symmetry

MDPI

Editorial

Special Issue: "Symmetry in Cognition and Emotion"

Anna Pecchinenda [1,2]

[1] Department of Psychology, Sapienza University of Rome, Via dei Marsi 78, 00185 Rome, Italy; anna.pecchinenda@uniroma1.it; Tel.: +39-6-4991-7530; Fax: +39-6-4991-7711
[2] Cognitive and Motor Rehabilitation and Neuroimaging Unit, IRCCS Santa Lucia, 00179 Rome, Italy

Abstract: The ten contributions of the current Special Issue on "Symmetry in Cognition and Emotion" represent different and original contributions to this topic. The new evidence spans from addressing whether the attentional blink can be elicited by internal events to the role of the fronto-parietal network. The review contributions address the effect of emotion on pseudoneglect and the role of the temporal parietal junction in processing self-related information, respectively. Four contributions provide new evidence on processing different aspects of faces, such as age, gaze, emotional expression, and their effect on response inhibition. Finally, two contributions provide novel evidence on the asymmetric preferences in decisions and on the relation between preferences for visual symmetry, respectively. Taken together, these contributions provide a new insight into the different forms of "Symmetry in Cognition and Emotion", and we hope they can help to stimulate new research.

Keywords: functional brain asymmetry; attention; face; emotion; decision; preference

check for updates

Citation: Pecchinenda, A. Special Issue: "Symmetry in Cognition and Emotion". *Symmetry* **2022**, *14*, 2573. https://doi.org/10.3390/sym14122573

Received: 3 October 2022
Accepted: 2 November 2022
Published: 5 December 2022

Introduction

The investigation of symmetries in cognition and emotion has a long tradition, often conceptualized as the asymmetries of the two brain hemispheres. Accordingly, the left hemisphere has been traditionally linked to symbolic processing and the right hemisphere to perceptual processing [1]. In addition, based on neuropsychological studies on patients who suffered brain damage, the right hemisphere has been linked to emotion [2]. Although, an alternative account links the left hemisphere to positive emotions and the right hemisphere to negative emotions [3]. Importantly, asymmetries in cognition and emotion transcend the left/right-hemisphere asymmetries. In fact, recently, the emphasis has also been placed on asymmetries of top–down and bottom–up processes in cognition and emotion [4].

The goal of the "Symmetry in Cognition and Emotion" Special Issue is to provide the recent evidence addressing brain and behavioral symmetries in human cognition and emotion. The ten contributions published in the Special Issue address different aspects of (a)symmetry in emotion and cognition. Specifically, two review papers address the effects of emotion on hemispheric asymmetries, attention, and the role of the right temporo-parietal junction in social cognition and attention. More specifically, in "A Systematic Review on the Interaction between Emotion and Pseudoneglect", Strappini et al. [5] review the evidence on how emotion and attention interact in biasing the activation of one hemisphere over the other. They review the evidence on the effect of emotion on pseudoneglect, that is, on the asymmetrical bias for the left visual field typically observed in healthy, right-handed individuals. They conclude that although there is some evidence that emotion modulates pseudoneglect, the direction of the effect is not clear, and it depends on methodological factors more than on the valence of emotional stimuli. Ahmad et al. [6] in "Are We Right about the Right TPJ? A Review of Brain Stimulation and Social Cognition in the Right Temporal Parietal Junction", review the evidence obtained from studies using non-invasive brain stimulation on the role of the temporal parietal junction, which has been typically linked to social cognition. They conclude that the role of the right TPJ is better understood as being involved in processing self-related information.

Two contributions focus on the asymmetries in the mechanisms underlying the attentional blink, which is a phenomenon that characterizes visual selective temporal attention. The attentional blink is observed when visual stimuli are presented in rapid temporal succession and participants monitor the stream of stimuli for multiple targets presented among distractors. Under these conditions, performance is impaired when the two targets are separated by a distractor. The attentional blink can be affected by different factors (for a review, see [7]), and the effects of emotion [8], even when it is not visible [9], as well as the number of targets presented in the stream [10], have been used to disentangle the different accounts of this phenomenon. In keeping with this research strategy, Zivi et al. [11], in "Attention to a Moment in Time Impairs Episodic Distinctiveness during Rapid Serial Visual Presentation", assess the relative contribution of top–down (i.e., temporal expectation) and bottom–up (i.e., target onset) mechanisms to the attentional blink. Starting from the evidence that attention to sensory input and memory representations relies on similar neurocognitive processes, the authors investigated the extent to which an internally generated event can yield an attentional blink, interfering with the performance of a following external stimulus. Their results show that this is indeed the case, as an internally generated event yields an attentional blink for the following target. In contrast, Pecchinenda et al. [12], in "Contributions of the Right Prefrontal and Parietal Cortices to the Attentional Blink: A tDCS Study", use a different approach by relying on non-invasive brain stimulation. They showed that there are both top–down and bottom–up contributions to the attentional blink. Importantly, they also show that good attentional performance relies on an optimal level of excitability of the frontoparietal network. In fact, potentiating the activity of the frontoparietal network by enhancing the top–down contribution and/or attenuating bottom–up contributions had a beneficial effect (i.e., reduced the attentional blink) only for poor performers, but impaired good performers.

