Face in the Crowd and Level of Self-Criticism

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ABSTRACT

Thus far, there has been no face in the crowd research that also considers the level of self-criticism. This is despite the fact that self-criticism is the key underlying factor in psychopathology and that having objective criteria to diagnose it would be highly beneficial. Therefore, the aim of the current study was to explore fixation duration on all seven primary emotions (happiness, sadness, fear, disgust, contempt, anger, and surprise) as well as embarrassment and neutral face expression in relation to the level of self-criticism using a 3 × 3 face in the crowd grid. The convenience nonclinical sample contained 119 participants gathered through social media; 63.03% were women and 36.97% were men. We used The Forms of Self-Criticizing and Self-Reassuring Scale for measuring self-criticism, the Tobii X2 eye tracker, and the Amsterdam Dynamic Facial Expression Set–Bath Intensity Variations for eye-tracking of emotions. Results showed that highly self-critical people exhibited significant anger avoidance in attention and an attention avoidance tendency in relation to most emotions. The present findings may explain why highly self-critical people have difficulty identifying emotional expressions: They probably avoid looking at faces, which makes it harder for them to identify the expressions correctly.

KEYWORDS

self-criticism
emotions
face in the crowd
eye-tracking

INTRODUCTION

The current study analyses the relationship between self-criticism and attentional engagement in the context of the *face in the crowd* paradigm. Many scientists (e.g., Taubert et al., 2011) claim that faces should be perceived holistically. From such a gestalt perspective, certain configural aspects of faces might be detected efficiently, and even give rise to "pop-out" effects. Hansen and Hansen (1988) first introduced the paradigm to measure the cognitive mechanisms of early natural detection of angry faces. It is propably an automatic mechanism: scanning for threats to better process and respond to dangers from the enviroment (Öhman & Mineka, 2001).The face in the crowd effect (FICE, Hansen & Hansen, 1988) refers to the finding that threatening or angry faces are detected more effectively than happy or nonthreatening faces in a crowd containing distractor faces (Pinkham et al., 2010) or, vice versa, that happy faces are detected more rapidly and more accurately in a crowd of faces (e.g., Juth et al., 2005). Previous research has suggested that FICE could reflect adverse childhood experiences (Iffland & Neuner, 2020), in the sense that repetitive exposure to threat stimuli may elicit attention biases that prioritize them (Gibb et al., 2009) or avoid them (Iffland et al., 2019). It can be also suggest that people who tend to have strong self-criticism might detect negative faces more quickly.

Shahar (2015) defines self-criticism as an intensely negative, chronic relationship with the self that is characterized by an uncompromising insistence on high standards and on directing hostility and contempt towards oneself when these unachievable high standards are not met. The etiology of chronic self-criticism can be traced back to early childhood and a lack of affiliative relationships (Falconer et al., 2015) or to highly critical, controlling, and demanding parents (Stinckens et al., 2013) whose approach can be considered as maltreatment in the form of neglect or abuse. People with high self-criticism have been shown to have been frequently maltreated in childhood and, therefore, there is an assumption that their self-criticism was a form of adaptation to that maltreatment that could lead to anger avoidance (Mirman et al., 2021). Excessive self-criticism is one of the most important psychological processes affecting susceptibility to psychopathology and its persistence (Falconer et al., 2015). Findings from cross-sectional studies have shown that self-criticism is implicated in a range of psy-

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chopathologies, including depression, social anxiety, eating disorders, and post-traumatic stress disorder (McIntyre, 2018). This supports the notion that self-criticism may be a transdiagnostic process associated with subsequent psychopathology and thus, it may be an important factor for early diagnosis and intervention. Therefore, it is important to identify objective criteria for diagnosing self-criticism, as subjective scales are prone biases, including social desirability. A possible objective criterion could be eye-tracking metrics such as a number of fixations on negative stimuli (e.g., faces).

There has been little exploration of self-criticism involving eye tracking and even less involving face in the crowd research. Self-criticism is significantly associated with depression and anxiety (Gilbert et al., 2012). Therefore, research involving eye-tracking in relation to depression or anxiety might help further our understanding of self-criticism. Most previous studies have found an attention bias towards negative stimuli (e.g., Duque et al., 2014; Suslow et al., 2001) and an attentional avoidance of positive stimuli (e.g., Kellough et al., 2008; Perlman et al., 2009). Duque et al. (2014) explored the relationships between rumination, a relevant factor in information processing in depression, and the attentional mechanisms activated in depressed individuals while attending to negative emotional expressions (sad, angry, and happy faces). Total time attending to negative faces was correlated with a global ruminative style, which suggests that sustained processing of negative information is associated with a higher ruminative style and indicates a higher level of depressive symptomatology.

Similarly, in self-criticism research, Strnádelová et al. (2019a) found that people with a higher level of pathological self-criticism—so-called hated self—avoided the eye region when looking at happy facial expressions, which may indicate a general avoidance of happy cues on joyful facial expressions. This was confirmed by Strnádelová et al. (2019b), who found that self-critical people with a high level of hated self looked significantly more often outside the face in photographs of multiple emotional faces. Thus,the tendency to avoid some particular areas of facial expressions by self-critical people can be observed. However, the overall fixation on the expression has not yet been sufficiently investigated.

