the 7-point scale showed us the extent to which the target participants and their conversation partners thought negatively of their own conversational performance. To ensure the validity of the data, we excluded six participants' data that indicated the existence of own-negative factors in their conversations (We believed that participants with the average score on measure (I) or measure (J) <4 tended to have negative thoughts). The remaining 76 participants' data were analyzed because they demonstrated that there were no own-negative factors in their conversations (the score on measure (I) or measure (J) ≥4).

We tested the scores of people's thoughts by asking the target participants to answer how negative or positive each of their thoughts they estimated their conversation partner had about them was (measure I). As well as measure J was used for the conversation partners to answer the negative or positive thoughts they had about the target participants. Collectively, the average of these two scores on the above measures was designated as the thought index which acted as our dependent variable. The impression type (conversation partners' impression vs participants' estimated impression) acted as our independent variable. A paired samples *t*-test revealed a non-significant effect of impression type on thought, 95% CI = [−1.54, 0.56], t (37) = 1.15, p=0.26. This

analysis showed that participants did not have negative thoughts of themselves during communication performance.

As the same as in Study 1a, measures A to D which rated how much their conversation partners liked the target participants were highly correlated (α = 0.88), and measures E to H which rated how much the target participants estimated their conversation partner liked them were also highly correlated (α = 0.91). Jointly, the liking index acted as a dependent variable, and the rating type (conversation partners' actual liking vs participants' estimated of liking) acted as our independent variable. A paired samples *t*-test revealed a significant effect of rating type on liking, mean difference = 0.68, 95% CI [0.41, 0.94], t (37) =5.16, $p< 0.001$, d=0.83, with participants estimating their conversation partners liked them (M=4.82, SD=0.82) significantly less than their conversation partners liked them (M=5.49, SD=0.81). (Figure 3)

In addition, we conducted an additional analysis by Pearson product–moment correlations with the impression type and our negative deviation index. Negative deviation index was computed by subtracting participants' estimated liking from their conversation partners' actual liking. Pearson product–moment correlations showed that Measure I was unrelated to liking gaps (r = 0.09, p = 0.61); Measure J was unrelated to liking gaps (r = −0.04, p = 0.81); And Measure I and J together were also no correlation with liking gaps (r = 0.19, p = 0.91).

Study 2a mainly explored whether people's negative thoughts of themselves during interpersonal communication were the reason behind the negative deviation effect. By evaluating the participants' scores of the negativity in conversational performance and analyzing participants' liking index collected just from the conversations without negative thoughts, we examined whether there is still a negative deviation effect. The results showed that the target participants estimated their conversation partners liked them significantly less than their conversation partners actually liked them, demonstrating the same negative deviation effect revealed in Study 1a. At the same time, it proved that the negative deviation effect was not just caused by people's own-negative thoughts of conversational performance, because the effect still existed in people who were not self-critique. Therefore, it is not entirely sufficient for Boothby (2018) to conclude that the more people thought negatively in the communication, the bigger the liking gap existed between them. While we found that the bigger or smaller gap still exists when people had no negative thoughts. According to the above discussion, we can infer that people's own-negative thoughts may result in the negative deviation effect to some extent, but there are still other main reasons for it. However, Study 2a only discussed the influence of people's own-negative thoughts of conversational performance on the negative deviation effect without taking other factors into account. To explore it further, we tested the negative deviation effect under the two different conditions of people having verbal communication and not having verbal communication in Study 2b. Will the psychological defense activated by the above two ways of communication be another main reason for the negative deviation effect?