Four contributions focus on the asymmetries present when processing faces. Dalmaso et al. [13], in "Is Face Age Mapped Asymmetrically onto Space? Insights from a SNARC-like Task", consider whether the age of a face, similar to any other magnitude, is represented asymmetrically in the two hemispheres, with young faces being mapped to the left of space and older faces to the right. This is a typical form of brain asymmetry observed for other types of magnitude representations. Their results, using the spatial–numerical association of response codes (SNARC effect), show that this is not the case.

Azhari et al. [14], in "Asymmetric Prefrontal Cortex Activation Associated with Mutual Gaze of Mothers and Children during Shared Play", investigate the potential asymmetries present in brain behavior. Using functional near-infrared spectroscopy (fNIRS), the study assessed whether establishing a mutual gaze between mother and child during shared play results in the symmetrical activation of the prefrontal cortex. The results show that, contrary to the neural synchrony typically observed during mutual gaze, the deactivation of prefrontal activity for mothers coincided with the activation of prefrontal activity for children. The authors argue that one possible account of this result calls upon the asymmetries in the demands underlying initiation (from mothers) and those underlying reciprocation (from children) of mutual gaze, with the reciprocation of the gaze of another individual being more demanding and requiring greater attention with a third object (for age differences in orienting attention based on gaze, see [15]).

Riberto et al. [16], in "Symmetry in Emotional and Visual Similarity between Neutral and Negative Faces", investigate the extent to which different aspects of faces (identity and emotional expression) have symmetrical or asymmetrical influences on judgements of perceived similarity.

They observed that people tend to judge similar faces as having the same identity, but different emotions as well as faces with different identities but with the same emotion. However, the patterns of similarity judgements based on emotional expression were different from that for identity. This contribution adds another piece to the puzzle on how variant aspects of faces, such as emotional expression, and invariant aspects of faces, such as identity, are processed independently or whether they interact in affecting our perception and judgements.

Nayak and Tsai [17], in “Fronto-Parietal Regions Predict Transient Emotional States in Emotion Modulated Response Inhibition via Low Frequency and Beta Oscillations”, present some important insights into how emotional faces affect response inhibition and cognitive control. By using a stop-signal task with emotional (happy and disgust) and neutral faces, and recording EEG, they show that emotion speeds up responses (both stop and go responses). At the neural level, inhibitory control and response inhibition were associated with changes in the frontal regions typically linked to cognitive control, but also to changes in mid-parietal regions involved in emotion perception. The authors interpret these results as showing that task-relevant emotion speeds up responses and improves response inhibition from the very early phases of stimulus processing. The study contributes to the rich research tradition on the relationship between emotion and cognitive control, and clarifies when and how emotional stimuli facilitate or hinder cognitive control (see also [8,18–20]). Finally, two contributions address the symmetry presented in individuals' preferences. Huang et al. [21], in “Asymmetrical Property of the Subproportionality of Weighting Function in Prospect Theory: Is It Real and How Can It Be Achieved?”, investigate the mechanisms underlying preferences when making decisions under conditions of risk. They compare two theories (equate to differentiate vs. prospect theory) and show that individuals' decisions are asymmetrically affected by two factors, and that knowing the difference between two options affects decisions more than knowing the prospect value. In contrast, Bertamini et al. [22], in “Perspective Slant Makes Symmetry Harder to Detect and Less Aesthetically Appealing”, address another type of preferences, namely, the individuals' preferences for visual symmetry. They assess whether individuals' preferences for abstract patterns that are symmetrical are evident when stimuli are presented in perspective as well as in the fronto-parallel plane, and to what extent individuals' preferences differ depending on the spontaneity of their judgment. They show that a pattern's distortion occurring as a result of perspective reduces individuals' preferences for symmetry, regardless of the spontaneity of their judgments.

We hope this Special Issue contributes to an improved understanding of the different types of symmetries characterizing cognition and emotion. We also hope that the evidence presented here can be helpful in formulating novel hypotheses and stimulating new research.

