

Neuro-psycho disorders and hyponatremia

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INTRODUCTION

This study compared two analytic methods for assessing neural activation to variations in face trustworthiness in Younger Adults (YA) and Older Adults (OA). One method was the assessment of differences in peak activation levels to faces that varied in trustworthiness; the second was multi-voxel pattern analysis. The results revealed that age differences varied across methods. These results have methodological implications that should be considered in a wide array of neuroimaging studies. They also have more specific implications for understanding age-related changes in the neural substrate for detecting face trustworthiness.

Identifying people who are untrustworthy or trustworthy is an important component of social behavior. Based on others' facial appearance, individuals make rapid inferences about their traits, including trustworthiness, which shapes their social interactions and guides decision making. It is therefore important to understand the mechanisms underlying the judgment of face trustworthiness.

DESCRIPTION

Many studies have documented variations in neural activation levels to face trustworthiness in brain reward regions when YA view young adult faces. However, a study that included both younger and older perceivers and faces revealed that activation levels showed significant sensitivity to face trustworthiness for OA but not YA. These authors suggested that the lack of effects for YA may have been due to their weaker response to trustworthiness when older and younger faces are mixed together, a hypothesis they could not test due to their study design. However, face ratings did reveal YA responses to face trustworthiness that were equivalent to OA responses. Given the equivalence of ratings across age, Xie, et al., hypothesized that voxel pattern analyses might be sensitive to YA neural responses to face trustworthiness in these stimuli that were not detected when examining activation levels.

Although Xie, et al. predicted that voxel patterns would be sensitive to face trustworthiness in both YA and OA, they also expected weaker sensitivity in OA. Specifically, OA show neural dedifferentiation, which can be conceptualized as an increasingly shared neural substrate for particular stimuli or tasks that yield less specificity in the activation pattern with increasing age. An example of neural dedifferentiation relevant to face perception is that between category neural differentiation in the FFA when passively viewing faces and other objects shows a smaller difference in activation to faces vs. other stimulus categories for OA than YA. In addition, OA show greater FFA adaptation to faces that are moderately similar. Thus, the neural region that is specifically attuned to faces shows less differentiation between faces and other objects and between similar

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Word count: 933 Figures: 00 Tables: 00 References: 00

Received: 17.11.2022, Manuscript No. IPJNN-22-13171; Editor assigned: 21.11.2022, PreQC No. IPJNN-22-13171 (PQ); Reviewed: 05.12.2022, QC No. IPJNN-22-13171; Revised: 03.02.2023, Manuscript No. IPJNN-22-13171 (R); Published: 10.02.2023

faces in OA than YA. Consistent with the evidence for neural dedifferentiation in OA, behavioral research has demonstrated that OA showed reduced accuracy in face identity recognition, face emotion recognition, and their trustworthy ratings make less fine distinctions among faces. The evidence for greater OA than YA neural and behavioral dedifferentiation in the domain of face perception led to the prediction that voxel patterns for different categories of trustworthy faces are more discriminable in YA than OA.

Xie, et al. examined whether it was possible to accurately classify YA and OA voxel patterns for different levels of face trustworthiness in a composite reward region composed of individual regions showing sensitivity to trustworthiness in previous research, as well as in FFA and primary visual cortex, not discussed in this Short Commentary. They tested their hypotheses using both Linear Discriminant (LDA) and Support Vector Machine (SVM) classification models to demonstrate the generality of the effects. Permutation testing was employed to assess the model's performance.

As predicted, both LDA and SVM accurately classified the voxel patterns for high, medium and low trustworthy faces in a composite reward region for both YA and OA. These results are consistent with meta-analyses that showed sensitivity of YA activation levels to face trustworthiness in several reward regions. They are also consistent with the Zebrowitz, et al. finding that OA activation levels in individual reward regions varied significantly with face trustworthiness. However, in contrast to that study's finding that neural activation levels were more sensitive to variations in face trustworthiness for OA than YA, both LDA and SVM categorized voxel patterns in the composite reward region more accurately for

YA than OA, as predicted. Thus, reward-region activation levels are more diagnostic of varying levels of face trustworthiness for OA than YA, perhaps because OA are more aroused by trustworthiness information than YA when faces include older exemplars. On the other hand, reward-region activation patterns are more diagnostic for YA than OA, perhaps because OA neural dedifferentiation diminishes neuronal representational content.

CONCLUSION

The finding that activation levels discriminated OA' neural responses to face trustworthiness in reward regions better than YA' responses, while the reverse was true for voxel pattern analysis, raised the question of which method is best. The authors argued that the answer to this question should be determined by which best predicts behavioral data. The block design used in their data set did not enable them to determine whether activation levels and/or voxel patterns predicted their behavioral measure of trustworthy ratings and whether there was an age-related dissociation in the predictive validity of these neural measures. Future research should employ an event related design that can answer such questions. For example, research is needed to determine whether the behavioral dedifferentiation that is shown in in OA' ratings of face trustworthiness is tied to age differences in the level of neural activation in relevant brain regions and/or to voxel patterns. Measures that integrate patterns and levels may provide even more sensitive neural discrimination of face trustworthiness and behavioral predictions than either neural signal alone, and this multi-method approach is likely to be valuable beyond the study of age differences.