



Asymmetric affective perspective taking effects toward valence influenced by personality perspective taken

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Abstract

Previously, we found that taking perspectives of two polar targets of the neuroticism dimension of personality influenced affect evaluations of negative pictures more than positive pictures. As neuroticism is more reactive to negative affects, the current follow-up experiment explores the effect of affective perspective taking (APT) when perspectives are derived from extroversion, which is more reactive to positive affects. Stimuli consisted of neutral, sad, and happy pictures, which were rated from the perspectives of an introvert and an extrovert. Emotional strength rating was a dependent variable, and $N = 41$. We found a significant interaction between APT and valence. The difference in ratings between adopting an introverted and an extroverted perspective toward happiness was larger than toward sadness. Together with the results from our previous study, these results suggest an asymmetric influence of APT toward positive and negative valences and that the direction of influence asymmetry depends on the type of personality dimension from which perspectives are derived.

Keywords Perspective taking · Valence · Sadness · Happiness

Introduction

The process that allows us to understand or intuit the feelings of another is known as affective perspective taking (APT; Dunn & Hughes, 1998; Healey & Grossman, 2018; Wellman et al., 2000). It is the social-cognitive process in which one suppresses one's own perspective and represents or imagines the emotional state of another (Hillis, 2014). As such, APT has indeed important social implications. For example, APT was found to be related to less conflict behavior (Dunn & Cutting, 1999) and to enhance help behavior (Oswald, 1996). Likewise, APT has emotional implications as well. For instance, it was found to benefit emotional restoration and coping reactions after affectively heightened situations (Tejada, 2020), and more generally, it leads to

emotional regulation (Gilead et al., 2016). However, to the best of our knowledge, whether APT is studied in a social or emotional context, the question of whether its accuracy or effects vary between negative and positive valence has rarely been studied directly (Binyamin-Suissa et al., 2021; Charernboon, 2020; Yu et al., 2018).

When one takes perspective, does the valence of the emotional context matter? Our previous study (Binyamin-Suissa et al., 2021) and also that of Yu et al. (2018) and Charernboon (2020) suggest this might be the case. Yu et al. and Charernboon showed variability in the accuracy of reading the affective state of others according to valence in a clinical population. Our previous study demonstrated variability of the APT effect in a nonclinical sample. In the latter, participants were asked to rate the emotional strength of pictures having positive, negative, and neutral valence from two perspectives relevant to emotional processing. Our main finding was that taking these perspectives toward negative valence pictures resulted in a bigger effect than toward positive valence pictures.

The present work is a follow-up of our (i.e., Binyamin-Suissa et al., 2021) aforementioned research. To clarify this, let us first review our previous study in more detail. As mentioned, the perspectives used in the previous study were relevant to emotional processing. However, more importantly,

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they were perspectives that could be considered to be two polar perspectives derived from the personality dimension of neuroticism (i.e., sensitive and tough). Neuroticism is one of five well-established personality dimensions of the prominent Big Five model of personality (Costa & McCrae, 1985). At its high end, the dimension of neuroticism describes a cluster of basic tendencies toward insecurity, vulnerability, emotionality, irritability, and self-consciousness (John et al., 2008). Importantly, neuroticism is acknowledged for its reactivity primarily to negative emotions (Boksem et al., 2006; Gross et al., 1998; Monroe & Simons, 1991). Hence, in regard to perspective taking, we suspected that a sensitive target would show higher reactivity (intensified subjective experience of emotion) than a tough target when facing emotional stimuli, and this would be more so when the stimuli are negative than when they are positive. As mentioned, this prediction was confirmed. There was a greater difference between ratings of emotional strength of pictures from a sensitive perspective than ratings of those pictures from a tough perspective in the negative condition, compared with the positive one. This pattern of results may indeed be due to the specific emotional reactivity of the personality dimension the perspectives were derived from. However, there could be other explanations. For example, it is not inconceivable that the effect of perspective taking is stronger in negative valence contexts than in positive ones, regardless of the type of perspectives taken.

Therefore, in the present study, we aimed to broaden the basis of support for our explanation of the asymmetric effect of APT according to valence. That is, we wanted to examine whether the bigger effect in the negative condition is indeed due to or depends on the specific personality dimension that the perspectives are derived from. To this end, we used two other perspectives derived from another personality dimension that is relevant to emotional processing but does not share with neuroticism the reactivity to negative emotion. More specifically, we used two polar perspectives that can be derived from the extroversion dimension of the Big Five—extrovert and introvert. At its high end, the dimension of extroversion describes a cluster of basic traits as being energetic, assertive, enthusiastic, and sociability (John et al., 2008). From the five personality dimensions of the model, extroversion together with neuroticism are considered to be the two most associated to emotion (Costa & McCrae, 1985). Nevertheless, not only does extroversion not share with neuroticism the responsiveness to negative affects, but extroversion is also acknowledged to be more reactive to positive emotions (Canli et al., 2001; Larsen & Ketelaar, 1989). Hence, in regard to perspective taking, we suspected that an extrovert target would show higher reactivity than an introvert one when facing emotional stimuli. Moreover, we expected this higher reactivity to be even larger when the emotional stimuli were positive than when they were

negative. Therefore, we speculated that using the two polar perspectives of the extroversion dimension of personality, in the present study, would result in a reversal of the asymmetric effect of APT according to valence. That is, in contrast to the greater effect found for negative compared with positive valence in the previous study when perspectives were derived from neuroticism, in the present study we expected a greater effect for positive valence than for negative valence.

