



Perception of complexity, interest level, and preference for harmonic progression of music for adults with schizophrenia



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ABSTRACT

This study compared how adults with a diagnosis of schizophrenia and those without schizophrenia perceived the harmonic progression of music. Thirty adults diagnosed with schizophrenia (SP) and 37 healthy adults without schizophrenia (NSP) listened to musical excerpts with five different harmonic progressions. After listening to each excerpt, the participants reported their perception of the complexity of the musical excerpt, their personal interest in the excerpt, and their personal preference for the musical excerpt on an 11-point scale. The results showed that the SP group tended to be less sensitive to increased harmonic complexity, and this difference reached statistical significance ($p = 0.040$). No significant differences were found between the groups in terms of their interest in or preference for harmonic progression in music. However, among harmonic progression, interest level ($p = 0.014$), and personal preference ($p = 0.000$), there were significant interaction effects. Overall, and in line with previous studies the findings indicate that adults with SP are less sensitive to harmonic progressions and harmonic changes in music. Findings from this study provide essential information for music selection when working with clients with schizophrenia in mental health settings.

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Music therapy in psychiatric settings has a long history dating back to the 1800s. Along with depression, schizophrenia is one of the most common psychiatric diagnoses that music therapists work with. Therapeutic use of music for people with schizophrenia has been shown to improve their affective state, including their mood and mental functioning (Gold, Heldal, Dahle, & Wigram, 2005). Other studies found that participation in music therapy helped to alleviate depression, anxiety, flat affect, bluntness, and lack of interest (Miranda & Claes, 2009; Mössler, Chen, Heldal, & Gold, 2011).

Music therapy can be an effective means of improving mental health for individuals with acute or chronic schizophrenia (Kwon, Gang, & Oh, 2013; Talwar et al., 2006). Studies suggest that music can be an effective medium of treatment for adults who have psychotic symptoms (Glicksohn & Cohen, 1999; Hannibal, Pedersen, Hestbæk, Sørensen, & Munk-Jørgensen, 2012; Silverman, 2003, 2006). A recently published systematic review of the effect of music therapy on individuals with schizophrenia describes music as a reliable intervention for various symptoms of the disorder (Cercone, 2008; Silverman, 2003). Additional evidence-based studies suggest that music is effective in eliciting desired brain wave (alpha)

activity, behavior, and cognitive functioning for patients with chronic schizophrenia (Kwon et al., 2013).

Due to neurocognitive deficits, individuals with schizophrenia have difficulty in affect recognition (Addington & Addington, 1998). Music therapy has been shown to be effective in minimizing perceptual distortion when music is used to assist patients with schizophrenia in identifying their own affect and emotionality (Gold, Solli, Krüger, & Lie, 2009). Na and Yang (2009) found that music listening was an effective intervention for patients with schizophrenia, as music plays the role of “here and now” stimulation.

In addition, studies found that music helped reduce hallucinations, which is a common symptom of individuals with schizophrenia. Hallucinating involves the presence of a sensory experience in the absence of actual stimulation. Music being an auditory stimulation, it helped to reduce distorted sensory perception by being a means of reality orientation (Ceccato, Caneva, & Lamonaca, 2006). As an auditory input music can also help elicit attentiveness, vigilance, and various emotions (Särkämö, Tervaniemi, & Huotilainen, 2013).

Music is an art involving time and combinations of sounds that are characterized by temporal and spatial elements. Musical elements are generally categorized into rhythmic, tonal, and other components (Bruscia, 1987). Distinct music-specific components inside the music module comprise the system concerned with tonal encoding of pitch. Central to pitch organization is the perception

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of pitch along musical scales (Peretz & Coltheart, 2003). Among the various musical elements, tonal components determine the music's overall complexity. Consonance and dissonance are the most salient features that determine the tonal complexity of music.

During music listening, personal factors unique to each listener may affect the musical process (Koelsch, Schröger, & Gunter, 2002). Listeners' experiences of discomfort and reward during listening depend on their capacity to comprehend the musical information, such as harmonic progression (Berlyne, 1971). For example, it has been found that individuals with little music exposure tend to find certain levels of harmonic complexity to be more overwhelming than do individuals with more extensive music backgrounds.

In the process of music listening, music perception and cognition depend on the complexity of different variables of music. Bruscia (1987) categorized music components into rhythmic, tonal, and other components, and further stated that rhythmic components regulate one's energy or arousal level, whereas tonal components regulate emotionality. Among the tonal components, melody and harmony are major variables. Harmony is a structure that encompasses both vertical and horizontal characteristics of tone, and it is created when more than one tone is produced simultaneously (vertical) progressing along with the melody (horizontal). When it comes to harmonic progression, there can be various degrees of complexity in the harmonic makeup, which elicit different levels of emotional and affective responses (Grocke & Wigram, 2007).