Study 2b

Purpose

By comparing the extent of negative deviation effect between the verbal communication group and the non-verbal communication group, we examined whether the

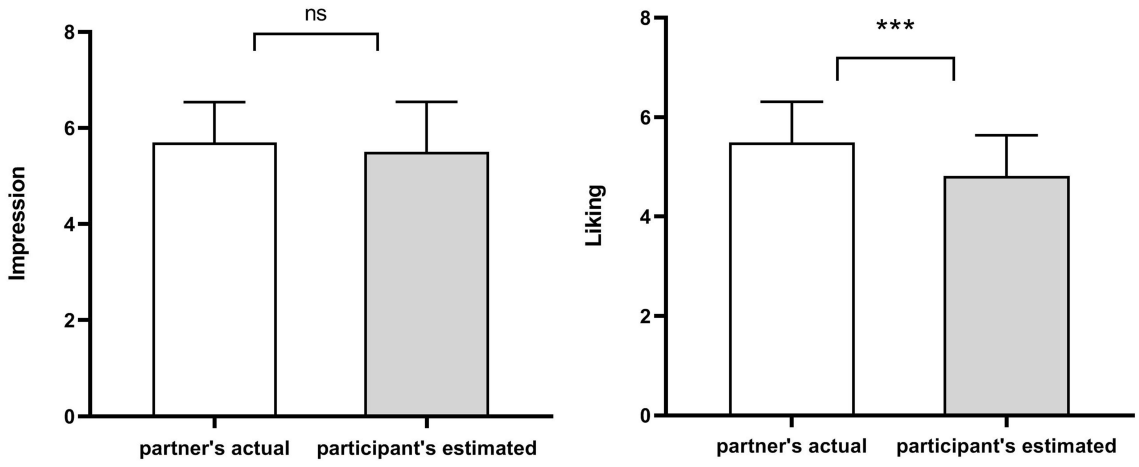

Figure 3 The results of study 2a: mean ratings of actual impression/liking of conversation partners and estimated impression/liking of target participants.

psychological defense activated by different ways of communication was the reason behind the negative deviation effect.

Method

Participants

One hundred twenty-four Chinese students volunteered to participate in the study, and four of them were excluded because they knew each other. The remaining one hundred twenty participants (34% male, 66% female; age: M= 21.02 years, SD= 2.40) participated in exchange for ¥ 10. Each participant provided informed consent. A sensitivity analysis conducted with G*Power showed that the sample size was sufficient to detect small-to-medium effects of f = 0.20, assuming an alpha level of 0.05 and 80% power for a mixed-model ANOVA with two groups.

Device

A 7-point Likert-type scale on psychological defense created in study 2b, with the end points strongly disagree and strongly agree, was used for participants to report the extent to which they agreed with the following statements: (k) "It would be hard for me to open my mind to the other participant"; (l) "If the other participant gave me a bottle of drink, I would hesitate to accept"; (m) "If the other participant asked me private questions, I would not answer"; (n) "If the other participant flattered me, I would be uncomfortable"; and (o) "If the other participant asked for my number, I would hesitate about it". The higher the score is, the higher the degree of psychological defense the participant has. Two hundred participants were invited to finish this scale on psychological defense ($\alpha = 0.81$).

Procedure

The procedure for the verbal communication group was identical to that for the non-verbal communication group. For the non-verbal communication group, the two participants who did not know each other were escorted to the laboratory, where they sat face to face. During their 1-min non-verbal communication, the experimenter introduced the basic information of those two participants (such as their names, ages and hometowns). For the verbal communication group, the 2 participants were instructed to have a communication face to face for 5 min, as in Study 1a. The target participant and the conversation partner were again designated randomly. After they finished their communication, the participants were escorted to two separate rooms, where they were asked to complete a computer-based survey of eight questions (measures A to H). As in Study 1a, only four questions (measures E to H) were presented for the target participants to complete, while the other four questions (measures A to D) were presented for the conversation partners to complete. Then, we asked the target participants to finish the 5-question scale about psychological defense written in the above Device section of this paper.