The current study

To examine this prediction, we conducted an experiment in which we introduced neutral pictures together with pictures that were classified as sad or happy (Moyal et al., 2018), which were matched for their emotional intensity and arousal. Participants were requested to evaluate the emotional strength of the pictures from three different perspectives—a manipulation used for measuring APT in various research contexts (Binyamin-Suissa et al., 2019; Campbell et al., 2014; Gilead et al., 2016; Perry et al., 2011). Two of the perspectives were allocentric—extrovert and introvert. The third perspective was egocentric—“me” (the participant’s own perspective). Pictures were separated by emotion (neutrals + sad/happy) into two separate blocks.

The current design allows inspecting whether APT is, in fact, impacted by different personality dimensions. This can be done by predicting two rival predictions concerning the nature of the interaction between valence and perspective. As mentioned above, it is possible that the effect of perspective taking is stronger in negative valence contexts than in positive ones, in a way that is not sensitive to personality dimensions. In this case, we would merely replicate the interaction found in our previous study (Binyamin-Suissa et al., 2021), where the difference between the allocentric perspectives was more prominent for the negative stimuli compared with the positive stimuli. However, a rival prediction is that APT is influenced by different personality dimensions. Therefore, since extroversion is aligned with positive affect, the interaction between valence and perspective will show that the difference between the extrovert perspective and the introvert perspective will be more prominent for the positive stimuli than the negative stimuli.

Additionally, in regard to the comparisons between each of the emotional conditions with the neutral condition, we predicted a replication of our finding in the previous study (Binyamin-Suissa et al., 2021), where APT effects were larger in each emotional condition than in the neutral one. Here, we predicted that the difference between the emotional ratings obtained from the introvert and the extrovert perspectives would be bigger in the positive valence condition (happy) than in the neutral one, and likewise in the negative (sadness) condition than in the neutral one.

Method

Participants

Forty-two students from Ben-Gurion University of the Negev were enlisted for course credit. They were all native Hebrew speakers, had normal or corrected-to-normal vision and did not report a history of emotional disorders or attention deficit disorder. One participant did not complete the task and therefore was excluded (final sample $N = 41$).

A pilot study ($N = 18$) was conducted to estimate the required sample size. To determine the final sample, we used (1) a power analysis to ensure a minimum predictive power of 80% with a 0.05 Type I error, performed using GLIMMPSE (Kreidler et al., 2013); (2) a similar drop-out rate as that in the pilot study; and (3) fewer study requirements compared with the pilot (e.g., no virtual meeting at the end of the experiment). Thus, the sample size was determined to be 42 participants. More details on the pilot study and the power analysis can be found in the code book (<https://osf.io/b7ftv/>).

Design

The design had nine conditions, with perspective (extrovert, introvert, me) and emotional valence (neutral, positive, negative) as two within-subject factors. The task consisted of 144 trials, divided into two blocks. Each of the blocks had 72 trials: 12 pictures of one emotional valence—either sad or happy—plus 12 neutral pictures, with each of the 24 pictures presented three times per block, one for each perspective. Trials were presented in random order for each participant and the order of the blocks was counterbalanced across participants.

Materials

Affective stimuli The affective stimuli were the same as in Binyamin-Suissa et al. (2021). Hence, from the Categorized Affective Pictures Database (CAP-D; Moyal et al., 2018), we used 12 sad pictures (mean normative intensity = 4.80 on a scale ranging from 1 [*very low intensity*] to 9 [*high intensity*], mean normative arousal = 4.06 on scale ranging from 1 [*not arousing*] to 9 [*highly arousing*]) and twelve happy pictures (mean normative intensity = 4.53, mean normative arousal = 3.77). The stimuli were chosen to maintain minimal differences in arousal, $t(22) = -1.46$, $p = .15$, and intensity, $t(22) = -1.17$, $p = .25$, between the two valences, and have maximal level of agreement with the emotion they

aroused (greater than 59%).¹ For neutral stimuli, we used 24 neutral pictures (mean normative arousal = 3.34, mean normative valence = 5.43). These pictures were taken from the International Affective Picture System (IAPS; Lang et al., 2001).² There was an additional set of six pictures (two for each valence: positive, negative, neutral) that was used for training sessions (see more details in the procedure section).

