Особенности познавательной деятельности современных детей, подростков и молодежи в контексте проблем образования

Research article

Self-face advantage and social threat: Cross-cultural aspects

P. V. Rumyantzeva[1], D. A. Gorbachev[1], A. S. Ivanov[✉2], K. V. Kunakh[1]

[1] Independent Researcher, Saint Petersburg, Russia
[2] Herzen State Pedagogical University of Russia, 48 Moika Emb., Saint Petersburg 191186, Russia

Authors

Polina V. Rumyantzeva, SPIN: 3577-2230, ResearcherID: D-7100-2017, ORCID: 0000-0002-1871-7697, e-mail: polinarum@gmail.com

Donat A. Gorbachev, SPIN: 7651-3510, e-mail: science@donat.dev

Artem S. Ivanov, SPIN: 7462-3285, ResearcherID: AAM-1793-2020, ORCID: 0000-0001-8377-309X, e-mail: ivan0vartems@yandex.ru

Konstantin V. Kunakh, e-mail: kunkonst@gmail.com

Abstract

Introduction. Self-face advantage is related to a faster response that adult people have to their own face compared to other visual stimuli. Research in self-face advantage generally focuses on two social characteristics: social threat and cultural differences. The reported study investigated cross-cultural aspects of the relationship between social threat and self-face advantage. We expected to find cross-cultural differences in the reaction time to one's own face in social situations involving high and low threat. The data on the Russian sample were compared with American and Chinese samples.

Materials and methods. The sample consisted of 20 Russian undergraduate students who were asked to identify orientations of self-face in visual trials involving low and high social threats. In experimental sets, the level of social threat was moderated by the images of university professors that induced high or low level of social anxiety. The sets were constructed individually for each participant. The reaction time and the response accuracy were registered for each trial.

Results. We have found some differences in the reaction time to one's own face in different social situations involving high and low threats in Russian, American, and Chinese samples. First, Russian students tend to show a lower level of social fears. Second, their self-face advantage is less susceptible to the "boss effect" in comparison with Chinese and Americans students. Gender as a source of social threat also contributes to the magnitude of the "boss effect".

Conclusion. The results can be used by psychologists providing support for university students. The obtained data may also become the foundation for complex and large-scale experimental models.

Keywords: self-face advantage, social threat, face recognition, university students, experiment

Приоритет восприятия собственного лица и социальная угроза: кросс-культурный аспект

П. В. Румянцева[1], Д. А. Горбачев[1], А. С. Иванов[✉2], К. В. Кунах[1]

[1] Независимый исследователь, Россия, г. Санкт-Петербург
[2] Российский государственный педагогический университет им. А. И. Герцена,
191186, Россия, г. Санкт-Петербург, наб. реки Мойки, д. 48

Сведения об авторах

Полина Витальевна Румянцева, SPIN-код: 3577-2230, ResearcherID: D-7100-2017, ORCID: 0000-0002-1871-7697, e-mail: polinarum@gmail.com

Донат Антонович Горбачев, SPIN-код: 7651-3510, e-mail: science@donat.dev

Артем Сергеевич Иванов, SPIN-код: 7462-3285, ResearcherID: AAM-1793-2020, ORCID: 0000-0001-8377-309X, e-mail: ivan0vartems@yandex.ru

Кунах Константин Викторович, e-mail: kunkonst@gmail.com

Аннотация

Введение. Под приоритетом восприятия собственного лица понимается феномен, при котором взрослые люди быстрее реагируют на свое собственное лицо при сравнении с другими визуальными стимулами. В связи с влиянием социального контекста на приоритет восприятия собственного лица наиболее часто исследуются факторы социальной угрозы и культурных различий. Настоящее исследование было нацелено на изучение кросс-культурных характеристик воздействия социальной угрозы на приоритет восприятия собственного лица на российской выборке. Мы предполагали, что можно будет обнаружить кросс-культурные различия во времени реакции на изображение собственного лица в различных перцептивных социальных ситуациях (с высоким и низким уровнем социальной угрозы) по сравнению с американской и китайской выборками.

