**Symposium Title:**

**MUSIC AND AUTISM: A STRENGTHS-BASED APPROACH TO STUDYING COGNITION AND EMOTION PERCEPTION**

**Moderator:** Dr. Eve-Marie Quintin

**Abstract 1:**

**MUSIC AND AUTISM: THE RELATIONSHIP BETWEEN EMOTION PERCEPTION AND COGNITIVE FUNCTIONING**

**Hadas Dahary1 & Eve-Marie Quintin1**

**1. McGill University**

**Objectives:** Individuals with autism spectrum disorder (ASD) often demonstrate difficulty in processing basic emotions in faces particularly with specific negative emotions, including sadness and fear. However, little research has compared emotion processing of faces to that of other modalities. Music is a powerful emotional vehicle, an area in which individuals with ASD often show great interest and skills, and is thus an alternative (and potentially preferred) domain for measuring emotion processing. Further, studies on emotion recognition with low-functioning adolescents are virtually non-existent, which limit the applicability of findings to individuals with varying cognitive abilities. The purpose of this research is two-fold: 1) To directly compare intensity ratings of music-evoked and facial expressions of emotions, and 2) to extend the applicability of findings to children with varying levels of cognitive functioning.

**Methods:** Twenty-three adolescents with ASD and low to high scores on the WISC-V Verbal Comprehension Index (50-111) completed three emotion recognition (ER) tasks: A Music ER task and two Facial ER tasks (1. Face Only ER task, 2. Combined ER task). Across the three tasks, the participants identified and rated the intensity of emotions (i.e., happy, sad, or fearful) in music excerpts (Music ER task) and in faces (Facial ER tasks). The Face Only ER task presented each face without the accompaniment of music, while the Combined ER task presented each face simultaneous to music that evoked the same emotion presented on the face. Each ER task included 18 trials (6 trials per emotion) of 4 seconds in length and took about 2-3 minutes to complete.

**Results:** Participants with lower cognitive ability (VCI: ≤80; n=12) rated emotions more intensely than those with higher cognitive ability (VCI: >80; n=11) across Music and Facial ER tasks (*p* < .01). However, cognitive ability did not have a significant effect on intensity ratings of specific emotions and intensity ratings of emotions within any of the three ER tasks (p < .05). Across participants, a main effect of emotion revealed that happy and fearful were rated more intensely than sad (*p* < .01). A marginal main effect of task showed that participants rated emotions more intensely in the Combined ER tasks than in the Music ER task (*p = .*07*)*. A two-way interaction between task and emotion was also found such that in the Music ER task, fearful and sad were rated more intensely than happy, but in the Combined ER task, the reverse was found (*p* < .05).

**Discussion/Conclusions:** Adolescents with ASD with lower cognitive ability appear to be more sensitive to emotions presented in faces and music than adolescents with ASD with higher cognitive ability. Higher intensity ratings for arousing emotional stimuli (happy and fearful) may support previous accounts of atypical development or connectivity of limbic brain areas including the amygdala. Findings provide important implications for using strengths-based music education to teach emotion processing skills to adolescents with ASD and to facilitate the inclusion of these children in their classrooms.

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**Abstract 2:**

**MUSIC AND AUTISM: ASSOCIATIONS BETWEEN RHYTHM PERCEPTION AND COGNITIVE FUNCTIONING**

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**1. McGill University**

**Objectives:**Individuals with Autism Spectrum Disorder (ASD) have demonstrated strength in perceiving musical stimuli, with most studies focusing on pitch and melody perception and memory (Heaton, 2009). Few studies have assessed musical rhythm perception of individuals with ASD and found typical performance when processing and producing simple and complex rhythms, which seems associated with visual perceptual skills. However, rhythm perception has not been investigated in relation to ASD symptomology. Further, previous studies have focused on individuals with high cognitive functioning. Thus, the relationship between rhythm perception, ASD symptomology, and cognitive skills remains to be investigated across levels of functioning. The purpose of this research is to assess whether ASD symptomology is related to musical rhythm perception and to examine the influence of varying levels of cognitive functioning on performance of a music rhythms task.

