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Use of music for mood regulation in adolescents with intellectual disabilities: a case control study

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Functions connected to mood and emotion regulation are often reported as the most frequent and important functions of music, particularly during adolescence. However, less is known on how adolescents with intellectual disabilities (ID) use music for emotion regulation. The aim of this study was therefore to explore how adolescents with intellectual disabilities ($n=30$) use music for mood regulation in comparison to adolescents without ID ($n=34$). We assessed the seven mood-regulation strategies of the Music in Mood Regulation questionnaire, personality traits, mood, and a number of variables regarding music listening. The result showed that personality and mood were associated with the use of music for mood regulation and that adolescents with ID were less specific in their use of mood regulation strategies than adolescents without intellectual disabilities, even when adjusting for gender differences. In conclusion, the present study shows that personality traits in addition to mood is related to differences in usage of music for mood regulation among adolescents with and without intellectual disability. The study provides initial insights into the use of music and the relationships between personality, mood, and music in mood regulation in adolescents with intellectual disabilities.

Keywords: adolescent; intellectual disability; emotion regulation; mood regulation; music

Introduction

Music holds great importance in human lives, especially during adolescence (North *et al.* 2000, North *et al.* 2004, Zillmann and Gan 1997). Research conducted in the past decades has shown that it goes beyond merely being a source of entertainment and can be used to satisfy a plethora of socio-psychological needs (Bonde *et al.* 2015, Chang *et al.* 2015, DeNora 2004, Theorell 2014, Viper *et al.* 2020). Regardless of their cultural background, people tend to report that their main motives and greatest benefits of listening to music are related to their moods and emotions (Boer and Fischer 2012, Laukka 2007, Schäfer *et al.* 2009). By mechanisms such as musical tension, emotional contagion, or audio–visual interactions, music evokes activity changes in the core brain regions that underlie emotion, serving a variety of social functions such as, social contact, social cognition, communication, coordination of actions, cooperation, and increased social cohesion (Koelsch, 2014). The ability of music to affect our emotions has been prized throughout ages (Garrido and

Davidson 2013); however, scientific evidence regarding music's power to truly induce emotions observed in all three components of the emotional response system (i.e. the expressive, the physiological and the experiential) was not found until a decade ago (Lundqvist *et al.* 2009). It should be noted that although there is a conceptual difference between mood and emotion, especially concerning duration (Beedie *et al.* 2005, Meyer, 1956), emotion and mood are often used interchangeable in the music psychology literature (Hu, 2010).

People's interest in music and time spent engaging in it appear to peak during adolescence (Bonneville-Roussy *et al.* 2013, Jakubowski *et al.* 2020, North *et al.* 2000, North *et al.* 2004, Zillmann and Gan 1997). Laiho (2004) argues that the strong attachment to music may be associated with the psychological development of this age group and proposes that the psychological functions of music for adolescents can be categorized into four categories—interpersonal relationships (enhancing feelings of connectedness and belonging, providing common topics for conversation, expressing opposition against adults), identity (being means for exploration of oneself, discovering examples of

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individualities, moral guidance, etc.), agency (controlling environment through music, obtaining feelings of mastery through playing, etc.), and emotional, the most pronounced category (controlling and improving mood, regulating arousal, etc.).

The emotional aspect has been thoroughly studied by Saarikallio (2007), who conducted qualitative studies involving adolescents about their use of music in daily life. The adolescents reported two main reasons for listening to music—mood control and feeling good. To achieve these objectives, they employed seven different strategies—*Entertainment* (used to prevent silence or boredom, achieve a happier mood, create a certain atmosphere, and provide background), *Revival* (to energize, revitalize, or relax), *Strong Sensation* (to experience deep emotions, excitement, pleasure, thrills, etc.), *Diversion* (to distract oneself from stress, worries, unpleasant emotions, etc.), *Discharge* (to express and release emotions, predominantly anger, but also sadness), *Mental Work* (to stimulate mental images, thoughts, ideas, and feelings and to provide a framework for reflecting on them), and *Solace* (to provide comfort and stimulate feelings of being understood and connected in times of sorrow). These regulatory strategies were more frequently employed by older adolescents as compared to the younger ones, and by girls as compared to boys, with the exception of ‘Discharge’ (Saarikallio 2008).