THE CURRENT STUDY

Thus far, there has been no face in the crowd research that also considered the level of self-criticism. This is despite the fact that self-criticism is a key underlying factor in psychopathology (Falconer et al., 2015) and that having objective criteria to diagnose it would be highly beneficial. Therefore, the aim of the current study was to explore fixation durations on all seven primary emotions (happiness, sadness, fear, disgust, contempt, anger, and surprise, e.g., Ekman & Heider, 1988) as well as embarrassment and neutral face expressions in relation to the level of self-criticism. We examined the relationship between the level of self-criticism and fixation durations on various emotions using a 3 × 3 face in the crowd grid. Based on previous research findings, we formulated the following hypotheses:

H1: Highly self-critical participants will focus on the angry face in the crowd for longer than other participants (Duque et al., 2014).

H2: Participants with a higher level of self-criticism will have a lower fixation duration on happy faces than other participants (Kellough et al., 2008; Perlman et al., 2009; Strnádelová et al., 2019b).

METHODS

Sample

We obtained our research sample using the snow-ball technique via social media and direct invites. The inclusion criteria were that participants had to be aged over 18 and not be diagnosed with any psychopathology. The sample contained 119 participants; 63.03% were women, and 36.97% were men. Mean participant age was 23.1 years, with a standard deviation of 7.85, and a minimum of 18 years and a maximum of 66 years. All participants signed informed content forms. All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study's protocol was approved by the Ethical committee of a related university.

Measures

THE FORMS OF SELF-CRITICIZING AND SELF-REASSURING SCALE

Self-criticism and self-reassurance was measured using the Forms of Self-Criticising and Self-Reassuring Scale (FSCRS) by Gilbert et al. (2004). The scale consists of 22 items answered on a 5-point Likert scale (0 = *not at all like me*, 4 = *extremely like me*) and contains the following subscales: inadequate self, hated self, and reassured self. The FSCRS is a reliable, valid tool for measuring the level of self-criticism and self-reassurance, and this applies to both the original English version (Gilbert et al., 2004) and the Slovak version (Halamová et al., 2017), as well as cross-cultural comparisons (Halamová et al., 2018, 2019). For normal populations, the combined score of self-criticism consisting of hated self and inadequate self is recommended (Halamová et al., 2018). Therefore in this study we used the combined score of self-criticism.

TOBII X2 EYE TRACKER

We used Tobii X2-60 eye trackers with a Velocity–Threshold Identification Fixation Filter (I-VT; Olsen & Matos, 2012) to monitor participants' eye gaze. The eye-trackers were installed below a 1920 × 1200 px screen, and the sampling rate was 60 Hz. The I-VT fixation classification algorithm quantifies emotional responses instantly, before cognitive perception and rational interpretation take place. Participants were seated in front of a 52.5 × 32.5 cm screen, placed 60 cm away, with a visual angle of 46.86°. As recommended by Henderson et al. (2005), the emotion pictures measured 12.7 cm × 9.5 cm (width × height) and had a resolution of 480 × 360 px. The grid was 38.1 × 28.5 cm with 1440 × 1080 px and contained 3 × 3 emotional faces within a black frame.

AMSTERDAM DYNAMIC FACIAL EXPRESSION SET–BATH INTENSITY VARIATIONS

The Amsterdam Dynamic Facial Expression Set–Bath Intensity Variations (ADFES-BIV) was used as it was the most suitable regarding accuracy, validity, and standardization for use with the Facial Action Coding System (FACS; Ekman & Friesen, 1978), and a range of emotion expressions. The set was developed by van der Schalk et al. (2011) and later revised by Wingenbach et al. (2016). The ADFES-BIV comprises dynamic expressions and pseudo-dynamic stimuli. These were used to create a grid of nine emotions (anger, contempt, disgust, embarrassment, fear, happiness, neutral, pride, sadness, and surprise). The experimental grid displayed the faces of five men and four women showing nine different emotions at the highest intensity. Each emotion and each person was displayed once in a randomized position in the grid. We randomly picked 362 of the 362,880 possible combinations, which were then randomly presented to the participants.

Procedure

The experiment was conducted in a lab using 20 Tobii Pro X2-60 eye trackers (Bielikova et al, 2018). Informed consent was obtained from the participants, who then viewed the randomized stimulus presentation, filled out the FSCRS, and answered the sociodemographic questions. At the beginning, a 9-point calibration was performed. Each grid was displayed for 3 s, followed by a black screen for 0.5 s, and then another grid for 3 s, and so on. We have replicated the design of similar eye-tracking studies to guarantee validity and reliability of the procedure, where the range in seconds varies slightly (see e.g., Shasteen et al., 2014; Xu et al., 2015). The experiment lasted for 24 minutes per participant. The participants were instructed: "Please look at the faces that appear on the screen."