Perspective Taking (PT) subscale of the Interpersonal Reactivity Index (IRI; Davis, 1983) The PT subscale of the IRI assesses general ability for perspective taking. The subscale comprises seven items (e.g., “I sometimes try to understand my friends better by imagining how things look from their perspective”) on scales ranging from 0 (*does not describe me*) to 4 (*describes me very well*). The overall score ranges from a minimum of 0 to a maximum of 28. Higher scores reflect stronger ability (Cronbach’s alpha = .63).

Procedure

The study was administered online and built using Gorilla Experiment Builder (Anwyl-Irvine et al., 2020). The program controlled stimuli presentation and timing. Participants used the computer mouse to respond. After signing an informed consent, participants were given two short descriptions of personality types—one of an extrovert and one of an introvert (based on John et al., 2008). Participants were then asked to think of their acquaintances and choose and write a short paragraph on one that was the closest to the extrovert’s description and one that was the closest to the introvert’s description. In these two paragraphs, participants were asked to describe a day in the life of each of the acquaintances they chose, while emphasizing their mental reactions—thoughts and emotions to the events of that day (see a similar manipulation in Eyal et al., 2018). After that, participants were asked to enter their acquaintances’ names into the program. They were then informed that in the task to be performed, they would have to intuit the emotional reactions of their two acquaintances. More specifically, they were informed that they would be presented with pictures that would be preceded by a cue with the name of the acquaintance whose perspective they were to take, or by a cue instructing them to take their own perspective. They were also informed that after each picture there would be a screen instructing them to rate the emotional response that the picture aroused (on behalf of the target perspective or their own perspective). Before approaching the task in each of the two blocks, participants completed two short training sessions. Each of the trainings was tailored to the block it preceded and

¹ The arousal and intensity ratings and levels of agreement of the pictures were taken from the CAP-D database.

² Note that the IAPS database does not include an intensity measure.

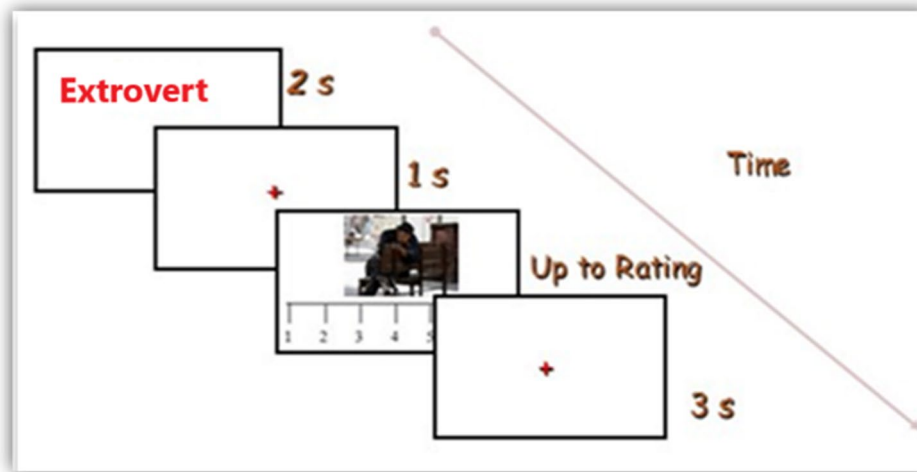


Fig. 1 Drawing of an extrovert/sadness condition trial. *Note.* In the experiment, the cue (represented in the figure by “Extrovert”—i.e., the perspective to take) appeared as the name of the relevant acquaintance

only contained pictures of the relevant emotional valence (happiness or sadness) mixed with neutral pictures. Finally, participants were asked to answer three questions verifying understanding of the instructions and only after three correct answers were they then allowed to continue to the task.

Each experimental trial started with a cue that was shown for 2,000 ms. The cue was the name of the acquaintance whose perspective the participant was instructed to adopt, or a cue indicating to use their own perspective. After a fixation of 1,000 ms, participants were shown a display in which a picture was presented along with a rating scale below it. Participants were instructed to rate the affective response to the picture from the perspective they were asked to adopt, as fast and accurately as they could. This display was replaced by the next screen once the subjects indicated their rating (ranging from 1 [*no affective reaction at all*] to 7 [*very strong reaction*]) by clicking the mouse. The last screen presented a second fixation point for 3,000 ms (see Fig. 1). After completing the task, participants were asked to complete the PT subscale of the IRI (Davis, 1983), and answer questions regarding their levels of engagement during the experiment and debriefing questions. Importantly, in the debriefing questions we asked the participants to rate how close they are to each of the targets from 0 to 100. As will be described later, we computed the difference between the closeness to the extrovert target and the closeness to the introvert target of each subject and used it as a covariate.