High scores on the questionnaire of Music in Mood Regulation (MMR; Saarikallio 2008), measuring the use of aforementioned strategies demonstrate positive correlations to adaptive and salutary mood regulation strategies, especially reappraisal (the change of thoughts about a situation) and attention (the extent to which one tends to observe one’s feelings); however, not all of them are necessarily adaptive (Aldao and Nolen-Hoeksema 2012, Meule et al. 2013). Carlson et al. (2015) conducted a study using functional magnetic resonance imaging while participants listened to music and assessed their medial prefrontal cortex (mPFC) activity. Based on the findings that hypoactivity in this area is associated with depression (Koenigs and Grafman 2009), they concluded that the use of Discharge and Diversion might be a poor strategy for males since it correlated with lower activation levels of mPFC. However, for females, Diversion was found to be more optimal, displaying positive correlations with the activation of mPFC.

Intellectual disabilities and mood regulation

While emotional and mood regulation is a highly researched topic (for example, on PsychARTICLES, 213 articles can be found with those words in the research titles published between 2016 and 2020), it is fairly understudied among people with intellectual disabilities (ID) (none of the article titles found combined

the words emotional or mood regulation with cognitive or intellectual disability since 2000). This deficit is noted by practitioners and researchers (Littlewood et al. 2018, McClure et al. 2009).

Emotional regulation is strongly connected to different forms of psychopathology. There are many clinical symptoms that stem from deficiency in a person’s capability to experience, differentiate, or understand their emotional responses that can result in maladaptive attempts to regulate emotions (Campbell-Sills and Barlow 2007). The prevalence of psychopathology is three to seven times higher among adolescents with ID (Einfeld et al. 2011, Hatton et al. 2018, Uzun Cicek et al. 2020), which, in this regard, is considered a risk factor. It has been suggested that there is a general vulnerability toward developing poor emotional regulation strategies in people with ID (McClure et al. 2009).

As McClure et al. (2009) pointed out, most of the research about emotional regulation conducted on people with ID merely addressed one component of emotional regulation, the recognition of emotions. It has been hypothesized that deficits in self- and behavioral regulations (most commonly studied through aggression) that are more prevalent among individuals with ID (Taylor 2002) stem from a lower ability to recognize emotions. As compared to the normative population, they demonstrate greater difficulties in labeling some specific emotions; however, these capabilities do not appear to differ between aggressive and non-aggressive individuals. Both the groups display a comparable ability to take another person’s perspective; therefore, deficient emotional recognition seems to be an inadequate explanation for regulation problems (Moore 2001, Jahoda et al. 2006). Furthermore, while some studies suggest that children with developmental delays or ID use less effective emotional regulation strategies (Baker et al. 2002, Wilson 1999), others report no such disadvantages (Baurain and Nader-Grosbois 2012). Interviews with adults with ID indicate that they employ a variety of regulation strategies but not at their full capacity as used by individuals without ID (Littlewood et al. 2018). Although we have not found any similar studies on adolescents with ID, we believe these results are valid for them as well. Many questions regarding the possible differences in emotional and mood regulation in this population remain unanswered; hence, we decided to study their use of music as a tool for mood regulation in order to gain knowledge on mood regulation in people with ID, which is very scarce, and to explore whether aspects of everyday use of music can potentially be a way to support mood regulation in adolescents with ID. In addition, current research recognizes personality traits and cognitive ability are relevant for music experience (Chamorro-Premuzic and Furnham 2007) with potential impact on mood regulation. In order to gain a more comprehensive

understanding of music in mood regulation of adolescents with and without ID, it would therefore seem useful to include personality traits.