RESULTS

The fixation duration variable (M = 303.78, SD = 428.36, Mdn = 183.40) was heavily positively skewed (skewness = 11.17), which is usually the case with eye-tracking data (Holmqvist et al., 2011). The variable also displayed an excessive leptokurtic kurtosis (kurtosis = 281.19) at 86.7% of the durations were under 500 ms. Logarithmic transformation is sometimes applied in this situation, but the statistically sound option is to incorporate the appropriate statistical distribution of the dependent variable into the regression model (Lo & Andrews, 2015). We used the fitdistrplus package (Delignette-Muller & Dutang, 2015) in *R* version 4. 0. 1 (R Core Team, 2020) to assess the appropriate distribution of the dependent measure. Several relevant distributions were fitted onto the empirical data (see Figure A1 in the Supplementary Materials): normal, lognormal, gamma, and generalized gamma (the generalized gamma distribution has an additional parameter to take the excess kurtosis into account, see Cox et al., 2007, for the statistical properties). Gamma and lognormal distributions are the usual choices for eye-tracking data (e.g., Catrysse et al., 2017; Strnádelova et al. , 2019a). The fit of distributions was inspected graphically (Q-Q plot, P-P plot, CDF function). The generalized gamma distribution best fitted the dependent measure (see Figure A1 in the Supplementary Materials).

Bearing in mind that the dependent variable has a generalized gamma distribution, we used the generalized additive mixed model (Stasinopoulos et al., 2017) with the generalized gamma distribution (log link), available in the gamlss package (Stasinopoulos et al., 2017). Mixed-effects models incorporate random and fixed effects. There were three independent variables: (a) "emotions" was the categorical fixed effect (with neutral faces as the reference category/intercept) for testing differences among emotions, (b) "critical" was the summed raw score of the inadequate and hated self subscales of the FSCRS, continuous fixed effect testing to see how respondents with higher self-critical scores react in general, and (c) "critical × emotions" was the interaction test to see how respondents with higher self-critical scores react to different emotions. The random effect was the respondents because the assumption of the independence of observations does not hold in the repeated-measures (within-subject) condition. We inspected the residuals of all the models and detected any departures from the homoskedasticity assumption (variance was not constant across levels of predictors). Therefore, we included a heteroskedastic model (with different estimated variances across predictors). We also included a nonlinear model (using penalized B-splines) to account for a possible nonlinear relation between the continuous predictor and the dependent variable. The residual diagnostics are available in the Supplementary Materials (see Figure A2). Standard information criteria were used for the model selection, deviance (-2 × log-likelihood), Akaike information criterion (AIC), and the model with lowest values was selected (see Table 1). Table 2 shows the estimated parameters of the final model (the heteroskedastic model with generalized gamma distribution).

DISCUSSION

In this study, we analysed the relationship between the level of self-criticism and fixation durations on nine facial emotions using a 3 × 3 face in the crowd grid. Our results did not confirm either of the two hypotheses. In fact, the findings contradicted H1, as highly self-critical participants fixated on angry faces significantly shorter than other participants.

This finding runs counter to many previous research studies that have found an attention bias for negative stimuli (e.g., Duque & Vázquez, 2015; Shechner et al., 2012), even though the comparison is problematic because previous studies used different samples, different clinical populations, and different methods. Nonetheless, the present finding may explain why highly self-critical people (higher hated self score) have difficulty identifying emotion expressions (Strnádelová et al., 2019b): they probably avoid looking at faces, which makes it harder for them to identify the expressions correctly.

The trait-congruency perspective proposes a predisposition of individuals to search and process information is congruent with personality characteristics (e.g., Segerstrom, 2001). To illustrate,

TABLE 1.
Information Criteria for Fitted Models

Model	Deviance	df	GAIC
Normal	4026608	136.26	4026880
Lognormal	3493930	136.23	3494202
Gamma	3566247	136.09	3566519
Generalized Gamma	3464833	136.71	3465107
Generalized Gamma (heteroskedastic)	**3463757**	145.72	**3464048**
Generalized Gamma (heteroskedastic non-linear)	3463757	146.24	3464049

Note. GAIC = Generalized Akaike information criterion. The final model with lowest values is in bold.

TABLE 2.
The Estimated Parameters of the Final Model

Parameter	Estimate	OR	*SE*	*p*
Intercept	**5.030**	152.87	0.008	< .001
Self-criticism	**-0.001**	0.99	0.003	.041
Surprise	**0.026**	1.03	0.012	.026
Sadness	-0.017	0.98	0.012	.142
Happiness	**0.085**	1.09	0.012	< .001
Fear	**0.033**	1.03	0.012	.005
Embarrassment	**-0.023**	0.98	0.012	.046
Disgust	**0.022**	1.02	0.012	.063
Contempt	-0.016	0.98	0.012	.720
Anger	**0.038**	1.04	0.012	.001
Self-criticism: surprise	0.001	1.00	0.005	.305
Self-criticism: sadness	0.001	1.00	0.005	.255
Self-criticism: happiness	-0.001	1.00	0.005	.688
Self-criticism: fear	-0.001	1.00	0.005	.986
Self-criticism: embarrassment	0.001	1.00	0.005	.507
Self-criticism: disgust	-0.001	1.00	0.005	.664
Self-criticism: contempt	0.001	1.00	0.005	.064
Self-criticism: anger	**-0.001**	0.99	0.005	.040