Additional measures

To provide further tests of reliable consequences of perspective taking, as reflected in evidence of mental effort, we also collected two additional measures.

Manipulation check Participants rated how hard it was for them to rate the picture from their own perspective and how hard it was from their acquaintances’ perspectives. We used a 100-point scale (0 [*not at all*], 100 [*very hard*]).

Response time (RT) We measured participants’ response times to provide an indirect measure of mental effort (with more time indicating more effort expended). Since considering another person’s perspective requires mental effort (Eyal et al., 2018), we expected a significant difference between the target and “me” trials such that “me” trials would be faster.

Statistical approach

Emotional rating analysis was conducted using mixed-effects modeling (also known as multilevel regression or hierarchical modeling) and RT analysis was conducted using generalized mixed-effects modeling (GLMM) with an inverse-gaussian link function (Lo & Andrews, 2015; Tamir & Mitchell, 2013). In both models, valence, perspective (“me” perspective was included only in the RT analysis), and their interaction were included as fixed and random slope effects. In addition, IRI scores and the difference scores of the closeness of each of the targets to the participants were inserted as covariates (centered). Where applicable, degrees of freedom were estimated using the Satterthwaite degrees of freedom method. Models were fitted using software consisting of R (Version 4.1.2; R Core Team, 2018) and the main R packages: lme4 (Bates et al., 2012), lmerTest (Kuznetsova et al., 2017), and emmeans (Lenth et al., 2019). The code book including the models’ performance and materials can be found in the Open Science Framework (<https://osf.io/b7ftv/>).

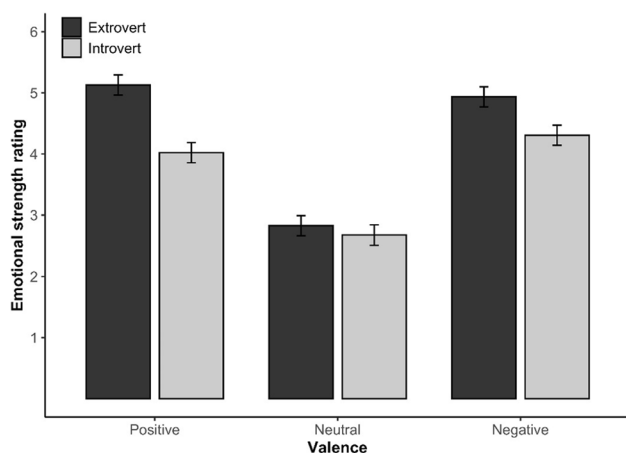


Fig. 2 Results of the Valence \times Perspective interaction. *Note.* Error bars depict one standard error from the mean

Results

Manipulation check

A paired t test indicated that, as expected, participants' self-reported effort to rate from their acquaintances' perspectives was higher than from their own perspective, $t(40) = -7.86$, $p < .001$, $\eta_p^2 = .61$.

Main analysis—Perspective-taking effects

We conducted an analyses of variance (ANOVA) summary for the mixed-effects model introduced above. The PT subscale of the IRI and the difference in closeness did not interact significantly with any of the independent variables or the interaction between them, nor it significantly correlate with the dependent variable (i.e., no main effects) and thus will not be further discussed. A significant interaction was found between perspective and valence, $F(2, 38) = 29.94$, $p < .001$, $\eta_p^2 = .61$, and there were two main effects, $F(1, 38) = 24.38$, $p < .001$, $\eta_p^2 = .39$, and $F(2, 38) = 130.46$, $p < .001$, $\eta_p^2 = .87$, for perspective and valence, respectively (see Fig. 2). In the negative condition, the affective evaluations from the extrovert perspective ($M = 4.99$, $SE = 0.15$) were significantly higher than from the introvert perspective ($M = 4.34$, $SE = 0.17$), $t(38) = 3.52$, $p < .001$, $\eta_p^2 = .24$. The same was true for the positive condition: ratings from the extrovert perspective ($M = 5.10$, $SE = 0.11$) were higher than from the introvert perspective ($M = 4.07$, $SD = 0.15$), $t(38) = 8.44$, $p < .001$, $\eta_p^2 = .65$. In the neutral condition, there was no significant difference between ratings from the two perspectives: extrovert ($M = 2.77$, $SD = 0.13$) and introvert ($M = 2.61$, $SD = 0.13$), $t(38) = 1.31$, $p = .19$.

Are perspective-taking effects modulated by valence?