The present study

This study aimed to explore the possible differences in the use of music for mood regulation between adolescents without ID and those with ID, indicate the possible trends of differentiation, and provide grounds for a larger investigation. The adolescents were assessed regarding how frequently they listened to music and how often they get to decide what music to listen to. Additionally, we considered their musical backgrounds, personality traits, and the moods that they had been experiencing lately. We primarily investigated their utilization of music in mood regulation focusing on the following research questions:

Research question 1: *Do adolescents with and without ID differ in their use of strategies for mood regulation with music?*

Research question 2: *Is the utilization of music in mood regulation associated with personality traits and mood?*

Methods

We used a cross sectional study design including a set of questionnaires to address the research questions.

Participants

The participants were 64 adolescents aged between 16–20 years ($M = 17.7$, $SD = 1.39$). Of them, 30 (15 girls and boys each) had mild ID (IQ 55–70) and a decrease in adaptive ability or behavior, while 34 were adolescents without ID (10 girls and 24 boys).

Material

A questionnaire was used comprising items regarding the following:

Demographic variables

Questions regarding the participants' gender, if they played any musical instruments, and preferred music genres, were rated on dichotomous scales. An item on if they had any hearing problems was rated on a five-point Likert type scale, ranging from not at all (1) to severe hearing problems (5).

Music usage questions

With respect to music usage, the following five questions were asked—the frequency of listening music per day', the extent to which they could decide what music to listen to, the type of music they preferred to listen to (8 preselected alternatives), where they listened to it (10 preselected alternatives), and the source used to listen to music (6 preselected alternatives). These items and the preselected alternatives were rated on a five-

point Likert type scale ranging from never (1) to always (5).

Mood impact of music

To measure how music was employed for mood regulation, the MMR (Saarikallio 2008) was used. From the original 40 items, 14 were extracted to assess how music usage was linked to the seven different regulatory domains—Entertainment, Revival, Strong Sensation, Diversion, Discharge, Mental Work, and Solace (2 items for each strategy). Each item was rated on a five-point Likert type scale ranging from never (1) to always (5). Furthermore, scores for two questions belonging to the same domain were added, resulting in a score ranging from 2–10 for each domain. Since the data were collected prior to the publication of the 21-item Brief Music in Mood Regulation Scale (B-MMR), the 14 items were chosen by the researchers (Saarikallio 2012). However, all these items have been included in the B-MMR. This study's Cronbach's alpha measure of internal consistency was found to be good, with a value of 0.91 for the ID group and 0.86 for the non-ID group.

Personality

In general personality research, the five-factor model (FFM; McCrae and Costa 2003) is predominant. Although the FFM has not been specifically validated for use with adolescents with ID, Boyd (2013) shows that the FFM within the adult ID population reproduce findings obtained within the intellectually typical population, giving support for the use of FFM based questionnaires in the adolescent ID population. Since long questionnaires can be taxing, particularly for adolescents with ID, we used the Ten-Item Personality Inventory (TIPI), which is a brief self-administered inventory for the assessment of the FFM personality domains: extraversion, agreeableness, conscientiousness, 'emotional stability', and 'openness to experience' (Gosling *et al.* 2003). TIPI consists of 10 statements, and for symmetry with other items in the questionnaire, the adolescents were instructed to indicate the extent to which they agreed with each statement on a five-point Likert scale (1 = disagree strongly to 5 = agree strongly). Gosling *et al.* (2003) reported adequate levels of convergence with other widely used FFM instruments; moreover, the test-retest reliability was found to be acceptable for all scales of the TIPI.

Current mood

To measure their mood during the recent week, four items concerning basic moods of happiness, anger, anxiousness, and sadness were rated on a five-point Likert type scale ranging from never (1) to always (5).

Table 1. Characteristics of participants with intellectual disabilities (ID) and without ID.