Материалы и методы. Выборка состояла из 20 российских студентов, которые должны были определять ориентацию собственного лица, предъявляемого в сериях визуальных проб с высоким и низким уровнями социальной угрозы. Уровень социальной угрозы модерировался при помощи включения в экспериментальные серии изображений преподавателей, вызывающих низкий или высокий уровень переживания социальной тревоги (серии изображений составлялись индивидуально для каждого участника эксперимента). Для каждой попытки фиксировались время реакции и точность ответа.

Результаты. Мы обнаружили определенные различия во времени реакции на свое собственное лицо в различных социальных контекстах (в условиях высокой и низкой социальной угрозы) на выборке российских студентов по сравнению с американской и китайской выборками. У российских студентов обнаружена тенденция демонстрировать несколько более низкий уровень социальной тревоги, и то влияние, которое оказывает «эффект босса» на приоритет восприятия собственного лица, по всей видимости, является менее выраженным по сравнению с китайской и американской выборками. Кроме того, исследование показало, что фактор гендерной принадлежности преподавателя — «источника» социальной угрозы играет определенную роль во влиянии «эффекта босса».

Заключение. Результаты исследования могут быть использованы в практике психологической поддержки студентов университетов. На основе полученных данных могут быть построены более сложные и масштабные экспериментальные модели.

Ключевые слова: приоритет восприятия собственного лица, социальная угроза, узнавание лица, студенты, эксперимент

Introduction

Self-face advantage is related to a faster response that adult people have to their own face compared to other visual stimuli (Ma, Han 2009). Numerous studies indicate that self-face attracts attention quickly and the processing of one's own face is prioritized (Pannese, Hirsch 2011; Platek et al. 2004).

It is usually stated that self-face is a physical aspect of a person's appearance that has a special meaning because of its uniqueness, its key role in identity formation and building and maintaining self-awareness. When we look at ourself in the mirror, we get access to our self-image and can update our mental representation of our own face (Bortolon, Raffard 2018; Tsakiris 2008).

The first works on self-face recognition were authored by G. G. Gallup Jr. (Gallup 1977). Gallup experimented with chimpanzees using the mark test. He showed that higher primates probably have some ability to recognize their own visual image.

Further studies involving human infants, children and adults showed that the ability for self-face recognition is closely connected with the symbolic representation of self, social perception of others and self-other distinction (Rochat et al. 2012).

There is a large body of evidence suggesting that a person's own face is perceived and processed differently compared to others' faces, both familiar and unfamiliar (Qiana et al. 2017). For example, it was proved that self-face attracts more attention and retains it for longer periods (Liu et al. 2016). Besides, it has a generally higher attentional priority (Brédart et al. 2006; Devue et al. 2009). One's own face enters awareness more rapidly (Geng et al. 2012); the responses to self-face are also different electrophysiologically (Devue, Bredart 2011; Guan et al. 2015; Gunji et al. 2009; Sui et al. 2006).

Interestingly, self-face advantage was proved to be persistent for different perception contexts, for example, for both upright and inverted images of faces (Keyes, Brady 2010), and regardless of the fact whether a response was documented to face-forward, three-quarter or profile views (Tong, Nakayama 1999).

One of the theoretical explanations of self-face advantage is a presumption that self-face processing is underpinned by a special social cognitive mechanism. It activates a positive attribute in self-concept, i.e., an implicit positive association (IPA) with self. The IPA theory of self-face recognition suggests that seeing one's own face may activate positive attributes in the self-concept, thus facilitating behavioral responses to self-face (Ma, Han 2010).

There is a vast amount of research on the influence of social context on self-face recognition processes.

Since the very first attempts to understand how a person's self-concept is constructed and maintained, it has been noted that self-concept is highly dependent on the "social environment", where a person meets others and interacts with them (Bortolon, Raffard 2018; Guan et al. 2015; Ma, Han 2009).

Research in self-face advantage generally focuses on two social characteristics: social threat and cultural differences.

According to Y. Ma and S. Han (Ma, Han 2009), in a high-threat context self-face advantage tends to transform into self-face disadvantage. During the experiment, graduate students were asked to identify their face orientation in different visual contexts. When self-face was presented along with advisors' faces (a high-threat situation), reaction time increased significantly. The research results have shown that self-face disadvantage in simulated high-threat situations correlates positively with fear of a possible negative evaluation from advisors. The authors argue that social threat moderates self-face processing via the reduction of positive self-associations, which weakens the self-advantage effect.