To test for our first prediction, we calculated the contrast: $(\text{Positive}_{\text{Extrovert}} - \text{Positive}_{\text{Introvert}}) - (\text{Negative}_{\text{Extrovert}} - \text{Negative}_{\text{Introvert}})$. As predicted, the difference between the emotional ratings for extrovert and for introvert perspectives in the positive condition was larger than in the negative condition, $t(38) = 0.87$, $p < .001$, $\eta_p^2 = .60$. To explore the second prediction, concerning APT effects in each of the emotional conditions compared with the neutral one, we calculated two additional contrasts: $(\text{Positive}_{\text{Extrovert}} - \text{Positive}_{\text{Introvert}}) - (\text{Neutral}_{\text{Extrovert}} - \text{Neutral}_{\text{Introvert}})$ and $(\text{Negative}_{\text{Extrovert}} - \text{Negative}_{\text{Introvert}}) - (\text{Neutral}_{\text{Extrovert}} - \text{Neutral}_{\text{Introvert}})$. The two contrasts were found to be significant, $t(38) = 0.38$, $p = .01$, $\eta_p^2 = .15$, and $t(38) = 0.49$, $p < .001$, $\eta_p^2 = .25$, respectively. These findings indicate that, as predicted, the difference between the emotional ratings for extrovert and for introvert perspectives in the positive condition was larger than in the neutral condition, and also in the negative condition it was larger than in the neutral condition.

Secondary analysis—Response times (RT)

RT analysis was carried to provide an indirect measure of mental effort in target versus “me” trials (with more time indicating more effort invested). Two filters were applied to the RT data: responses slower than 10 seconds or faster than 150 ms were excluded. Next, responses that fell outside of ± 2 median absolute deviations from the median (Leys et al., 2013) were excluded (overall less than 8.31% of the trials). As mentioned above, the link-function for this analysis was inverse-Gaussian and therefore Wald chi-squared tests were conducted for statistical inference. In addition, this analysis focused on the perspective independent variable and the full analysis can be found in the code book (<https://osf.io/b7ftv/>). ANOVA-like analysis showed there was a significant effect for perspective, $\chi^2(2) = 29.20$, $p < .001$. A planned contrast was conducted, comparing the “me” versus the extrovert and introvert perspective taken together. As expected, the RTs in the “me” trials were significantly shorter compared with the extrovert and introvert trials taken together, $z = 2.31$, $p = .020$, $OR = 1.05$.

Discussion

Let us begin with briefly reviewing our main findings. First, the difference between the emotional ratings from the extrovert and introvert perspectives was larger in the positive condition than in the negative condition. Second, this

difference between the two perspectives was larger in each of the emotional conditions (positive and negative) than in the neutral condition. These findings support our two predictions, respectively. They support the first one, that is, when using perspectives of the extroversion dimension of personality, which is more reactive to positive emotions, the APT effect would be larger for positive than for negative valence. In addition, these results support the second prediction that APT would have an effect for any emotional valence—negative and positive. As much as these results are interesting and important on their own, the full significance of them becomes apparent when evaluated alongside the findings of our prior work (Binyamin-Suissa et al., 2021), which we believe are complementary.

Binyamin-Suissa et al. (2021) used two other perspectives. Those perspectives were derived from the neuroticism dimension of personality, which is more reactive to negative affects. As indicated earlier, from the five personality dimensions of the Big Five model, neuroticism together with extroversion are considered to be the two most relevant to emotional processing. Contrary to the present study, Binyamin-Suissa and colleagues found a larger APT effect for negative valence than for positive valence, while similar to the present study, they found APT effects for both negative and positive emotional valence when each was compared with the neutral condition. Therefore, considering the results of the two studies together reveals two separate pieces of evidence for APT effects for both positive and negative valence, thereby strengthening these effects' stability. Importantly, evidence of this effect for negative valence was already found in previous studies (Binyamin-Suissa et al., 2019; Gilead et al., 2016). However, to the best of our knowledge, there is no prior direct evidence for an APT effect for positive valence. Nonetheless, an indirect support for an APT effect for positive valence can be found in a recent study (Lei et al., 2019) that used a similar APT task with two other allocentric perspectives. Although direct comparisons of the disparity between the two perspectives across valences are lacking in that study, inspecting the means discloses a rather similar pattern to the one found in the current study and our abovementioned previous study (positive > neutral). Another indirect support for an APT effect for positive valence may be found in a recent meditation study (Shao et al., 2016). In a neuroimaging study, Shao et al. (2016) investigated the effects of eight weeks of meditation training on emotional reaction. Very similar to the current study, the dependent behavioral measure was arousal evaluation for positive, negative, and neutral images. The meditation participants were trained explicitly to “detach from a self-referential framework and observe one's own thoughts and feelings from an outsider's perspective.” Although one cannot isolate the impact of this particular guidance from the overall effect of meditation on arousal evaluations, it is quite

reasonable to value its influence. Commonly, when people encounter an intense affective situation, taking an outsider's perspective often helps them be more detached and thereby less aroused.