	ID group				Non-ID group			
	Boys (<i>n</i> = 15)		Girls (<i>n</i> = 15)		Boys (<i>n</i> = 24)		Girls (<i>n</i> = 10)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Play instrument (yes)	6 (40%)		7 (47%)		13 (54%)		3 (30%)	
Hearing problem	1.33	0.62	1.6	1.12	1.50	0.66	1.10	0.32
Listens to music	4.07	0.88	4.47	0.64	4.04	0.62	3.60	0.70
Choose music	4.53	0.83	4.07	1.10	4.12	0.80	3.90	0.57
<i>Preferred genre</i>								
Rock and pop	2.53	1.60	2.67	1.63	3.46	0.78	3.80	1.14
Hard rock	2.80	20.1	1.93	1.44	3.33	1.27	1.50	0.53
Classic	1.33	0.62	1.60	1.24	1.83	1.17	1.40	0.52
JBS	1.73	1.28	2.13	1.60	2.04	1.08	2.00	1.05
Hip hop/rap	2.27	1.79	3.60	1.60	2.67	1.61	3.50	0.71
Dance	1.93	1.53	2.00	1.36	1.58	0.88	1.40	0.52
Swedish schlager	2.33	1.68	2.60	1.40	1.62	1.01	2.30	0.82
Techno	3.00	1.77	2.67	1.54	3.50	1.84	1.50	0.85
<i>Situation</i>								
School break	2.07	1.34	2.87	1.41	2.92	1.21	2.40	0.70
School lesson	1.67	1.18	1.67	.90	2.58	1.41	1.40	0.52
Disco	2.07	1.83	3.80	1.70	4.46	1.14	4.90	0.32
Computer	4.13	1.41	4.27	1.22	4.21	0.93	3.70	0.48
While reading	1.33	0.82	2.60	1.35	2.29	1.30	1.50	0.53
With friends	2.40	1.35	3.40	1.30	3.04	0.86	3.20	0.42
While eating	1.40	0.74	2.33	1.18	1.71	0.75	2.20	0.63
Homework	1.73	1.22	2.87	1.51	3.08	1.25	2.00	0.67
Club/concert hall	1.60	1.40	2.60	1.81	4.04	1.12	3.90	1.29
During transport	3.00	1.51	4.20	1.15	3.88	1.30	4.30	0.95
<i>Listening device</i>								
Radio	2.73	1.79	2.33	1.11	2.79	0.93	3.00	1.16
TV	2.00	1.41	4.07	1.16	2.67	0.96	3.70	1.06
Computer	3.93	1.49	4.20	1.15	4.38	0.92	3.70	0.48
CD	3.20	1.74	4.20	0.94	2.46	1.29	3.30	0.95
Portable device	3.20	1.13	4.13	0.85	3.56	0.76	3.27	0.58

Procedure

The heads at three special needs upper secondary schools for young people with ID and those at three regular upper secondary schools in four Swedish municipalities were contacted and their permission to conduct the study was obtained. The study was performed in accordance with the Declaration of Helsinki. All adolescents were informed about the purpose of the study and that participation was voluntary. Informed consent was obtained from all participants before the questionnaires were handed out. For those below the age of 18, parents were requested to provide approval regarding their children's participation in the research. The questionnaire was completed by the adolescents anonymously. It took between 15–40 min and 15–20 min to complete the questionnaire for those with and without ID respectively. None of the participating adolescents have had expressed any negative experiences or interrupted their participation.

Data analysis

All statistical analyses were performed using the IBM Statistical Package for the Social Sciences for Windows (version 25.0). The data were complete without any missing values. The gender differences were computed using analysis of variance (ANOVA). Moreover, the associations between variables were calculated using the Pearson correlation analysis. A *p*-value of 0.05 or less was regarded as statistically significant.