Other research findings show that social threat situations change the neurophysiological mechanisms of self-face processing: the experiment by Guan et al. revealed that when participants were exposed to the image of an angry face, it eliminated the self-face neural processing and self-face image elicited similar P3 amplitudes to friend-face (Guan et al. 2015).

Some studies have shown that a social-threat effect is limited to certain social situations only, namely, comparison with important others (Guan et al. 2014). However, these findings are inconsistent.

According to L. Guan, M. Qi, H. Li, and G. Hitchman (Guan et al. 2015), a personal factor that moderates self-face advantage in social-threat situations is self-esteem. In their experiment, participants were primed with angry (rising social fears) and happy faces; unlike high self-esteem individuals, low self-esteem individuals demonstrated a reduced self-advantage effect in social-threat situations.

Culture is the second important social factor that moderates self-face advantage. Meta-analytic research by C. Bortolon and S. Raffard (Bortolon, Raffard 2018) shows that self-face advantage effect is stronger for participants from western cultures in comparison with participants from eastern cultures. These results are consistent with the previous studies (Liew et al. 2011; Sui et al. 2009). These differences are related to the culturally determined understanding of where self belongs in the society. Western cultures tend to prioritize

autonomy and independence of self, while in Eastern cultures an individual self is very much part of social connections and relations with others (Markus, Kitayama 1991).

Recent research has shown that there are some neural mechanisms that mediate the interaction between cultural characteristics and processing of self-relevant information, including self-face image (Guan et al. 2020).

The reported study investigated cross-cultural aspects of the relationship between social threat and self-face advantage. We expected to find cross-cultural differences in the reaction time to one's own face in social situations involving high and low threat. The data on the Russian sample were compared with American and Chinese samples.

Materials and methods

In general, the research structure was similar to that described in (Ma, Han 2009).

Participants

The study included 20 Russian undergraduate students (10 male and 10 female) who joined the experiment as volunteers. All the participants were right-handed and had normal or corrected-to-normal vision.

Questionnaire measurement

The Breif Fear of Negative Evaluation Scale (BFNE) (Leary 1983) was used to assess the students' tendency to feel scared of possible negative evaluation from others. All the participants were also provided with the list of 10 university professors, who also agreed to take part in the experiment. Students were asked to mark those professors with whom they had had some interaction in a potentially threatening context. For example, they knew this particular professor as their university teacher, or examinator, or evaluator of their papers or tests, etc. Then, the participants were asked to choose one professor, whose test or exam bothered him/her more than others.

Stimuli and procedure

Before the experiment, ten digital images were taken of the participants and the professors. Each face was oriented to the left (varied from 30 to 90) in five images and to the right in the others. All the images were adjusted for brightness and contrast. All the photos were divided into 100 fragments (10x10), and 30 scrambled images were randomly formed with a gray stripe on the left or right, the width of the stripe was 1/8 of the width of the scrambled image.

Before the experiment, individual sets of images were prepared. They consisted of 10 self-images, 10 images of the professor representing the highest level of social threat, 10 scrambled images with gray bars (sets 1 and 2); 10 self-images, 10 images of the professor representing the lowest level of social threat, 10 scrambled images with gray bars (sets 3 and 4); 10 images of fellow students, 10 images of the professor representing the highest level of social threat, 10 scrambled images with gray bars (sets 5 and 6).

The participants were given the following instruction:

You are going to be shown a set of photos. For each photo, determine if the face or the gray bar is oriented to the left or to the right. Press the relevant left or right arrow on the keyboard with your index and middle fingers. The speed of your reaction and accuracy of your assessment will be taken into account.

The stimulus in each set was presented randomly; they subtended a visual angle of 2.13 X 2.17 at a viewing distance of 70 cm and were presented for 200 ms at the center of the screen followed by a fixation cross with a duration between 800 and 1200 ms. For each stimulus, participants were instructed to respond with their left hand in one block and their right hand in the other.

Reaction time and response accuracy were registered for each trial.

Results

The mean of response accuracy was 29.72 ± 1.70, the mean of social threat was 2.53 ± 0.98.