Results and Discussion

The Effect of Different Ways of Communication on the Degree of Psychological Defense

We performed a statistical analysis of the results of the scale on psychological defense. Our five measures (measures K to O) were highly correlated ($\alpha = 0.85$); thus, the average of the scores on these measures was designated as the indicator of the target participants' degree of psychological defense; namely, the psychological defense index, which served as the dependent variable. The ways of communication (non-verbal vs verbal) served as an independent variable. An independent samples *t*-test revealed a significant effect of the way of communication on the degree of psychological defense, mean difference=1.44, 95% CI [0.98,1.90], $t(58)=6.20$, $p<0.001$, $d=1.60$. The psychological defense index reported by the target participants in the non-verbal communication group (M=4.85, SD=0.96) was significantly higher than that in the verbal communication group (M=3.41, SD=0.83).

The Degree of Psychological Defense Effected on Negative Deviation

We performed a statistical analysis of the results of each of the four questions for the target participants and their conversation partners, as in Study 1a. Measures A to D which rated how much their conversation partners liked the target participants were highly correlated ($\alpha = 0.86$), and measures E to H which rated how much the target participants estimated their conversation partner liked them were also highly correlated ($\alpha = 0.87$). Collectively, this liking index acted as our dependent variable. A 2 (rating type: conversation partners' actual liking vs participants' estimated liking) × 2 (degree of psychological defense: non-verbal group vs verbal group) mixed-model ANOVA was computed on the liking index.

The analysis yielded the main effect of rating type, $F(1,58) = 111.08$, $p< 0.001$, $\eta_p 2=0.66$, showing the target participants estimated their conversation partners liked

them (M=4.45, SD=0.94) significantly less than their conversation partners liked them (M=5.46, SD=0.83). We also found the main effect of the degree of psychological defense, $F(1,58)=8.47$, $p<0.01$,$\eta_p2=0.13$. Thus, the liking index of the target participants and conversation partners in the non-verbal communication group (M=4.68, SD=1.15) was significantly less than that in the verbal communication group (M=5.23, SD=0.79). More importantly, the ANOVA yielded an interaction effect between rating type and the degree of psychological defense, $F(1,58)=20.51$, $p< 0.001$, $\eta_p2 =0.26$. That is, for the non-verbal communication group, the target participants estimated that their conversation partners liked them (M=3.96, SD=0.87) significantly less than their conversation partners liked them (M=5.40, SD=0.92), mean difference=1.44, SE=0.14, p< 0.001, 95% CI=[1.17, 1.71]. Similarly, for the verbal communication group, the target participants estimated that their conversation partners liked them (M=4.94, SD=0.73) significantly less than their conversation partners liked them (M=5.52, SD=0.75), mean difference=0.58, SE=0.14, p< 0.001, 95% CI=[0.30, 0.85]. The results showed that a negative deviation existed in the two groups (Figure 4).

We conducted an analysis by an independent samples *t*-test with the degree of psychological defense (non-verbal group vs verbal group) as the independent variable and our negative deviation index as the dependent variable, which was computed by subtracting participants' estimated liking from their conversation partners' actual liking. This *t*-test revealed a significant effect of the degree of psychological defense on the negative deviation index, $t(58) = 4.53$, $p< 0.001$, $d=1.16$, 95% CI [0.48, 1.25]. The results showed that the negative deviation of the non-verbal communication group (M=1.44, SD=0.71) was significantly stronger than that of the verbal communication group (M=0.58, SD=0.77).

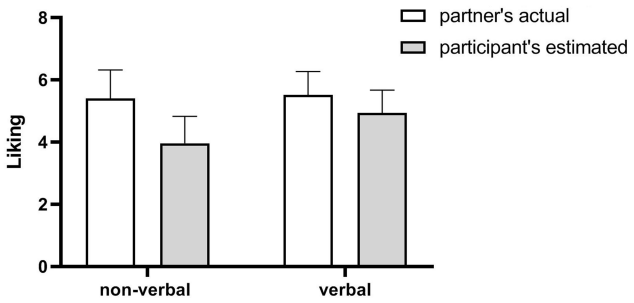

Figure 4 The tendency of negative deviation in non-verbal and verbal communication groups.