Results

Group differences in demographic variables

The characteristics of the ID and the non-ID groups are shown in Table 1. On average, 45% of the participants played a musical instrument. Most of them (69%) reported no hearing problems, and only one participant from the ID group indicated having severe hearing problems. No significant differences in playing an instrument or hearing problems related to the group or gender were found.

As compared to the non-ID participants, those with ID reported a more frequent use of music ($F_{(1,60)} = 5.78$, $p = 0.019$) and it was most prevalent among girls. Furthermore, girls with ID listened more to music than their non-ID counterparts ($F_{(1,23)} = 10.23$; $p = 0.004$), whereas there was no difference between boys with and without ID ($p = 0.92$). The groups did not differ with respect to their freedom of music choice; participants in both the groups reported that they were mostly free to choose what they listened to. In addition, both groups displayed similar preferences for music genres except that participants in the ID group listened to rock and pop less than those in the non-ID group ($F_{(1,60)} = 9.37$; $p = 0.003$). Overall, and irrespective of the groups, girls listened more to hip hop and rap ($F_{(1,60)} = 7.10$; $p = 0.010$), while boys preferred hard rock and techno ($F_{(1,60)} = 12.71$; $p < 0.001$ and $F_{(1,60)} = 7.34$; $p = 0.009$, respectively).

The participants in both groups listened to music at similar places; however, those with ID listened to it less

Table 2. Mean and standard deviation of MMR strategies, personality, and mood for adolescents with intellectual disabilities (ID) and without ID.

	ID group						Non-ID group					
	Boys		Girls		All		Boys		Girls		All	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<i>MMR</i>												
Entertainment	3.23	1.33	3.97	0.92	3.60	1.18	3.69	1.01	3.35	0.71	3.39	0.93
Revival	2.77	1.53	3.80	1.40	3.28	1.54	3.04	1.22	2.55	0.37	2.90	1.06
Strong sensation	3.07	1.52	3.90	1.18	3.48	1.40	3.65	1.17	3.25	1.01	3.53	1.13
Diversion	2.87	1.56	3.80	1.44	3.33	1.56	2.81	1.05	2.60	0.70	2.75	0.96
Discharge	2.30	1.07	2.73	1.29	2.52	1.19	2.33	1.24	2.15	0.78	2.28	1.12
Mental work	1.97	1.20	3.63	1.56	2.80	1.61	2.29	1.07	2.55	0.83	2.37	1.00
Solace	2.80	1.19	4.13	1.17	3.47	1.35	2.83	1.12	2.70	0.54	2.79	0.98
MMR	2.71	0.86	3.71	1.02	3.21	1.06	2.95	0.72	2.74	0.49	2.89	0.66
<i>Personality</i>												
Extraversion	5.13	2.53	5.33	1.54	5.23	2.06	5.42	1.02	5.60	0.84	5.47	0.96
Agreeableness	4.60	1.81	6.27	0.96	5.43	1.65	5.92	1.21	5.60	0.70	5.82	1.09
Conscientiousness	5.27	2.49	5.87	2.00	5.57	2.24	6.54	1.53	7.40	1.08	6.79	1.45
Emotional stability	5.33	2.06	6.33	1.23	5.83	1.74	5.63	1.01	5.60	0.84	5.62	0.95
Openness to Experience	5.40	1.99	6.00	1.93	5.70	1.95	6.46	1.67	5.90	0.74	6.29	1.47
<i>Mood</i>												
Happiness	3.27	1.16	3.20	1.47	3.23	1.30	4.08	0.78	4.40	0.70	4.18	0.76
Anger	3.00	1.13	2.93	1.22	2.97	1.16	2.58	0.93	2.70	0.48	2.62	0.82
Anxiety	1.87	0.99	3.07	0.96	2.47	1.14	1.83	0.64	2.50	0.53	2.03	0.67
Sadness	1.93	1.03	2.93	1.34	2.43	1.28	2.04	1.00	2.60	0.52	2.21	0.91

Note. MMR, Music in Mood Regulation; ID, Intellectual disability.

at discotheques, clubs, or concert halls than their non-ID counterparts ($F_{(1,60)} = 22.51$, $p < 0.001$ and $F_{(1,60)} = 26.09$, $p < 0.001$, respectively). On the other hand, the former listened to music more on compact discs than the latter ($F_{(1,60)} = 5.83$; $p = 0.019$).