The reaction time (RT) analysis showed, above all, that the results in left-hand trials are more differentiated (similar to the original research), but RTs differences in self-image vs. higher/lower threat professor were insignificant. In general, it can be said that Russian students tend to show higher RT rates compared to Chinese and American samples. The Russian students' RT means are more then 1, so they need more time for face perception compared to scrambled face perception (see Table 1).

Chinese and American samples have a significant correlation between subjective rating scores of the BFNE and left-hand responses. However, in our study we found this correlation only in non-normalized RTs (r = 0.45). For normalized RTs, this correlation is insignificant (r = 0.30).

ANOVA revealed significant results only for the interaction between all the four variables (p < 0.01, $\eta^2 = 0.35$), all the insignificant results were omitted from the table.

There are no significant differences in threat evaluation between males and females: 2.65 ± 1.07 (females) and 2.42 ± 1.16 (males) (see Table 2).

Table 1. RT means

Experimental sets	Right hand		Left hand	
	Self face/ classmate's face	Professor's face	Self face/ classmate's face	Professor's face
1-2: Self / higher threat professor	1.05	1.06	1.05	1.02
3-4: Self / lower threat professor	1.04	1.06	1.03	1.09
5-6: Classmate / higher threat professor *	1.16	1.07	1.18	1.04

Note: * We suggest that higher RTs to classmates' faces are due to the experimental design (different students' faces were presented, so we excluded these data from what follows).

Table 2. ANOVA results of RTs for Threat (high/low), Face (self-other), Hand (left-right); within-subjects variables, gender and between-subjects variable

Effect		Value	F	Hypothesis df	Error df	Sig.	e
Threat * Face * Hand * Gender	Pillai's Trace	0.350	9.687[b]	1.000	18.000	0.006	0.350
	Wilks' Lambda	0.650	9.687[b]	1.000	18.000	0.006	0.350
	Hotelling's Trace	0.538	9.687[b]	1.000	18.000	0.006	0.350
	Roy's Largest Root	0.538	9.687[b]	1.000	18.000	0.006	0.350

We did not find any significant differences in RT to self-face, either. At the same time, we suppose that right-hand variables are the most meaningful in the obtained differences (see Table 3).

We should also note that the significant correlation between subjective rating scores of the BFNE and non-normalized RTs to self-face for left-hand responses found in the whole sample is significant for females only (r = 0.65 for females and r = 0.09 for males).

Importantly, in 19 cases (from the total of 20), the professors with higher social threat scores are females.

Table 3. Reaction time means

Parameters	RTs female	RTs male	T	p
Self-face (self + professor – threat, right hand)	0.99 ± 0.15	1.11 ± 0.15	1.79	0.09
Self-face (self + professor – minimum threat, right hand)	1.10 ± 0.19	0.99 ± 0.20	1.25	0.23
Self-face (self + professor – threat, left hand)	1.07 ± 0.17	1.03 ± 0.09	0.69	0.50
Self-face (self + professor – minimum threat, left hand)	1.04 ± 0.14	1.02 ± 0.10	0.42	0.68

Discussion

The questionnaire results revealed some cross-cultural differences in responses to social threat: Russian students tend to show a little lower level of social fear compared to American and Chinese participants. We think that this fact needs further investigation, because the sample was really small, and a lot of other factors, besides cultural ones, could have influenced the results.

Reaction time results deserve a special focus. The mean of response accuracy in the Russian sample was similar to that in Chinese and American samples, while the mean of social threat results was lower (Ma, Han 2010). The results in left-hand trials are more differentiated (similar to the original research by Y. Ma and S. Han (Ma, Han 2009)), but RT differences in self-image vs. higher/lower threat professor were insignificant. In general, Russian students tend to show higher RT rates compared to Chinese and American samples. The Russian students' RT means are more then 1, so they need more time for face perception compared to scrambled face perception. A possible reason may be related to cultural differences, the factor of mirror projections (probably, more time is needed to recognize this type of stimuli) or the combination of the first and the second factors.

The ANOVA results can lead us to assume that in the Russian sample the interaction of all the experimental factors (level of social threat, face, right or left hand and gender) had an impact upon the reaction time. In general, the "boss effect" (Ma, Han 2009) in the Russian sample seems to be less salient. It is unclear, however, whether it is due to cultural differences or specifics of methodology. It needs further investigation.