In addition to providing evidence for stability of the APT effect for both valences, considering the results of the current study and our above-mentioned previous study together also allows for generalization. Thus, the fact that the sets of perspectives used in these two studies were different from one another (sensitive/tough vs. extrovert/introvert) permits us to conclude the existence of an APT effect for both valences regardless of the exact type of perspectives used. Beyond the fact that the effects were obtained in both studies, they were obtained using different sets of perspectives relevant to emotional processing.

Furthermore, this joint consideration of the two studies validates the asymmetric nature of the APT effect according to valence. In both studies, there was a significant difference between the effects found across valences—negative versus positive. More importantly, this joint consideration also supports the suggestion that the direction of this asymmetric effect depends upon which personality dimension the perspectives are derived from. Meaning, as can be concluded from the present study results, in positive emotional context, APT seems to be more effective when using perspectives from the dimension of extroversion (bigger difference between perspectives for positive compared with negative valence), whereas in negative context, APT was found in our previous study to be more effective when using perspectives from the dimension of neuroticism (bigger difference between perspectives for negative compared with positive valence). These findings have theoretical as well as potential practical importance. Theoretically, they suggest that valence does not modulate APT influences on emotional evaluations in a fixed manner (i.e., always bigger/smaller influence for the same specific valence). Rather, it does so according to the personality dimension that perspectives are derived from (when derived from neuroticism, the effect of APT is bigger in negative valence and vice versa when derived from extraversion). Moreover, the finding of the current study alone may contribute new insights to the research field of “positive empathy” (understanding and sharing others' positive emotions). For example, could taking the perspective of an extrovert facilitate one to better understand and share the exhilarating emotions of another? Positive empathy was found to be associated with salutary social and personal outcomes (prosocial behavior, social closeness, and well-being), and APT is thought to be a key component of this (Morelli et al., 2014, 2015).

Practically, as dispositional and situational social perspective taking improves after brief interventions (for systematic review, see Wolgast et al., 2020), our findings might mark the specific most advisable direction for training programs

of APT to follow. Since deficiency in APT abilities is associated with a variety of psychopathologies (Anastassiou-Hadjicharalambous & Warden, 2008; Hertz-Picciotto & Delwiche, 2009; Langdon et al., 2006; Mattern et al., 2015), such training programs might be highly beneficial in these conditions.

One limitation of the present study is in regard to age-related changes of perspective taking; perspective taking abilities are known to be still underdeveloped in adolescence (Symeonidou et al., 2016), and to undergo some degree of decline in adulthood (Fernandes et al., 2019; Helson et al., 2002). Moreover, as shown in a recent large-scale meta-analysis, older adults demonstrate an information processing bias toward positive versus negative information, while younger adults demonstrate a reversed effect (Reed et al., 2014). Our participants were all in their late adolescence. Hence, our results may not generalize to other ages. Therefore, future research might favor sampling broader age ranges. This direction seems quite promising as recently Ziaei et al. (2020) found age-related differences on the role of valence in cognitive empathy.

Another important future research direction pertains to the field of emotion regulation via cognitive strategies. Previous research has already shown that using the polar perspectives of neuroticism modulates brain activity involved in the generation of negative affects and can therefore constitute an emotion regulation strategy in the face of distress situations (Gilead et al., 2016). Thus, future research might examine the use of extroversion for the purpose of regulating positive emotions. This might be of great importance as positive emotions are known to be associated with significant desirable psychological outcomes (Carpenter et al., 2013; Nadler et al., 2010; Quidbach et al., 2010).

To conclude, this study demonstrates that when using polar perspectives from the *extroversion* dimension of personality, APT effects are larger toward positive than toward negative valence. This is a novel finding, and it is a mirror image of the finding from our previous research when we used polar perspectives of *neuroticism* and found APT effects were smaller toward positive than toward negative valence. Importantly, when considered together with this previous finding, it revealed a *dependence of asymmetric effects of APT on the personality dimension*.