In addition, we conducted a correlation analysis to test whether or not the liking gap was correlated to the self-defense measures. Following expectations, self-defense measures were positively related to liking gaps ($r = 0.90$, $p< 0.001$) which support our claims about the effect of the target's psychological defense on the phenomenon.

The emergence of psychological defense is a kind of self-defense, which refers to a psychological state of keeping vigilance to the outside world, and the distrust and vigilance of surroundings caused by fear of being hurt. Generally speaking, people will remain psychological alertness to prevent others from causing psychological harm to themselves. To prevent mental stress caused by frustration and conflict, psychological defense spontaneously tries to reduce anxiety and maintain psychological balance, which is the need for individual psychological protection.

Study 2b mainly provided evidence that the negative deviation effect exists because of psychological defense towards others during the initial communication. The results showed that the difference between how much their conversation partners actually liked the target participants and how much the target participants estimated their conversation partners liked them in the non-verbal communication group was significantly more than that in the communication group. The degree of psychological defense of the participants in the non-verbal communication group was also significantly higher than that in the communication group. Thus, our results proved that psychological defense towards others is another main reason for our effect. More specifically, in the non-verbal communication group, participants were much more defensive towards others due to the lack of verbal conversation during their first contact; thus, the target participants were more inclined to underestimate how much others liked them. In the verbal communication group, though the two people were also in contact for the first time, they could become more familiar with each other through verbal communication; in turn, the psychological defense was lowered. Therefore, the target participants were less inclined to underestimate that liking. All in all, Study 2b showed that people's psychological defense towards others in their initial communication is another main reason for our negative deviation effect.

General Discussion

In our studies, people tended to underestimate how much others liked them, a phenomenon we called negative

deviation effect in the estimate of impression they left on others, and provided evidence for the effect.

Study 1 mainly examined whether there was a negative deviation effect during interpersonal communication. The results of study 1a showed that participants estimated that their conversation partners liked them significantly less than their conversation partners liked them, proving the negative deviation effect existed. Study 1b showed that the effect still existed, even though people were clear about their actual liking for others, supporting study 1a.

Study 2 explored the reasons for the negative deviation effect. In study 2a, we tested whether the effect was caused by people's own-negative thoughts of their conversational performance. However, the results revealed that the effect still existed in the communications without own-negative thoughts, which demonstrated there were still other reasons for the effect. Therefore, in Study 2b, it was found that the effect was influenced by the degree of people's psychological defense towards others in their initial communication. Participants had two types of communication (verbal and non-verbal communication) to result in different degrees of psychological defense (high and low). We examined whether the impressions left on others that people estimated themselves would have changed due to the two different degrees of psychological defense. The results suggested that there was an interaction effect between rating type and the degree of psychological defense, indicating that the degree of people's psychological defense was related to the size of the negative deviation effect. In other words, people's underestimates of how much they are liked are influenced by psychological defense. Therefore, people's psychological defense towards others caused by their initial communication is the reason for our negative deviation effect. All in all, there is no need for an "it must be either/or approach." Both negative thoughts and psychological defense are the reasons for the effect, and even some other mechanism.

The results of this study make a novel contribution to the research in the field of impression formation. In previous studies, publicly recognized studies such as primacy effects, halo effects, and stereotypes opened the window into the study of impression formation in the field of social cognition and made an important exploration of people's social cognition of the impressions of others in real life. However, in the past, the study of impression formation mainly focused on the individual's initial impressions and impressions updating, and there was little discussion of the initial interactions with each other's impressions of their own impressions. Otherwise, that dyadic studies of impression formation are an important step forward relative to the very individualistic impression formation studies that now form the bulk of the impression formation literature. This study explores this problem and provides relatively reliable evidence to suggest that after initial contact, an individual's estimate of the impression he/she left on others has a negative deviation effect, which is of great significance for further expanding the research on impression formation.