Furthermore, there were some differences related to the activities during which the participants in the two groups listened to music. In the ID group, girls listened to it more when reading books, eating, doing homework, being with friends, and during commuting than their male counterparts (all F values were between 4.27 (friends) and 9.65 (books), and all p values were less than 0.05). In contrast, in the non-ID group, girls listened to music less frequently when doing homework than their male counterparts ($F_{(1,32)} = 6.56$, $p = 0.015$), and boys listened to it more during school lessons than their female counterparts ($F_{(1,32)} = 6.56$, $p = 0.015$).

Group differences in the MMR, personality, and mood

As shown in Table 2, the MMR strategies of Entertainment and Strong Sensation were the most used mood regulation techniques among participants from the ID and non-ID groups, respectively. Discharge was the least used strategy in both groups. The ANOVAs showed significant main effects of group and gender on Solace, Mental Work, and Revival; however, since these strategies also demonstrated significant group by gender interaction effects ($F_{(1,60)} = 6.65$, $p = 0.012$, $F_{(1,60)} = 4.97$, $p = 0.030$, and $F_{(1,60)} = 5.29$, $p = 0.025$, respectively), we conducted simple effects analyses as follow-ups. It was found that the interactions were due to gender differences in the ID group, in which girls reported significantly greater use of Solace, Mental

Work, and Revival strategies than boys; however there were no significant gender differences in the non-ID group.

The personality traits differed to some extent between the two groups. The most endorsed traits in the ID and non-ID groups were 'emotional stability' and conscientiousness respectively; however, the least endorsed trait in both groups was extraversion. The ANOVAs for personality traits showed a main effect of group in conscientiousness ($F_{(1,60)} = 8.61$, $p = 0.005$) with higher scores observed in the non-ID group. There was a main effect of gender as well as group by gender interaction effect on agreeableness ($F_{(1,60)} = 8.87$, $p = 0.004$). Regarding the ID group, the simple effects analyses indicated that girls reported significantly greater agreeableness than the boys; however, there were no significant gender differences the non-ID group.

Finally, the ANOVAs on mood ratings showed a main effect of group on happiness ($F_{(1,60)} = 13.13$, $p < 0.001$), with the ID group reporting lower ratings than the non-ID group. A main effect of gender on anxiety and sadness ratings was found ($F_{(1,60)} = 19.75$, $p < 0.001$ and $F_{(1,60)} = 8.12$, $p = 0.006$, respectively). This was because more girls than boys (irrespective of their groups) reported feeling anxious and sad. There were no significant group by gender interaction effects among the mood variables.

To summarize, as compared to the non-ID group, participants in the ID group were more prone to use Solace, Mental Work, and Revival mood regulation strategies, particularly the girls. The ID group scored lower on the personality trait conscientiousness but higher on agreeableness, especially the girls. Finally,

Table 3. Gender adjusted partial correlation (r) between MMR domains, personality, and mood for adolescent with intellectual disabilities (ID) and without ID.