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Declarations

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References

- Anastassiou-Hadjicharalambous, X., & Warden, D. (2008). Cognitive and affective perspective-taking in conduct-disordered children high and low on callous-unemotional traits. *Child and Adolescent Psychiatry and Mental Health*, 2, Article 16.
- Anwyl-Irvine, A., Massonnié, J., Flitton, A., Kirkham, N., & Evershed, J. (2020). Gorillas in our midst: An online behavioral experiment builder. *Behavior Research Methods*, 52(1), 388–407.
- Bates, D., Maechler, M., & Bolker, B. (2012). lme4: Linear mixed-effects models using S4 classes. Available at: <http://CRAN.R-project.org/package=lme4>. Accessed 13 Dec 2021
- Binyamin-Suissa, L., Moyal, N., Naim, A., & Henik, A. (2019). Perspective taking and emotion: The case of disgust and sadness. *Consciousness and Cognition*, 74, Article 102773.
- Binyamin-Suissa, L., Hochman, S., Moyal, N., & Henik, A. (2021). Perspective taking effects are modulated by the valence of stimuli. *Acta Psychologica*, 215, Article 103267.
- Boksem, M. A., Tops, M., Wester, A. E., Meijman, T. F., & Lorist, M. M. (2006). Error-related ERP components and individual differences in punishment and reward sensitivity. *Brain Research*, 1101(1), 92–101.
- Campbell, T., O'Brien, E., Van Boven, L., Schwarz, N., & Ubel, P. (2014). Too much experience: A desensitization bias in emotional perspective taking. *Journal of Personality and Social Psychology*, 106(2), 272–285.
- Canli, T., Zhao, Z., Desmond, J. E., Kang, E., Gross, J., & Gabrieli, J. D. (2001). An fMRI study of personality influences on brain reactivity to emotional stimuli. *Behavioral Neuroscience*, 115(1), 33–42.
- Carpenter, S. M., Peters, E., Västfjäll, D., & Isen, A. M. (2013). Positive feelings facilitate working memory and complex decision making among older adults. *Cognition & Emotion*, 27(1), 184–192.
- Charernboon, T. (2020). Negative and neutral valences of affective theory of mind are more impaired than positive valence in clinically stable schizophrenia patients. *Psychiatry Investigation*, 17(5), 460–464.
- Costa, P. T., & McCrae, R. R. (1985). *The NEO Personality Inventory manual*. Psychological Assessment Resources, Inc.
- Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology*, 44(1), 113–126.
- Dunn, J., & Cutting, A. L. (1999). Understanding others, and individual differences in friendship interactions in young children. *Social Development*, 8(2), 201–219.
- Dunn, J., & Hughes, C. (1998). Young children's understanding of emotions within close relationships. *Cognition and Emotion*, 12(2), 171–190.
- Eyal, T., Steffel, M., & Epley, N. (2018). Perspective mistaking: Accurately understanding the mind of another requires getting perspective, not taking perspective. *Journal of Personality and Social Psychology*, 114(4), 547–571.
- Fernandes, C., Gonçalves, A. R., Pasion, R., Ferreira-Santos, F., Barbosa, F., Martins, I. P., & Marques-Teixeira, J. (2019). Age-related decline in emotional perspective-taking: Its effect on the late positive potential. *Cognitive, Affective and Behavioral Neuroscience*, 19(1), 109–122.
- Gilead, M., Boccagno, C., Silverman, M., Hassin, R. R., Weber, J., & Ochsner, K. N. (2016). Self-regulation via neural simulation. *Proceedings of the National Academy of Sciences*, 113(36), 10037–10042.
- Gross, J. J., Sutton, S. K., & Ketelaar, T. (1998). Relations between affect and personality: Support for the affect-level and affective

