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Deviant Neural Correlates of Configural Detection in the Facial Processing of People with Williams Syndrome

Ching-Fen Hsu
Assistant Professor,
Dept. of Foreign Languages and Literature,
Huafan University

Jenn-Yeu Chen
Professor,
Dept. of Chinese as a Second Language,
National Taiwan Normal University

ABSTRACT

Purpose: This study investigated the facial processing strategies of Williams syndrome (WS) patients, who exhibit genetic deficits on chromosome 7q11.23. Because of this deficit, this clinical group has been unsuccessful in detecting configural or global information in previous behavioral studies such as the standardized block design test. However, no neurophysiological evidence has been reported regarding this impairment; thus, the event-related potentials (ERPs) technique was used to address this deficit. **Methods:** Female faces were manipulated (changing the features or configurations) as facial stimuli. The images used to change the features (the eyes or mouth) or configurations were based on other female faces. WS patients (n=13) and their chronological-age matched controls (n=13) participated in this study. The participants assessed the similarities or differences among consecutively presented faces from a set of models, some of which had altered features (feature-changed faces) or configurations (configuration-changed faces). The faces were randomly presented and no duplicates were displayed. **Findings:** Regarding response latencies and accuracy rates, the behavioral results of WS patients were similar to those of the healthy controls. Both groups demonstrated rapid detection and high accuracy rates when assessing the feature-changed faces, but responded slowly and erred considerably when assessing the configuration-changed faces. However, the groups presented distinct brainwave responses to the configuration-changed faces. The healthy controls processed the configuration-changed faces differently compared with the feature-changed faces in the vertex areas of both hemispheres, whereas the clinical group failed to differentiate these 2 types of facial stimuli. **Conclusion:** In this study, we discovered

neural evidence for a configuration detection deficit among WS patients when processing faces. The results further identified a weak central coherence among WS patients, suggesting a syndrome-general but not syndrome-specific deficit in people with developmental disabilities. **Implications:** WS patients demonstrated asymmetric brain and behavioral performances during facial processing. This asymmetry was reported in a verbal study that used ERPs and a false memory paradigm. WS patients exhibit genetic deficits that cause atypical development during the early stages of life. These findings were consistent with those of our previous studies pursuing contextual competence, which is defined as the ability to integrate the meanings of words into a contextual theme by using appropriate social knowledge and semantic comprehension; this has been considered a major deficiency among those with autism or right-hemisphere brain damage. Our findings confirmed a deviant central coherence among this clinical group. Neuroconstructivists claim that a small gene mutation during the initial developmental stages can yield devastating effects in long-term development. The deficient configuration detection performance of the WS group provides evidence supporting central coherence deficiency, proving that the interaction between genes and cognition is a dynamic process.

Keywords: weak central coherence,Williams syndrome (WS), event-related potentials (ERPs) , configural detection deficit, facial processing

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