Note. OR = odds ratio. *SE* = standard error. Estimates significant at the .05 level are in bold.

optimism (Scheier et al., 2000) or anxiety (Bradley et al., 2000) are related to the selective processing of trait-congruent emotional information. In line with the trait-congruency perspective, Perlman et al. (2009) found that the amount of time spent looking at the eyes of fearful faces was positively related to neuroticism. The authors´conclusion was that eye gaze represents a possible behavioral link in a complex relationship between genes, brain function, and personality. It may also be transfered to a transdiagnostic personal construct which is self-criticism. Self-critical individuals showed a lower fixation duration than respondents with lower self-criticism scores. It could be related to their avoidance of judging, criticising (mainly angry) emotional faces.

However, our results were obtained using a nonclinical sample and would have to be compared with results obtained from clinical samples to see whether this pattern of attentional emotion avoidance is related to high self-criticism in nonclinical samples only or whether it can be generalized. Hypothetically, it is possible that emotion avoidance versus attention bias for negative stimuli could signal that the highly self-critical person is either well adapted to the environment or is suffering from a mental disorder (e.g., Duque & Vázquez, 2015). Perlman et al. (2009) found that optimists displayed emotion avoidance of negative stimuli and a preference for positive stimuli. This corresponds with our statistically significant result that highly self-critical people tend to exhibit attentional anger avoidance. However, in our study, there was a tendency towards avoiding most emotions, even positive ones such as happiness, and this could point to a difference between the optimists in Perlman et al.'s study (2009) and the well-adapted highly self-critical people with no clinical diagnosis in our sample.

In addition, the avoidance tendency among self-critical individuals occured even in response to the neutral expression, which may indicate an attentional bias against any human facial expression or human faces generally, not just emotional ones. This assumption should be tested in further research, as it may reveal a general bias in self-critical people that prompts them to avoid scanning faces. This avoidance of human faces could complicate interactions and communication. However, a different method was used in this

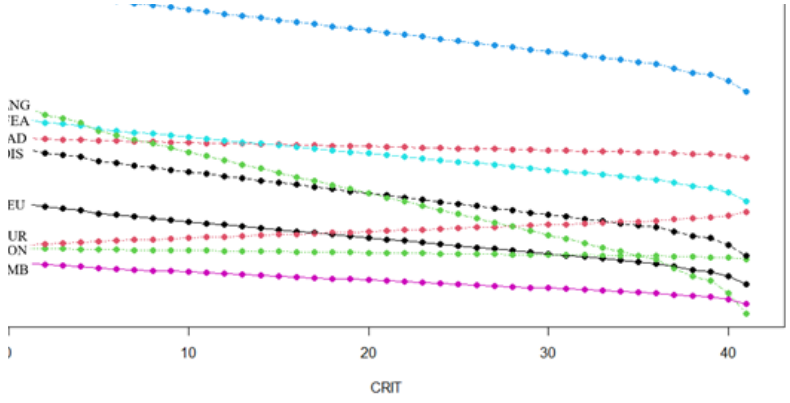

FIGURE 1.
Comparison of interactions between fixation duration of emotions and self-criticism score. Joy = happiness; Ang = anger; Fea = fear; Sad = sadness; Dis = disgust; Neu = neutral; Sur = surprise; Con = contempt; Emb = embarrassment.

study compared to previous studies. The face in the crowd paradigm has not been explored in relation to self-criticism, although it is quite natural that self-critical people encounter various faces in the social environment and select their fixations on them.

As attentional avoidance of emotional stimuli has been related to emotional maltreatment (Iffland et al., 2019), one interpretation of our results could be that participants with high self-criticism had been maltreated in childhood and that their self-criticism is a form of adaptation to that maltreatment that led to attentional anger avoidance. Of all the emotions, anger is most often linked to being criticized and most often expresses "direct hostility towards the beholder" (Staugaard, 2010, p. 669).

Possibly, there is another interpretation of the result that participants with higher self-criticism scores had lower fixation durations than participants with lower self-criticism scores and that the interaction with anger was the only statistically significant one. This could be because they detect and thus efficiently and rapidly avoid this emotional expression because they avoid judging and criticism, which angry emotional faces mainly signal.

In future research, it would be worth investigating this to see whether there are any differences both in fixation duration and in first fixation on various emotions. The hypothesis that maltreated individuals exhibit hyperactivity towards stimuli indicating a threat from their past could then be tested (e.g., Iffland & Neuner, 2020; Voellmin et al., 2015).

