Hemispheric Processing of Figurative Language in Adults with ASD and Schizophrenia Patients

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ABSTRACT

Figurative language enriches everyday communication by enabling the expression of complex intents in concise, interesting and amusing ways (Berman & Ravid, 2010; Mo et al., 2008; Rapp et al., 2008). Thus its use is indeed common in everyday communication (Gibbs, 2000). Studies carried out on populations with Autistic Spectrum Disorders (ASD) (Abrahamsen & Smith, 2000; Mackay & Shaw, 2004; Rundblad & Annaz, 2010) and schizophrenia (SZ) (Lakimova et al., 2010) point to difficulty with the comprehension of figurative language and a tendency to interpret it in a literal manner. Most studies that examined figurative language in ASD population have examined children and adolescents (MacKay and Shaw, 2004; Olofson et al., 2014; Rundblad & Annaz, 2010), and only a few included adults with ASD (Gold & Faust, 2010; Williams et al., 2013).There is a general agreement that some comprehension difficulties persist into adulthood (Kasirer & Mashal, 2014; Thoma & Daum, 2006). A growing body of research on language processing in the normal population indicates that significant linguistic ability, including comprehension of figurative language, involves the right hemisphere (Jung Beeman, 2005). Neuro-anatomical studies have found a typical neural activity in populations with ASD (Tesnik et al., 2011) and SZ patients (Mashal et al., 2013) as compared to typical populations. Despite ASD population known difficulty to comprehend figurative language, and despite the general agreement that some difficulties in comprehension of figurative language persist into adulthood, only a few studies that have examined the comprehension of figurative language have focused on the adult population, whereas most studies have focused on the young population, children and adolescents. To the best of our knowledge, intervention programs that aim to improve comprehension of figurative language in adults with ASD have not been designed. In this study, we examined comprehension and hemispheric processing of figurative language in adults with ASD. We focused on the processing of idioms and irony, both being categories of figurative language.

Method: The overall study consists of three experiments. In the first experiment we examined comprehension and hemispheric processing of adults with ASD as compared to TD population when processing two different levels of figurative language, idioms and irony. Following our findings and in view of ASD population known difficulty to comprehend irony, we constructed our second experiment. In our second experiment a short term intervention program was designed, aimed to enhance irony comprehension

in adults with ASD. We examined its contribution towards enhancing irony comprehension in participants, and the effect it had on the hemispheric processing of irony in comparison to two control groups: ASD adults and TD adults that did not participate in the active intervention, but participated in a passive intervention. Moreover, both disorders, i.e. ASD and SZ reveal common difficulties in the field of social cognition and specifically in the comprehension of figurative language on the one hand, while exhibiting characteristics unique to each on the other hand. In the third experiment we compared the comprehension and hemispheric processing during idioms processing of two groups: ASD and SZ. Finding similarities and differences between populations showing identical surface characteristics can lead to better insights and improved understanding of the subject under study , in accordance with the characteristics of each population (Sasson et al., 2011; Sasson et al., 2007).

The aim of the study was to examine the hemispheric processing of figurative language in adults with ASD. The study focused on three objectives: (1) to find the similarities and differences in the figurative language comprehension profiles of participants with ASD as compared to the typical population; (2) to examine the influence of an irony intervention program on the comprehension and the hemispheric processing in individuals with ASD; (3) to compare comprehension and hemispheric processing among the ASD and the SZ populations.

Participants: 72 subjects participated in the current study (29 participants with ASD, 19 patients with schizophrenia and 24 typical developed subjects). To examine participants' hemispheric processing of figurative language we used divided visual field paradigm. In addition, background screening tests and an irony comprehension questionnaire were administered as well. Autistic spectrum subjects were randomly assigned to a study group that participated in the intervention program and control groups.

Results: Although ASD participants were less accurate as compared to typical developed participants, the results show that their understanding of figurative language was relatively unimpaired. While the TD group demonstrated a right hemisphere advantage in processing the non-salient meanings of idioms as well as the ironic endings of paragraphs, the ASD group processed these stimuli bilaterally. ASD participants improved their comprehension of irony following participation in the intervention program. Furthermore, after the intervention, responses lateralized to the right. Thus, following the intervention, participants with ASD demonstrated a pattern of hemispheric

processing of ironic target words that resembled the pattern seen in the TD group prior to the intervention. In direct comparison between ASD participants and schizophrenia patients, their overall performance was found to be similar. In regard to their reaction time, accuracy and hemispheric processing, no differences were found between the two clinical groups. However, the two clinical populations differed in their stimulus type preference. ASD participants were less accurate in response to literal stimuli, in contrast to schizophrenia patients who were less accurate in response to idiomatic one.

Conclusions: Our findings suggest that brain lateralization is atypical in adults with ASD. Relatively successful performance along with bilateral brain activation suggests that the ASD group uses a compensation mechanism. In addition, our findings suggest that an intervention that focuses on comprehension of irony improves performance of adults with ASD and affects the pattern of hemispheric processing of irony. This indicates the importance of designing special intervention programs for adults with ASD, so as to allow them social participation and the best quality of life. The similar performance of individuals with SZ and those with ASD in idiom processing along with different preference to stimulus type may indicate a different processing mechanism that operates in each clinical group.