Funding: AP was funded by the Ministry of University and Research: RM120172B77EE5F8.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Gazzaniga, M.S.; Hillyard, S.A. Language and speech capacity of the right hemisphere. *Neuropsychologia* **1971**, *9*, 273–280. [CrossRef] [PubMed]
2. Borod, J.C.; Cicero, B.A.; Obler, L.K.; Welkowitz, J.; Erhan, H.M.; Santschi, C.; Grunwald, I.S.; Agosti, R.M.; Whalen, J.R. Right hemisphere emotional perception: Evidence across multiple channels. *Neuropsychology* **1998**, *12*, 446–458. [CrossRef] [PubMed]
3. Davidson, R.J.; Irwin, W. The functional neuroanatomy of emotion and affective style. *Trends Cogn. Sci.* **1999**, *3*, 11–21. [CrossRef] [PubMed]
4. Pourtois, G.; Schettino, A.; Vuilleumier, P. Brain mechanisms for emotional influences on perception and attention: What is magic and what is not. *Biol. Psychol.* **2013**, *92*, 492–512. [CrossRef]
5. Strappini, F.; Galati, G.; Pecchinenda, A. A Systematic Review on the Interaction between Emotion and Pseudoneglect. *Symmetry* **2021**, *13*, 1531. [CrossRef]
6. Ahmad, N.; Zorns, S.; Chavarria, K.; Brenya, J.; Janowska, A.; Keenan, J.P. Are We Right about the Right TPJ? A Review of Brain Stimulation and Social Cognition in the Right Temporal Parietal Junction. *Symmetry* **2021**, *13*, 2219. [CrossRef]
7. Petersen, A.; Vangkilde, S. Decomposing the attentional blink. *J. Exp. Psychol. Hum. Percept. Perform.* **2022**, *48*, 812–823. [CrossRef]
8. Monachesi, B.; Pecchinenda, A. Weaker inhibition after happy faces: Evidence from an attentional blink task with emotional and neutral faces. *Motiv. Emot.* **2022**, *46*, 535–545. [CrossRef]

9. Pecchinenda, A.; Monachesi, B.; Laeng, B. Fearful expressions of rapidly presented hybrid-faces modulate the lag 1sparing in the attentional blink. *Acta Psychol.* **2020**, *209*, 103124. [CrossRef]
10. Petrucci, M.; Pecchinenda, A. Sparing and impairing: Emotion-induced modulation of the attentional blink and the extended sparing in a 3-targets RSVP task. *Atten. Percept. Psychophys.* **2018**, *80*, 439–452. [CrossRef]
11. Zivi, P.; Ferlazzo, F.; Sdoia, S. Attention to a Moment in Time Impairs Episodic Distinctiveness during Rapid Serial Visual Presentation. *Symmetry* **2021**, *13*, 1938. [CrossRef]
12. Pecchinenda, A.; De Luca, F.; Monachesi, B.; Petrucci, M.; Pazzaglia, M.; Doricchi, F.; Lavidor, M. Contributions of the Right Prefrontal and Parietal Cortices to the Attentional Blink: A tDCS Study. *Symmetry* **2021**, *13*, 1208. [CrossRef]
13. Dalmaso, M.; Vicovaro, M. Is Face Age Mapped Asymmetrically onto Space? Insights from a SNARC-like Task. *Symmetry* **2021**, *13*, 1617. [CrossRef]
14. Azhari, A.; Bizzego, A.; Balagtas, J.P.M.; Leng, K.S.H.; Esposito, G. Asymmetric Prefrontal Cortex Activation Associated with Mutual Gaze of Mothers and Children during Shared Play. *Symmetry* **2022**, *14*, 998. [CrossRef]
15. Pecchinenda, A.; Petrucci, M. Emotion First: Children Prioritize Emotional Faces in Gaze-Cued Attentional Orienting. *Psychol. Res.* **2021**, *85*, 101–111. [CrossRef]
16. Riberto, M.; Talmi, D.; Pobric, G. Symmetry in Emotional and Visual Similarity between Neutral and Negative Faces. *Symmetry* **2021**, *13*, 2091. [CrossRef]
17. Nayak, S.; Tsai, A.C. Fronto—Parietal Regions Predict Transient Emotional States in Emotion Modulated Response Inhibition via Low Frequency and Beta Oscillations. *Symmetry* **2022**, *14*, 1244. [CrossRef]
18. De Luca, F.; Petrucci, M.; Monachesi, B.; Lavidor, M.; Pecchinenda, A. Asymmetric Contributions of the Fronto-Parietal Network to Emotional Conflict in the Word–Face Interference Task. *Symmetry* **2020**, *12*, 1701. [CrossRef]
19. Petrucci, M.; Pecchinenda, A. The role of cognitive control mechanisms in selective attention towards emotional stimuli. *Cogn. Emot.* **2017**, *31*, 1480–1492. [CrossRef]
20. Pecchinenda, A.; Ferlazzo, F.; Lavidor, M. Modulation of selective attention by polarity-specific tDCS effects. *Neuropsychologia* **2015**, *68*, 1–7. [CrossRef]
21. Huang, Y.-N.; Shen, S.-C.; Yang, S.-W.; Kuang, Y.; Li, Y.-X.; Li, S. Asymmetrical Property of the Subproportionality of Weighting Function in Prospect Theory: Is It Real and How Can It Be Achieved? *Symmetry* **2021**, *13*, 1928. [CrossRef]
22. Bertamini, M.; Tyson-Carr, J.; Makin, A.D.J. Perspective Slant Makes Symmetry Harder to Detect and Less Aesthetically Appealing. *Symmetry* **2022**, *14*, 475. [CrossRef]