The main limitation in is the current study was that the available sample contained far fewer men than women, and this prevents further generalization. Also, it is possible that different results would be obtained using the hated self score from the FSCRS rather than the combined score for hated self and inadequate self, as was the case here. Given the theory behind the FICE, it may be that happy/angry superiority is more easily identified by analysing the first fixation compared to total fixation duration among self-critical participants. The main contribution of this study was the design of the face in the crowd task, which included all seven primary emotions, the neutral expression, and embarrassment.

CONCLUSION

In contrast to most previous studies that have found an attention bias for negative stimuli (e.g., Duque & Vázquez, 2015) in clinical samples with various diagnoses, our results showed that, in a non-clinical population, highly self-critical people exhibit significant attentional anger avoidance and an attention avoidance tendency in relation to most emotions.

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The authors declare that they have no potential conflicts of interests.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Written informed consent was obtained from all individual participants included in the study.

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JH and BS designed research project. BS collected data. RM processed data. MK performed the statistical analysis. JH and MK wrote the first draft of the article, all authors interpreted the results, revised the manuscript and read and approved the final manuscript.

DATA AVAILABILITY

In order to comply with the ethics approvals of the study protocols, data cannot be made accessible through a public repository. However, data are available upon request for researchers who consent to adhering to the ethical regulations for confidential data.

REFERENCES

Bielikova, M., Konopka, M., Simko, J., Moro, R., Tvarozek, J., Hlavac, P., & Kuric, E. (2018). Eye-tracking en masse: Group user studies, lab infrastructure, and practices. *Journal of Eye Movement Research, 11*. doi: 10.16910/jemr.11.3.6

Bradley, B. P., Mogg, K., & Millar, N. H. (2000). Covert and overt orienting of attention to emotional faces in anxiety. *Cognition and Emotion, 14*, 789–808. doi: 10.1080/026999300501566636

Cox, C., Chu, H., Schneider, M. F. & Munoz, A. (2007). Parametric survival analysis and taxonomy of hazard functions for the generalized gamma distribution. *Statistics in Medicine, 26*, 4352–4374. doi: 10.1002/sim.2836

Catrysse, L., Gijbels, D., Donche, V., De Maeyer, S., Lesterhuis, M., & Van den Bossche, P. (2017). How are learning strategies reflected in the eyes? Combining results from self-reports and eye-tracking. *British Journal of Educational Psychology, 88*, 1, 118–137. doi: 10.1111/bjep.12181

Delignette-Muller, M. L. & Dutang, C. (2015). fitdistrplus: An R package for fitting distributions. *Journal of Statistical Software, 64*, 1–34. doi: 10.18637/jss.v064.i04

Duque, A., Sanchez, A., & Vazquez, C. (2014). Gaze-fixation and pupil dilation in the processing of emotional faces: The role of rumination. *Cognition and Emotion, 28*, 1347–1366. doi: 10.1080/02699931.2014.881327

Duque, A., & Vázquez, C. (2015). Double attention bias for positive and negative emotional faces in clinical depression: Evidence from an eye-tracking study. *Journal of Behavior Therapy and Experimental Psychiatry, 46*, 107–114. doi: 10.1016/j.jbtep.2014.09.005

Ekman, P., & Heider, K. G. (1988). The universality of a contempt expression: A replication. *Motivation and Emotion, 12*, 303–308. doi: 10.1007/BF00993116

Ekman, P., & Friesen, W. V. (1978). *Facial Action Coding System (FACS)*

[Database record]. APA PsycTests.

Falconer, C. J., King, J. A., & Brewin, C. R. (2015). Demonstrating mood repair with a situation-based measure of self-compassion and self-criticism. *Psychology and Psychotherapy, 88*, 351–365. doi: 10.1111/papt.12056

Gibb, B. E., Schofield, C. A., & Coles, M. E. (2009). Reported history of childhood abuse and young adults' information-processing biases for facial displays of emotion. *Child Maltreatment, 14*, 148–156. doi: 10.1177/1077559508326358

Gilbert, P., Clark, M., Hempel, S., Miles, J. N. V., & Irons, C. (2004). Criticising and reassuring oneself: An exploration of forms, styles and reasons in female students. *British Journal of Clinical Psychology, 43*, 31–50. doi: 10.1348/014466504772812959

Gilbert, P., McEwan, K., Gibbons, L., Chotai, S., Duarte, J., & Matos, M. (2012). Fears of compassion and happiness in relation to alexithymia, mindfulness and self-criticism. *Psychology and Psychotherapy, 84*, 239–255. doi: 10.1348/147608310X526511

Halamová, J., Kanovský, M., Gilbert, P., Troop, N., Zuroff, D., Hermanto, N., Petrocchi, N., . . . & Kupeli, N. (2018). The factor structure of the Forms of Self-Criticising/ Attacking & Self-Reassuring Scale in thirteen populations. *Journal of Psychopathology and Behavioral Assessment, 40*, 736–751. doi: 10.1007/s10862-018-9686-2

Halamová, J., Kanovský, M., Gilbert, P., Kupeli, N., Troop, N., Zuroff, D., Petrocchi, N., . . . & Basran, J. (2019). Multiple group irt measurement invariance analysis of the forms of self-criticising/attacking and self-reassuring scale in thirteen international samples. *Journal of Rational-Emotive & Cognitive-Behavior Therapy, 37*, 411–444. doi: 10.1007/s10942-019-00319-1

Halamová, J., Kanovský, M., & Pacúchová M. (2017). Robust psychometric analysis and factor structure of the Forms of Self–criticizing/ Attacking and Self–reassuring Scale. *Československá Psychologie, 4*, 331-349.