We have found that in the vast majority of cases, professors associated with the highest level of social threat were female. Hence, it could be of interest to study the possible influence of the gender factor and related social threat on RTs. This finding is new compared to the original research (Ma, Han 2009). Thus, we can hypothesize that the "boss effect" can manifest itself differently depending on the professor's or student's gender.

These manifestations, in turn, may be mediated by cultural norms.

Conclusions

In general, as we had expected, we found some differences in reaction time to one's own face in different social situations—high threat and low threat—in the Russian sample compared to American and Chinese samples.

Russian students tend to show a lower level of social fears. They are also less susceptible to the "boss-effect" resulting in a lower impact of the "boss-effect" on self-face advantage compared to Chinese and Americans students. Gender as a source of social threat has a certain contribution to the magnitude of the "boss-effect". These, however, need further investigation.

Conflict of Interest

The authors declare that there is no conflict of interest, either existing or potential.

Ethics Approval

This study was performed in accordance with the 1964 Declaration of Helsinki.

Prior to obtaining the written informed consents, a complete explanation of the study was given to all its participants. All subjects gave written informed consent in accordance with the Declaration of Helsinki.

Author Contributions

The authors have made an equal contribution to the preparation of the manuscript of the article.

Acknowledgements

References

Bortolon, C., Raffard, S. (2018) Self-face advantage over familiar and unfamiliar faces: A three-level meta-analytic approach. *Psychonomic Bulletin & Review*, vol. 25, no. 4, pp. 1287–1300. https://doi.org/10.3758/s13423-018-1487-9 (In English)

Brédart, S., Delchambre, M., Laureys, S. (2006) One's own face is hard to ignore. *Quarterly Journal of Experimental Psychology*, vol. 59, no. 1, pp. 46–52. https://doi.org/10.1080/17470210500343678 (In English)

Devue, C., Bredart, S. (2011) The neural correlates of visual self-recognition. *Consciousness and Cognition*, vol. 20, no. 1, pp. 40–51. https://doi.org/10.1016/j.concog.2010.09.007 (In English)

Devue, C., van der Stigchel, S., Brédart, S., Theeuwes, J. (2009) You do not find your own face faster; you just look at it longer. *Cognition*, vol. 111, no. 1, pp. 114–122. https://doi.org/10.1016/j.cognition.2009.01.003 (In English)

Gallup, G. G. Jr. (1977) Self-recognition in primates: A comparative approach to the bidirectional properties of consciousness. *American Psychologist*, vol. 32, no. 5, pp. 329–338. https://doi.org/10.1037/0003-066X.32.5.329 (In English)

Geng, H., Zhang, S., Li, Q. et al. (2012) Dissociations of subliminal and supraliminal self-face from other-face processing: Behavioral and ERP evidence. *Neuropsychologia*, vol. 50, no. 12, pp. 2933–2942. https://doi.org/10.1016/j.neuropsychologia.2012.07.040 (In English)

Guan, L., Qi, M., Li, H. et al. (2015) Priming with threatening faces modulates the self-face advantage by enhancing the other-face processing rather than suppressing the self-face processing. *Brain Research*, vol. 1608, pp. 97–107. https://doi.org/10.1016/j.brainres.2015.03.002 (In English)

Guan, L., Qi, M., Zhang, Q., Yang, J. (2014) The neural basis of self-face recognition after self-concept threat and comparison with important others. *Social Neuroscience*, vol. 9, no. 4, pp. 424–435. https://doi.org/10.1080/17470919.2014.920417 (In English)

Guan, L., Wu, T., Yang, J. et al. (2020) Self-esteem and cultural worldview buffer mortality salience effects on responses to self-face: Distinct neural mediators. *Biological Psychology*, vol. 155, article 107944. https://doi.org/10.1016/j.biopsycho.2020.107944 (In English)

Gunji, A., Inagaki, M., Inoue, Y. et al. (2009) Event-related potentials of self-face recognition in children with pervasive developmental disorders. *Brain Development*, vol. 31, no. 2, pp. 139–147. https://doi.org/10.1016/j.braindev.2008.04.011 (In English)