ID (n = 30)	MMR domains							
	Entertainment	Revival	Strong sensation	Diversion	Discharge	Mental work	Solace	MMR
Personality								
Extraversion	-0.08	0.10	0.47**	0.16	0.00	0.29	0.29	0.25
Agreeableness	0.35	0.13	0.60***	0.11	-0.02	0.38*	0.29	0.36
Conscientiousness	0.25	0.21	0.63***	0.20	0.09	0.34	0.46**	0.43*
Emotional stability	0.29	-0.13	0.24	0.04	0.30	0.31	0.28	0.25
Openness to Experience	0.27	0.11	0.65***	0.30	0.13	0.41*	0.33	0.44*
Mood								
Happiness	-0.13	0.01	0.08	-0.11	-0.26	0.10	0.10	-0.04
Anger	0.38*	0.12	0.14	0.25	0.22	0.18	0.23	0.30
Anxiety	0.10	0.22	0.41*	0.21	0.24	0.21	0.31	0.34
Sadness	0.14	0.13	0.21	0.20	0.19	0.02	0.14	0.31
non-ID (n = 34)								
Personality								
Extraversion	0.05	0.07	0.11	0.03	0.06	0.09	0.08	0.11
Agreeableness	0.13	0.16	0.03	0.28	0.02	0.15	0.04	0.18
Conscientiousness	-0.10	0.09	-0.01	0.20	0.19	0.14	0.31	0.18
Emotional stability	-0.03	0.19	0.15	0.17	-0.13	-0.07	-0.01	0.06
Openness to Experience	0.35*	0.44**	0.39*	0.28	0.08	0.25	0.36*	0.47**
Mood								
Happiness	0.36*	0.22	0.30	0.39*	-0.01	0.03	0.09	0.30
Anger	-0.19	-0.37*	-0.03	-0.18	-0.16	-0.04	-0.14	-0.24
Anxiety	-0.06	-0.07	-0.08	0.07	-0.25	0.25	0.15	-0.03
Sadness	-0.27	0.07	0.37*	0.11	-0.05	0.19	0.14	0.13

Note. MMR, Music in Mood Regulation.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

the ID group reported being less happy. More girls than boys (irrespective of their groups) reported feeling anxious and sad.

The MMR domain relationships with personality and mood

Since there were strong gender differences in the MMR, particularly in the ID group, we conducted partial correlation analyses adjusted for gender to determine its relationships with personality and mood.

As seen in Table 3, the ID group showed greater significant correlation coefficients between the MMR strategies and personality traits than the non-ID group. All personality traits, except 'emotional stability', were related to at least one MMR strategy. In the non-ID group, only the 'openness to experience' personality trait was related to the MMR strategies.

As shown in Table 3, the ID group demonstrated correlations between mood and the MMR strategies, such as anger and Entertainment as well as anxiety and Strong Sensation. In the non-ID group, happiness showed positive correlations with Entertainment and Diversion, anger correlated negatively with Revival, and, finally, sadness correlated positively with Strong Sensation.

Discussion

This study explored how adolescents with ID used music for emotional regulation in comparison to their non-ID counterparts. We assessed the connections between the mood regulation strategies they employed, demographic variables, their personality traits, and mood.

To answer our first research question, whether adolescents with and without ID differ in their use of strategies for mood regulation with music, the two groups did differ to some degree. The results indicated that the ID group tended to use music for mood regulation more frequently in general, however, the difference was most pronounced for the strategy of Solace. To some extent, this is in line with Bonetti *et al.*'s (2021) finding that individuals with lower intelligence use music more frequently for mood regulation; however, they found the difference to be most noticeable in Strong Sensation.

Furthermore, some differences were observed between the boys and girls in the entire sample. In accordance with past studies (Saarikallio 2008), the latter tended to utilize music for mood regulation more frequently than the former, especially for Solace, Mental Work, and Revival. However, when analyzing the groups separately, gender differences were only confirmed in the ID group. Saarikallio (2008) reported that the use of music for mood regulation in adolescence may increase later for boys than girls and that gender differences becomes less pronounced as they get older. Thus, our results suggest that having an ID may delay the development of emotional regulation strategies using music particularly among boys, however, data from a wider age span and a larger sample are needed to confirm this hypothesis.

The relationship of personality with the MMR

There were some personality differences between the two groups. The ID group scored lower for

conscientiousness, suggesting non-planned impulsivity (Roberts *et al.* 2009) and higher for agreeableness, especially the girls; this is consistent with the findings that women with ID in particular express a desire to make friends and be liked (Sallafranque-St-Louis and Normand 2017).