Hansen, C. H., & Hansen, R. D. (1988). Finding the face in the crowd: An anger superiority effect. *Journal of Personality and Social Psychology, 54*, 917–924. doi: 10.1037//0022-3514.54.6.917

Henderson, J. M., Williams, C. C., & Falk, R. J. (2005). Eye movements are functional during face learning. *Memory & Cognition, 33*, 98–106. doi: 10.3758/BF03195300

Holmqvist, K., Nystrom, M., Andersson, R., Dewhurst, R., Jarodzka, H., & van de Weijer, J. (2011). *Eye tracking: A comprehensive guide to methods and measures*. Oxford University Press.

Iffland, B. & Neuner, F. (2020). Varying cognitive scars–differential associations between types of childhood maltreatment and facial emotion processing. *Frontiers in Psychology, 11,* 732. doi: 10.3389/fpsyg.2020.00732

Iffland, B., Weitkämper, A., Weitkämper, N. J., & Neuner, F. (2019). Attentional avoidance in peer victimized individuals with and without psychiatric disorders. *BMC Psychology 7*, 12. doi: 10.1186/s40359-019-0284-1

Juth, P., Lundqvist, D., Karlsson, A., & Öhman, A. (2005). Looking for foes and friends: perceptual and emotional factors when finding a face in the crowd. *Emotion 5*, 379–395. doi: 10.1037/1528-3542.5.4.379

Kellough, J. L., Beevers, C. G., Ellis, A. J., & Wells, T. T. (2008). Time course of selective attention in clinically depressed young adults: An eye tracking study. *Behaviour Research and Therapy, 46*, 1238–1243. doi:10.1016/j.brat.2008.07.004

Lo, S., & Andrews, S. (2015). To transform or not to transform: Using generalized linear mixed models to analyse reaction time data. *Frontiers in Psychology, 6*, 1171, 1–16.

McIntyre, R., Smith, P., & Rimes, K. A. (2018). The role of self-criticism in common mental health difficulties in students: a systematic review of prospective studies. *Mental Health & Prevention, 10*, 13–27. doi:10.1016/j.mhp.2018.02.003

Mirman, A., Bick, A. S., Kalla, C., Canetti, L., Segman, R., Dan, R., Ben, A., . . . & Bonne, O. (2021). The imprint of childhood adversity on emotional processing in high functioning young adults. *Human Brain Mapping. 42*, 615–625. doi: 10.1002/hbm.25246

Olsen, A. & Matos, R. (2012). Identifying parameter values for an I-VT fixation filter suitable for handling data sampled with various sampling frequencies. In: S. N. Spencer (Ed.), *ETRA '12, Proceedings of the Symposium on Eye Tracking Research and Applications* (pp. 317–320). Association for Computing Machinery.

Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved module of fear and fear learning. *Psychological Review, 108*, 483–522. doi: 10.1037/0033-295x.108.3.483

Perlman, S. B., Morris, J. P., Vander Wyk, B. C., Green, S. R., Doyle, J. L., Pelphrey, K. A. (2009). Individual differences in personality predict how people look at faces. *PLoS One, 4*, e5952. doi: 10.1371/journal.pone.0005952

Pinkham, A. E., Griffin, M., Baron, R., Sasson, N. J., & Gur, R. C. (2010). The face in the crowd effect: Anger superiority when using real faces and multiple identities. *Emotion, 10*, 141–146. doi: 10.1037/a0017387

R Core Team (2020). R*: A language and environment for statistical computing*. R Foundation for Statistical Computing. Retrieved from http://www.R-project.org/

Segerstrom, S. C. (2001). Optimism and attentional bias for negative and positive stimuli. *Personality and Social Psychology Bulletin, 27*, 1334–1343. doi: 10.1177/01461672012710009

Shechner, T., Jarcho, J. M., Britton, J. C., Pérez-Edgar, K., Bar-Haim, Y., Ernst, M., Fox, N. A., . . . & Pine. D. S. (2012). Attention biases, anxiety, and development: toward or away from threats or rewards? *Depression & Anxiety, 29*, 282–294. doi: 10.1002/da.20914

Scheier, M. F., Carver, C. S., & Bridges, M. W. (2000). Optimism, pessimism, and psychological well-being. In: E. Chang (Ed). *Optimism and pessimism: Implications for theory, research, and practice* (pp. 189–216). American Psychological Association.

Shahar, G. (2015). *Erosion: The psychopathology of self-criticism*. Oxford University Press.