Keyes, H., Brady, N. (2010) Self-face recognition is characterized by "bilateral gain" and by faster, more accurate performance which persists when faces are inverted. *Quarterly Journal of Experimental Psychology*, vol. 63, no. 5, pp. 840–847. https://doi.org/10.1080/17470211003611264 (In English)

Leary, M. R. (1983) A brief version of the fear of negative evaluation scale. *Personality and Social Psychology Bulletin*, vol. 9, no. 3, pp. 371–375. https://doi.org/10.1177/0146167283093007 (In English)

Liu, M., He, X., Rotsthein, P., Sui, J. (2016) Dynamically orienting your own face facilitates the automatic attraction of attention. *Cognitive Neuroscience*, vol. 7, no. 1-4, pp. 37–44. https://doi.org/10.1080/17588928.2015.1044428 (In English)

Liew, S. L., Ma, Y., Han, S., Aziz-Zadeh, L. (2011) Who's afraid of the boss: Cultural differences in social hierarchies modulate self-face recognition in Chinese and Americans. *PLoS ONE*, vol. 6, no. 2, article e16901. https://doi.org/10.1371/journal.pone.0016901 (In English)

Ma, Y., Han, S. (2009) Self-face advantage is modulated by social threat—Boss effect on self-face recognition. *Journal of Experimental Social Psychology*, vol. 45, no. 4, pp. 1048–1051. https://doi.org/10.1016/j.jesp.2009.05.008 (In English)

Ma, Y., Han, S. (2010) Why we respond faster to the self than to others? An implicit positive association theory of self-advantage during implicit face recognition. *Journal of Experimental Psychology: Human Perception and Performance*, vol. 36, no. 3, pp. 619–633. https://doi.org/10.1037/a0015797 (In English)

Markus, H. R., Kitayama, S. (1991) Culture and the self: implication for cognition, emotion and motivation. *Psychological Review*, vol. 98, no. 2, pp. 224–253. https://doi.org/10.1037/0033-295X.98.2.224 (In English)

Pannese, A., Hirsch, J. (2011) Self-face enhances processing of immediately preceding invisible faces. *Neuropsychologia*, vol. 49, no. 3, pp. 564–573. https://doi.org/10.1016/j.neuropsychologia.2010.12.019 (In English)

Platek, S. M., Thomson, J. W., Gallup, G. G. Jr. (2004) Crossmodal self-recognition: The role of visual, auditory, and olfactory primes. *Consciousness and Cognition*, vol. 13, no. 1, pp. 197–210. https://doi.org/10.1016/j.concog.2003.10.001 (In English)

Rochat, P., Broesch, T., Jayne, K. (2012) Social awareness and early self-recognition. *Consciousness and Cognition*, vol. 21, no. 3, pp. 1491–1497. https://doi.org/10.1016/j.concog.2012.04.007 (In English)

Sui, J., Liu, C. H., Han, S. (2009) Cultural difference in neural mechanisms of self-recognition. *Social Neuroscience*, vol. 4, no. 5, pp. 402–411. https://doi.org/10.1080/17470910802674825 (In English)

Sui, J., Zhu, Y., Han, S. (2006) Self-face recognition in attended and unattended conditions: An event-related brain potential study. *NeuroReport*, vol. 17, no. 4, pp. 423–427. https://doi.org/10.1097/01.wnr.0000203357.65190.61 (In English)

Tsakiris, M. (2008) Looking for myself: Current multisensory input alters self-face recognition. *PLoS ONE*, vol. 3, no. 12, article e4040. https://doi.org/10.1371/journal.pone.0004040 (In English)

Tong, F., Nakayama, K. (1999) Robust representations for faces: Evidence from visual search. *Journal of Experiment Psychology: Human Perception and Performance*, vol. 25, no. 4, pp. 1016–1035. https://doi.org/10.1037/0096-1523.25.4.1016 (In English)

Qiana, H., Wang, Z., Yan, L., Gao, X. (2017) Aging strikes the self-face advantage in featural processing. *Experimental Aging Research*, vol. 43, no. 4, pp. 379–390. https://doi.org/10.1080/0361073X.2017.1333834 (In English)