**Methods:** To date, twenty-seven adolescents with ASD and varying levels of cognitive functioning (WISC-V Verbal Comprehension Index: 45-111; Visual Spatial Index: 57-144) completed a rhythms perception task: an adapted version of the Beat Alignment Test (Iversen & Patel, 2008). Participants listened to short musical excerpts with overlaid beeps (on or off the musical beat) and identified whether the beeps matched the musical beat. Performance was analysed by calculating Hits (number of correct responses for off beat trials/number of off beat trials) minus False Alarms (number of incorrect responses for on beat trials/ number of on beat trials) (HiFA as per Tillman, Schulze, & Foxton, 2009). Teachers completed the Social Responsiveness Scale-2(SRS-2) questionnaire as a measure of ASD symptomology.

**Results:** The participants’ performance, based on HiFA, was significantly better than chance, *p*<.01. A regression analysis revealed that VSI but not VCI predicted task performance. Regression coefficients indicated that individuals with a lower VSI score performed the Beat Alignment Test less accurately than those with a higher VSI score, *p*<.01. A regression also showed that scores on the SRS-2 Social Motivation Scale predicted performance on the Beat Alignment Test, such that higher difficulties in social motivation resulted in less accurate performance, *p*<.05.

**Discussion/Conclusions:** Our results are consistent with previous findings showing preserved rhythm perception for individuals with ASD, and that this ability is related to visual spatial skills. Our results support previous research showing that there is a perceptual association between auditory rhythm and visual spatial frequency in the typical population. These results also suggest that music interventions should be approached differently when working with individuals with ASD that have varying symptomology and lower cognitive skills compared to those with higher cognitive skills, particularly in terms of visual spatial skills. The current findings could also help guide the development of music interventions that target cognitive functioning; for example, improving rhythmic skills may be associated with improvement in visual spatial abilities. Given previous reports of musical strengths, we suggest music education including a rhythmic component as a strength-based approach to promote inclusion of this population within the school system.

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**Abstract 3:**

**MUSIC AND AUTISM: AN EXAMINATION OF THE LINK MUSICAL WORKING MEMORY AND COGNITIVE FUNCTIONING**

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**Objectives:** Individuals with Autism Spectrum Disorder (ASD) often experience social and executive functioning difficulties, and demonstrate strengths and weaknesses in visual-spatial and verbal cognitive skills, respectively. Further, music perception tends to be a strength of people with ASD, who often show comparable levels of interest and responsivity to music with typically developing peers. Most studies in music perception involve the study of music-evoked emotions, pitch melody, and long-term musical memory. On the other hand, one aspect of music-related cognition that has yet to be systematically assessed in people with ASD is musical working memory. Our aims of this research are to: 1) assess whether a short-term musical working memory task can be used to measure working memory, and 2) investigate the relationship between cognitive skills (i.e., visual-spatial, verbal and executive functioning skills), ASD symptomatology, and short-term musical working memory in young people with ASD.

**Methods:** To date, twenty-seven adolescents with ASD and varying levels of cognitive ability (WISC-V Verbal Comprehension Index [VCI]: 45-111; Visual Spatial Index [VSI]: 57-144) participated in this study. To assess short-term musical working memory, sequences of 3, 4, and 5 pitches were presented in pairs to participants, who were asked to identify whether sequence-pairs were the same or different. Performance on the musical working memory task was calculated using Hits minus False Alarms (HiFA). Teachers completed the Social Responsiveness Scale-2 (SRS-2) and the Behaviour Rating Inventory of Executive Function-2nd Edition (BRIEF-2) questionnaires.

**Results:** Performance of adolescents with ASD based on a Hits – False Alarms calculation, was significantly above chance on the short-term musical working memory task for the 3- and 4-pitch sequences conditions, and below chance-level on the 5-pitch sequence condition. Further, a hierarchical linear regression revealed that overall task performance was associated with higher VSI and fewer Restrictive and Repetitive Behaviours (SRS-2). There was no significant relationship of performance with VCI or with the Global Executive Composite of the BRIEF-2.

**Discussion/Conclusions:** These finding add to the growing evidence of preserved or enhanced music perception skills of individuals with ASD. Results reveal that these strengths extend to musical working memory, specifically for 3 and 4 pitch sequences. Results are in line with those of previous work showing an association between (non-musical) short-term working memory and visual-spatial skills of people with ASD. Findings also suggest that music tasks can tap into working memory while minimizing reliance on verbal skills, which can be an area of challenge for some people with ASD. Additionally, these findings lend support toward the use of strengths-based music education and music interventions that incorporate pitch discrimination (e.g., working memory tasks).

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