When a person listens to music, it is speculated that the listener uses knowledge of tonal components of music at the preconscious level, by perceiving the tonal hierarchy and harmonic mechanism (Maslennikova, 2012; Peretz & Coltheart, 2003). However, individuals with schizophrenia have significant difficulty in understanding musical syntax and semantics due to their psychotic symptoms and perception distortions (Harrow, Grossman, Herbener, & Davies, 2000). A study by Hatada et al. (2014) also suggests that clients with schizophrenia have impaired musical ability due to their neurocognitive deficits. It is assumed that individuals with schizophrenia have a different experience in music listening due to neurological distortion.

Other studies have shown that clients with schizophrenia may have deficits in discrimination of fundamental acoustic features and perception of music. A specific deficit in discriminating prosodic features might contribute to the etiology of positive psychotic symptoms including hallucinations and delusions showing distorted pitch perception (Matsumoto et al., 2006). A study of brain waves during music listening found that patients with schizophrenia had relatively limited response to harmonic complexity, compared to healthy adults (Wu et al., 2013). The adults with schizophrenia performed poorer than the control group on the simple, discriminative task of differentiating melodic contour and rhythmic patterns (Vishne, Levitin, & Osherson, 2007). The literature suggests that adults with schizophrenia are less susceptible to musical components.

Regarding the perception of harmonic makeup, Maslennikova (2012) studied differences in perception of consonance and dissonance in individuals with schizophrenia, using EEG during listening to consonant and dissonant chords. Results suggest that patients with chronic schizophrenia require more resources to process musical stimuli. This is because these individuals perceive musical stimuli not in relation to emotions or direct perception, but as an object requiring evaluation or categorization. This may be due to the common schizophrenic symptom of flat affect, which creates difficulty in identifying and understanding emotionality (Kee, Kern, & Green, 1998). This difficulty may transfer to perception of emotion in music.

Likewise, for individuals with schizophrenia, perceptual and cognitive processing of understanding and responding to music may not be the same as in healthy adults. Harmony being the

Table 1
Participants' demographic information.

	Group with schizophrenia (SP)	Group without schizophrenia (NSP)
	(n = 30)	(n = 37)
Male/female	17/13	25/12
Age in years, <i>M</i> ± <i>SD</i> (range)	34.87 ± 9.21 (18.0–54.0)	33.55 ± 11.16 (20.0–56.0)
Music experience in years, <i>M</i> ± <i>SD</i> (range)	1.95 ± 0.06 (0–7.5)	2.60 ± 7.92 (0.0–27.8)
Duration of illness in years, <i>M</i> ± <i>SD</i> (range)	14.53 ± 6.99 (4–33)	N/A
Subtype of schizophrenia symptom ^a (positive/negative/neither)	18/8/4	N/A

^a The subtype with regard to dominant symptom of schizophrenia was determined via administration of PANSS.

significant tonal element in music, this study examined how adults with schizophrenia perceived music differently from healthy adults without schizophrenia in terms of complexity of harmonic progression, degree of interest, and personal preference.

Method

Participants

A total of 67 adults participated in this study. The group of adults without schizophrenia included 37 college students. They were recruited from universities and had no previous history of addiction or mental illness. None of the participants majored in music, and few had experience in music.

Thirty adults diagnosed with schizophrenia were recruited from a community mental health center: clinically diagnosed according to DSM-5 (American Psychiatric Association, 2013). In terms of the participants with schizophrenia, the Positive and Negative Syndrome Scale (PANSS) was administered to each participant to verify the quality of their psychotic symptoms (Kay, Opler, & Lindenmayer, 1988). PANSS is a 30-item, clinician-rated scale designed to assess severity of psychopathology of a client's psychotic disorders. PANSS was used to assess the effect of music on psychotic symptoms (Talwar et al., 2006). This scale is categorized into positive symptoms, negative symptoms, and general psychopathology. The internal reliabilities were 0.08, 0.68, and 0.60 for positive, negative and general symptoms, respectively. According to the PANSS results, eight of the participants were the positive subtype, 18 were the negative subtype, and four of them were the general pathology subtype.

The average age of the group with schizophrenia was 34.87 years, whereas the average age of the group without schizophrenia was 33.55 years. The participants were also asked to indicate the length of their experience in music activities. The music experience was defined as having any type of formal music training or consistent involvement in a music group. Average music experience was 23 months for the group with schizophrenia and 31 months for the group without schizophrenia. For the schizophrenia group, the mean duration of illness was 14.53 years (see Table 1). This study was approved by the internal research board in Ewha Womans university (IRB number 62-9).

Musical stimuli

A 16-measure melody was composed at five different levels of harmonic progression. A novel melody was composed for this

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