Shasteen, J. R., Sasson, N. J., & Pinkham, A. E. (2014). Eye tracking the face in the crowd task: Why are angry faces found more quickly? *PLoS One, 9*, e93914. doi: 10.1371/journal.pone.0093914

Stasinopoulos, D. M., Rigby, R. A., Heller, G., Voudouris, V. & De

Bastiani, F., (2017). *Flexible regression and smoothing: using gamlss in R*. Chapman & Hall/CRC.

Staugaard, S. R. (2010). Threatening faces and social anxiety: A literature review. *Clinical Psychology Review, 30*, 669–690. doi: 10.1016/j.cpr.2010.05.001

Stinckens, N., Lietaer, G., & Leijssen, M. (2013). Working with the inner critic: Process features and pathways to change. *Person-Centered & Experiential Psychotherapies, 12*, 59–78. doi: 10.1080/14779757.2013.767747

Strnádelová, B., Halamová, J. & Kanovský, M. (2019a). Eye-tracking of facial emotions in relation to self-criticism and self-reassurance. *Applied Artificial Intelligence, 33*, 839–862, doi: 10.1080/08839514.2019.1646004

Strnádelová, B., Halamová, J., & Kanovský, M. (2019b). Identification of primary facial emotions in relation to level of self-criticism. *Perception, 48*, 948–967. doi: 10.1177/0301006619870399

Strnádelová, B., Halamová, J. & Mentel, A. (2019). Self-reassurance, self-criticism, and eye-tracking of happy faces. *Studia Psychologica, 61*, 189–202. doi: 10.21909/sp.2019.03.782

Suslow, T., Junghanns, K., & Arolt, V. (2001). Detection of facial expressions of emotions in depression. *Perceptual and Motor Skills, 92*, 857–868. doi: 10.2466/pms.2001.92.3.857

Taubert, J., Apthorp, D., Aagten-Murphy, D., & Alais, D. (2011). The role of holistic processing in face perception: Evidence from the face inversion effect. *Vision Research, 51*, 1273–1278. doi: 10.1016/j.visres.2011.04.002

van der Schalk, J., Hawk, S. T., Fischer, A. H., & Doosje, B. J. (2011). Moving faces, looking places: Validation of the The Amsterdam Dynamic Facial Expressions Set (ADFES). *Emotion, 11*, 907–920. doi: 10.1037/a0023853

Voellmin, A., Winzeler, K., Hug, E., Wilhelm, F. H., Schaefer, V., Gaab, J., La Marca, R., . . . & Bader, K. (2015). Blunted endocrine and cardiovascular reactivity in young healthy women reporting a history of childhood adversity. *Psychoneuroendocrinology 51*, 58–67. doi: 10.1016/j.psyneuen.2014.09.008

Wingenbach, T. S. H., Ashwin, C., & Brosnan, M. (2016). Validation of the Amsterdam Dynamic Facial Expression Set–Bath Intensity Variations (ADFES-BIV): A set of videos expressing low, intermediate, and high intensity emotions. *PLoS One, 11*, e0168891. doi: 10.1371/journal.pone.0168891

Xu, P., Ehinger, K. A., Zhang, Y., Finkelstein, A., Kulkarni, S. R., & Xiao, J. (2015). TurkerGaze: Crowdsourcing saliency with webcam based eye tracking. *arXiv,* 1504.06755