Regarding our second research question, whether the utilization of music in mood regulation is related to personality traits and mood, the results showed a certain degree of personality and mood association with the MMR strategies. In the ID group, a variety of personality traits such as ‘openness to experience’, conscientiousness, agreeableness, and, to a lesser extent, extraversion, emerged as important personality were associated with a number of MMR strategies, especially Strong Sensation, which was influenced by four of the five personality factors. In contrast, only one trait, ‘openness to experience’, was found to be associated with the MMR strategies in the non-ID group, which is in line with previous studies on undergraduate students (Vella and Mills 2017). Thus, the MMR strategy pattern of both groups was quite different. Although the former used as many mood regulation strategies as the latter, their use was less specific. This is consistent with findings that children with ID have less distinct ways of choosing coping strategies in emotional situations (Pereira and Faria 2015). In addition, Glenn and Cunningham (2002) reported that in individuals with ID, the development of the self-regulation processes such as self-regulated attention is considerably slower.

Finally, the ID group reported less happiness than the non-ID group; moreover, the girls (irrespective of their groups) reported being more anxious and sad than the boys; this is in line with previous findings that anxiety and depression peak during adolescence, particularly among girls (Altemus *et al.* 2014). Although girls with ID reported the highest use of Solace as well as the highest mean scores for reported anxiety and sadness and the lowest ones for happiness, at the individual level, there were no significant correlations between Solace and any of the mood variables. Regarding mood, anger and anxiety showed the most pronounced association with mood regulation strategies in the ID group. In the non-ID group, happiness and sadness were associated with more use of mood regulation strategies and anger less use. According to our data, adolescents with ID in a negative mood use music for mood regulation more frequently, whereas the pattern for the adolescents without ID indicates that those with positive as well as negative moods employ it for mood regulation. These results are consistent with Sarikallio’s (2007) notion that strategies of Entertainment, Strong Sensation, and Revival have the use of music to not only create, but also preserve well-being in common.

Some limitations of this study should be noted. It had a relatively small sample of 64 adolescents, 30 and

34 in the ID and non-ID groups, respectively, thus rendering the generalization of the findings difficult. However, since this is the first attempt to examine music in mood regulation among adolescents with ID, this study was primarily intended to be exploratory. Therefore, the results shown in our sample can be employed as a guide for larger quantitative studies. In addition, at the time of data collection, a shorter version of Sarikallio’s MMR questionnaire, the B-MMR (Saarikallio 2012), was unavailable in Swedish; hence, the items were chosen by the researchers themselves. Nevertheless, all the MMR items in the present study were included in the B-MMR and the set of items used in our research showed good internal consistency at the level of the original B-MMR. Some of the items in the questionnaire related to music usage and current mood were designed for this study. Although they may have good face validity, other aspects of validity have not been tested.

As mentioned previously, research on emotional and mood regulation in populations with ID is scarce and further studies are needed to gain an improved understanding about the possible distinctions in their regulation processes (Littlewood *et al.* 2018, McClure *et al.* 2009). In addition, the participants in the ID group may have had neurobiological disorders such as autism spectrum or attention deficit disorders. Since these conditions present different characteristics regarding emotion and its regulation, social behavior, etc., it would be informative to assess them separately regarding their use of music in mood regulation. There might be other operating factors of the utilization of music in mood regulation that were not included in this study, and since some strategies like Discharge seem less constructive (Carlson *et al.* 2015), exploring them would be beneficial for identifying adolescents at risk.

In conclusion, the present study demonstrated that personality traits, in addition to mood, are associated with differences in the usage of music for mood regulation among adolescents with and without ID. It provides initial insights for the use of music and the relationships between personality, mood, and music in mood regulation during certain activities and daily life among adolescents with ID, which may help us understand their situation and to adapt support for them.

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