- reactivity views. *Personality and Social Psychology Bulletin*, 24(3), 279–288.
- Healey, M. L., & Grossman, M. (2018). Cognitive and affective perspective-taking: Evidence for shared and dissociable anatomical substrates. *Frontiers in Neurology*, 9, Article 491.
- Helson, R., Kwan, V. S. Y., & Jones, C. (2002). Personality change over 40 years of adulthood: Hierarchical linear modeling analyses of two longitudinal samples. *Journal of Personality and Social Psychology*, 83(3), 752–766.
- Hertz-Picciotto, I., & Delwiche, L. (2009). The rise in autism and the role of age at diagnosis. *Epidemiology*, 20(1), 84–90.
- Hillis, A. E. (2014). Inability to empathize: Brain lesions that disrupt sharing and understanding another's emotions. *Brain*, 137(4), 981–997.
- John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: *History, measurement, and conceptual issues*. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). Guilford Press.
- Kreidler, S. M., Muller, K. E., Grunwald, G. K., Ringham, B. M., Coker-Dukowitz, Z. T., Sakhadeo, U. R., ... Glueck, D. H. (2013). GLIMMPE: Online power computation for linear models with and without a baseline covariate. *Journal of Statistical Software*, 54(10), 1–26. <https://doi.org/10.18637/jss.v054.i10>
- Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest package: Tests in linear mixed effects models. *Journal of Statistical Software*, 82(13), 1–26.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2001). *International Affective Picture System: Instruction manual and affective ratings* (Tech. Rep. No. A-5). University of Florida, Center for Research in Psychophysiology.
- Langdon, R., Coltheart, M., & Ward, P. B. (2006). Empathetic perspective-taking is impaired in schizophrenia: Evidence from a study of emotion attribution and theory of mind. *Cognitive Neuropsychiatry*, 11(2), 133–155.
- Larsen, R. J., & Ketelaar, T. (1989). Extraversion, neuroticism and susceptibility to positive and negative mood induction procedures. *Personality and Individual Differences*, 10(12), 1221–1228.
- Lei, Y., Wang, Y., Wang, C., Wang, J., Lou, Y., & Li, H. (2019). Taking familiar others' perspectives to regulate our own emotion: An event-related potential study. *Frontiers in Psychology*, 10, Article 1419.
- Lenth, R. V., Singmann, H., Love, J., Buerkner, P., & Herve, M. (2019). emmeans: Estimated marginal means, aka least-squares means (Version 1.3.4). Available at <http://CRAN.R-project.org/package=emmeans>. Accessed 13 Dec 2021
- Leys, C., Ley, C., Klein, O., Bernard, P., & Licata, L. (2013). Detecting outliers: Do not use standard deviation around the mean, use absolute deviation around the median. *Journal of Experimental Social Psychology*, 49(4), 764–766.
- 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.
- Mattern, M., Walter, H., Hentze, C., Schramm, E., Drost, S., Schoepf, D., Fangmeier, T., Normann, C., Zobel, I., & Schnell, K. (2015). Behavioral evidence for an impairment of affective theory of mind capabilities in chronic depression. *Psychopathology*, 48(4), 240–250.
- Monroe, S. M., & Simons, A. D. (1991). Diathesis-stress theories in the context of life stress research: Implications for the depressive disorders. *Psychological Bulletin*, 110(3), 406–425.
- Morelli, S. A., Rameson, L. T., & Lieberman, M. D. (2014). The neural components of empathy: predicting daily prosocial behavior. *Social Cognitive and Affective Neuroscience*, 9(1), 39–47.
- Morelli, S. A., Lieberman, M. D., & Zaki, J. (2015). The emerging study of positive empathy. *Social and Personality Psychology Compass*, 9(2), 57–68.
- Moyal, N., Henik, A., & Anholt, G. E. (2018). Categorized Affective Pictures Database (CAP-D). *Journal of Cognition*, 1(1), Article 41.
- Nadler, R. T., Rabi, R., & Minda, J. P. (2010). Better mood and better performance: Learning rule-described categories is enhanced by positive mood. *Psychological Science*, 21(12), 1770–1776.
- Oswald, P. A. (1996). The effects of cognitive and affective perspective taking on empathic concern and altruistic helping. *The Journal of Social Psychology*, 136(5), 613–623.
- Perry, D., Hendler, T., & Shamay-Tsoory, S. G. (2011). Projecting memories: The role of the hippocampus in emotional mentalizing. *NeuroImage*, 54(2), 1669–1676.
- Quoidbach, J., Berry, E. V., Hansenne, M., & Mikolajczak, M. (2010). Positive emotion regulation and well-being: Comparing the impact of eight savoring and dampening strategies. *Personality and Individual Differences*, 49(5), 368–373.
- R Core Team. (2018). *R: A language and environment for statistical computing [Computer software]*. R Foundation for Statistical Computing <https://www.R-project.org/>
- Reed, A. E., Chan, L., & Mikels, J. A. (2014). Meta-analysis of the age-related positivity effect: Age differences in preferences for positive over negative information. *Psychology and Aging*, 29(1), 1–15.
- Shao, R., Keuper, K., Geng, X., & Lee, T. M. (2016). Pons to posterior cingulate functional projections predict affective processing changes in the elderly following eight weeks of meditation training. *EBioMedicine*, 10, 236–248.
- Symeonidou, I., Dumontheil, I., Chow, W., & Breheny, R. (2016). Development of online use of theory of mind during adolescence: An eye-tracking study. *Journal of Experimental Child Psychology*, 149, 81–97.
- Tamir, D. I., & Mitchell, J. P. (2013). Anchoring and adjustment during social inferences. *Journal of Experimental Psychology: General*, 142(1), 151–162.
- Tejada, K. A. (2020). Adolescents' post-conflict amelioration of anger and sadness via affective perspective-taking (Doctoral dissertation). Fuller Theological Seminary, School of Psychology.
- Wellman, H. M., Phillips, A. T., & Rodriguez, T. (2000). Young children's understanding of perception, desire, and emotion. *Child Development*, 71(4), 898–912.
- Wolgast, A., Tandler, N., Harrison, L., & Umlauf, S. (2020). Adults' dispositional and situational perspective-taking: A systematic review. *Educational Psychology Review*, 32(2), 353–389.
- Yu, R.-L., Chen, P. S., Tu, S.-C., Tsao, W.-C., & Tan, C.-H. (2018). Emotion-specific affective theory of mind impairment in Parkinson's disease. *Scientific Reports*, 8, Article 16043.
- Ziaei, M., Oestreich, L., Reutens, D. C., & Ebner, N. C. (2020). Age-related differences in structural and functional networks involved in empathy for positive and negative emotions. bioRxiv. <https://doi.org/10.1101/2020.04.03.024877>

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