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SUPPLEMENTARY MATERIAL

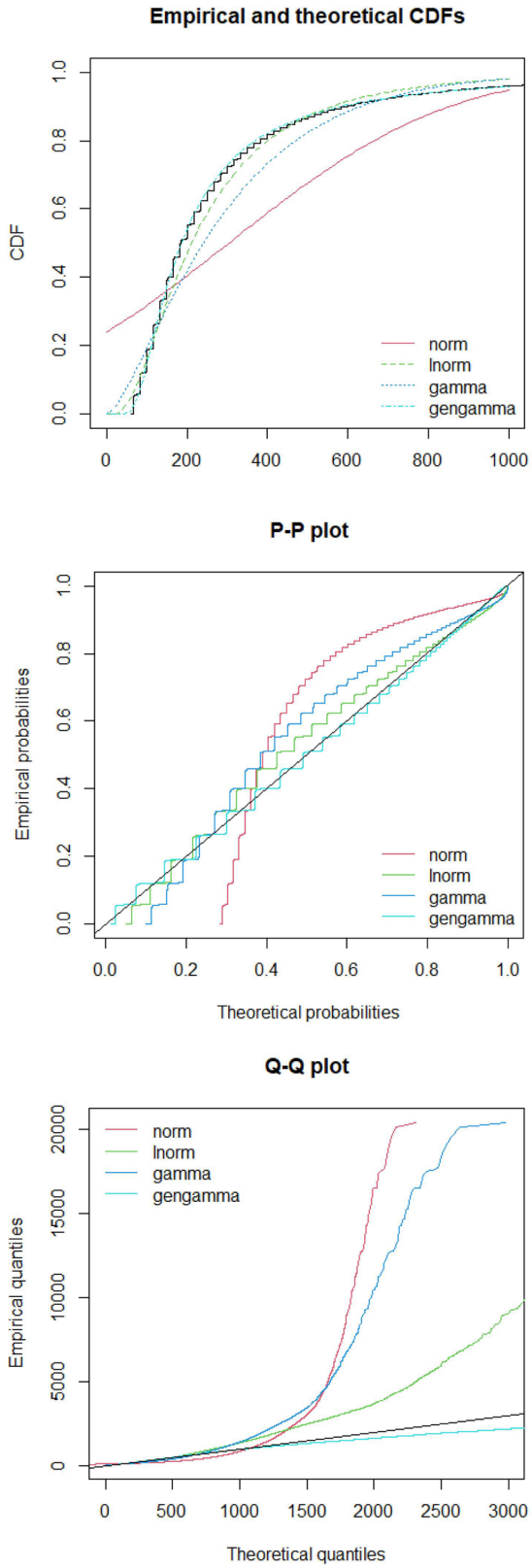

FIGURE S1.

Fitting several distributions on empirical data (black line). norm = normal distribution. Lnorm = lognormal distribution. Gamma = gamma distribution. gengamma = generalized gamma distribution.

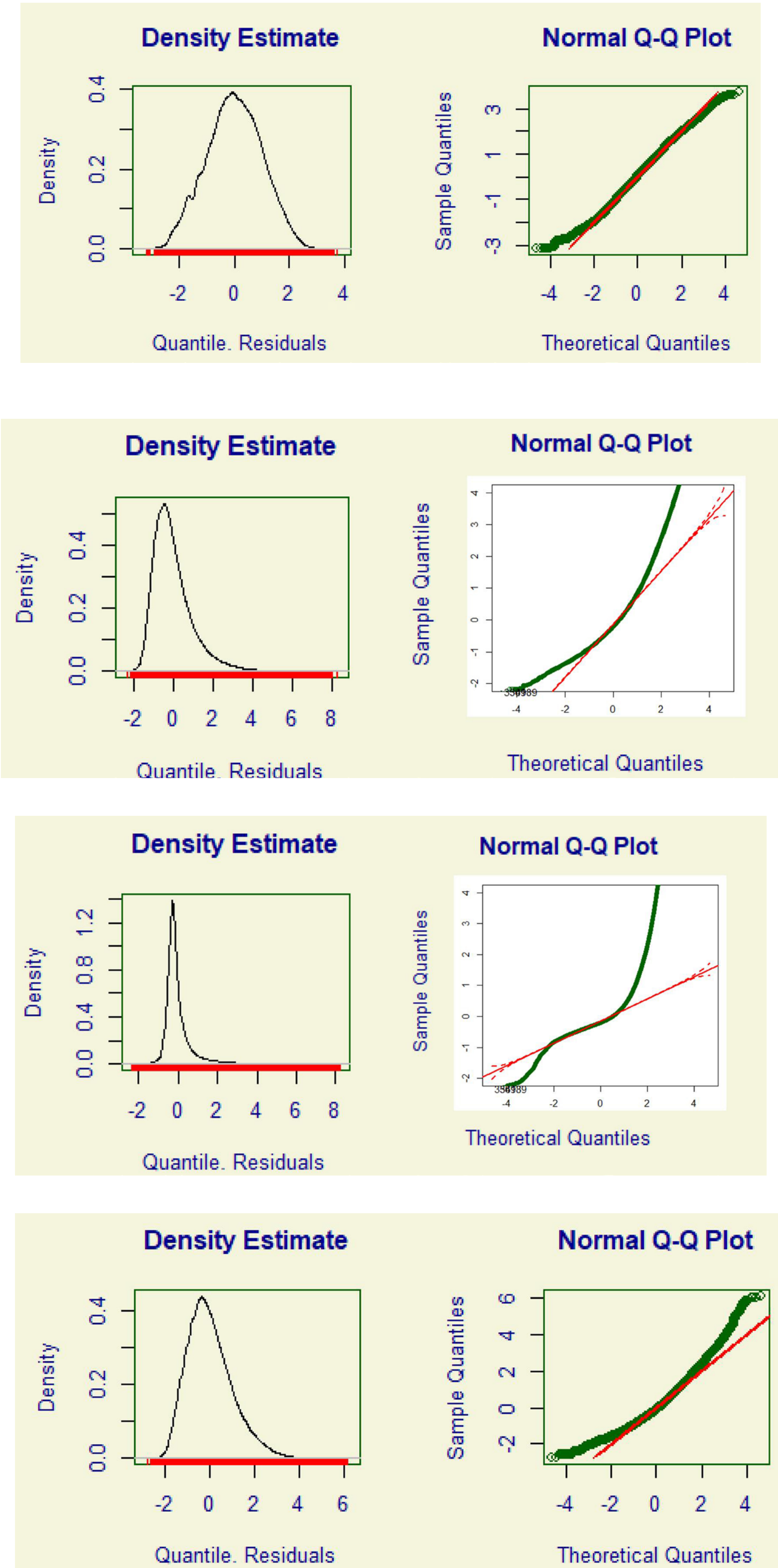

FIGURE S2.

Residual diagnostics of fitted models