Age Differences in Neural Activation to Face Trustworthiness: Voxel Pattern and Activation Level Assessments

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Short Communication

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DESCRIPTION

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 behaviour. Based on others' facial appearance, individuals make rapid inferences about their traits, including trustworthiness [1-3]. This shapes their social interactions and guides decision-making. It is therefore important to understand the mechanisms underlying the judgment of face trustworthiness. Many studies have documented variations in neural activation levels to face trustworthiness in brain reward regions when Younger Adults (YA) view young adult faces [4,5]. However, a study that included both younger and older perceivers and faces revealed that activation levels showed significant sensitivity to face trustworthiness for Older Adults (OA) but not Younger Adults Younger Adults (YA). Lack of effects for Younger Adults (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 Younger Adults Younger Adults(YA) responses to face trustworthiness that were equivalent to Older Adults (OA) responses. Given the equivalence of ratings across age, hypothesized that voxel pattern analyses might be sensitive to Younger Adults Younger Adults (YA) neural responses to face trustworthiness in these stimuli that were not detected when examining activation levels.

Predicted that voxel patterns would be sensitive to face trustworthiness in both Younger Adults Younger Adults (YA) and Older Adults (OA), they also expected weaker sensitivity in Older Adults (OA). Specifically, Older Adults (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 Older Adults (OA) than Younger Adults (YA). Thus, the neural region that is specifically attuned to faces shows less differentiation between faces and other objects and between similar faces in Older Adults (OA) than Younger Adults (YA). Consistent with the evidence for neural dedifferentiation in Older Adults (OA), behavioral research has demonstrated that Older Adults (OA) showed reduced accuracy in face identity recognition face emotion recognition. The evidence for greater Older Adults (OA) than Younger Adults (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 Younger Adults (YA) than Older Adults (OA) [6,7].

Examined whether it was possible to accurately classify Younger Adults (YA) and Older Adults (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 Younger Adults (YA) and Older Adults (OA). These results are consistent with meta-analyses that showed sensitivity of Younger Adults (YA) activation levels to face trustworthiness in several reward regions. They are also consistent with the finding that Older Adults (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 Older Adults (OA) than Younger Adults (YA); both LDA and SVM categorized voxel patterns in the composite reward region more accurately for Younger Adults (YA) than Older Adults (OA),as predicted. Thus, reward-region activation levels are more diagnostic of varying levels of face trustworthiness for Older Adults (OA) than Younger Adults (YA), perhaps because Older Adults (OA) are more aroused by trustworthiness information than Younger Adults(YA) when faces include older exemplars. On the other hand, reward-region activation patterns are more diagnostic for Younger Adults (YA) than Older Adults (OA), perhaps because Older Adults (OA) neural dedifferentiation diminishes neuronal representational content. The finding that activation levels discriminated Older Adults (OA)' neural responses to face trustworthiness in reward regions better than Younger Adults (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 [8,9]. 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 Older Adults (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 Older Adults (OA) is likely to be valuable beyond the study of age differences.

REFERENCES

1. Goh J, et al. Reduced neural selectivity increases fMRI adaptation with age during face discrimination. NeuroImage. 2010; 51:336-344.
2. Mende-Siedlecki P. The social evaluation of faces: A meta-analysis of functional neuroimaging studies. Handbook social cognitive and affective neuroscience. 2013;8:285-299.
3. Bandettini P, et al. Revealing representational content with pattern-information fMRI–an introductory guide . Social cognitive and affective neuroscience. 2009;4:101-109.
4. Desai A, et al. Effects of age and emotional intensity on the recognition of facial emotion. Indian experimental aging research. 2007; 34:63-79.
5. Henry J. A Meta-analytic review of emotion recognition and aging: Implications for neuropsychological models of aging. Neuroscience & biobehavioral reviews. 2008;32:863-881.
6. Alexander T, et al. Evaluating faces on trustworthiness after minimal time exposure. Social Cognition.2009; 27: 813-833.
7. Zebrowitz LH. Older and Younger Adults' first impressions from faces: Similar in agreement but different in positivity. Psychology and aging. 1998;50:375-82.
8. Ward NS, et al. Dedifferentiated face processing in older adults is linked to lower resting state metabolic activity in fusiform face area. Brain research. 1993; 77: 3-5.
9. Fu Y, et al. Older adults' neural activation in the reward circuit is sensitive to face trustworthiness. Cognitive, affective, & Behavioral neuroscience.2004; 21:433-76.