At the same time, the results of our studies showed that the psychological defense caused by people's first contact is the main reason for the negative deviation effect, which highlight the value of our work. The stronger the psychological defense that people had, the more they underestimated how much others liked them, and the stronger the effect was. With mutual contact and communication, people would gradually reduce psychological defense, and the extent of negative deviation would gradually decrease.

Most notably, why does people's underestimation of the impression they left on others change with the degree of their psychological defense towards others in interpersonal communication? Research suggests several reasons.

People feel insecure about the unknown. Therefore, this insecurity occurs when people come into contact with strangers for the first time. Based on uncertainty reduction theory, people would like to communicate with each other to obtain information which is conducive to uncertainty reduction, that is the common traits of the two, thus, increasing how much they like each other in their interactions.[55] Therefore, people can reduce the insecurity between strangers in interpersonal communication. The results and conclusions of Study 2b are consistent with this theory.

After brief contact, people cannot accurately estimate how much they are liked, but they are left to venture their best guess. However, people's best guesses tend to be biased.[53] Specifically, people underestimate the impact of the fear of embarrassment not only on themselves but also on others' preferences and decisions.[56] Therefore, it is necessary for people to keep alert about any possibilities that can make them feel awkward in unknown social interactions.[48] A considerable body of research proved that there is a fundamental asymmetry in people's evaluation of social interaction,[57–60] such as gain and loss, like and dislike, positive and negative. In nonverbal communication, perceivers are more sensitive to negative information than to positive ones.[61] Thus, negative information

has a greater impact on people's social cognition than positive information. Research has demonstrated that people's attention is focused on negative information without their intention. The reason for this effect lies in the valence of the traits, not their informational value. Thus, people may pay more attention to negative information to protect themselves from immediate harm.[62] Spontaneous psychological defense caused by insecurity in interpersonal interaction is the reason why people avoid being hurt directly. When getting more available information in a conversation (as in interviews), the goal of people's impression accuracy can alter the impacts of negative biases on their impressions by changing their information-gathering behaviour and subsequent others' behaviour.[63] The results and conclusions of the above previous studies are consistent with our analysis of the negative deviation effect and the reason for it.

The problem of impression formation in social cognition is one of the main topics in social psychology research. In this study, we discuss the negative deviation effect and its main reasons, which are beneficial for people in social interaction and provide them with new ways of thinking in interpersonal communication and mutual contact. Understanding the significance of the negative deviation effect and the impact of defense mentality on which people underestimate how much others like them can be helpful for people to improve their self-awareness reduce social anxiety and promote the development of people's prosocial behavior. In particular, for adolescents who are in the stage of "self-identity vs self-identity confusion",[64] knowledge about the negative deviation effect and the causes of it can help them to establish self-identity, boost their self-esteem and promote their socialization and the development of personality.

Our study is only a preliminary discussion in the field of people's estimation of their impressions they left on others after initial contact. Furthermore, it is necessary to explore whether a negative deviation effect will still exist among the people who are familiar with each other. In addition, are there any other factors influenced on the extent of negative deviation except for psychological defense? These questions can be discussed in future studies.

Conclusion

This research tested the negative deviation effect in people's estimate of the impression they left on others and the reasons for it in two studies. The results revealed that:

(1) People significantly underestimate how much they are liked. Even when people are clear about their liking for others, the underestimation still exists. Accordingly, we claim that there is a negative deviation effect on interpersonal communication.

(2) People underestimate the impression of being liked by others, not just because people are too focused on their own-negative thoughts of conversational performance, but rather because their psychological defense towards others in their initial communication is another main reason for our effect.

Disclosure

The abstract of this paper was presented at the 22nd National Academic Congress of Psychology with the name Negative deviation effect in interpersonal communication: why people underestimate the impression they left on others, as a poster presentation with interim findings.

The authors report no conflicts of interest for this work.

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