

Background

- Neurodiversity refers to the wide range of unique neurodevelopmental profiles in human neurodevelopment (Singer, 1998), including but not limited to Autism Spectrum Disorder (ASD) and Intellectual Developmental Disorder (IDD) (Armstrong, 2010).
- Neurodivergent persons, especially those on the autism spectrum (AS), have known musical strengths and interests (Quintin, 2019; Stanutz et al., 2014), making music a promising strength-based tool for supporting well-being.
- Group music-making activities mirror social interactions (turn-taking, eye contact, etc.) and have been shown to support psychosocial areas of development for neurodivergent youth (LaGasse, 2014).
- Rhythm perception is linked with cognitive and linguistic areas, such as phonological awareness (Huss et al., 2011; Rimmer et al., 2023).
- Repeated musical engagement can influence musical enjoyment, and enjoyment may promote feelings of subjective well-being, life satisfaction, and a profound sense of happiness (Reybrouck & Eerola, 2022).

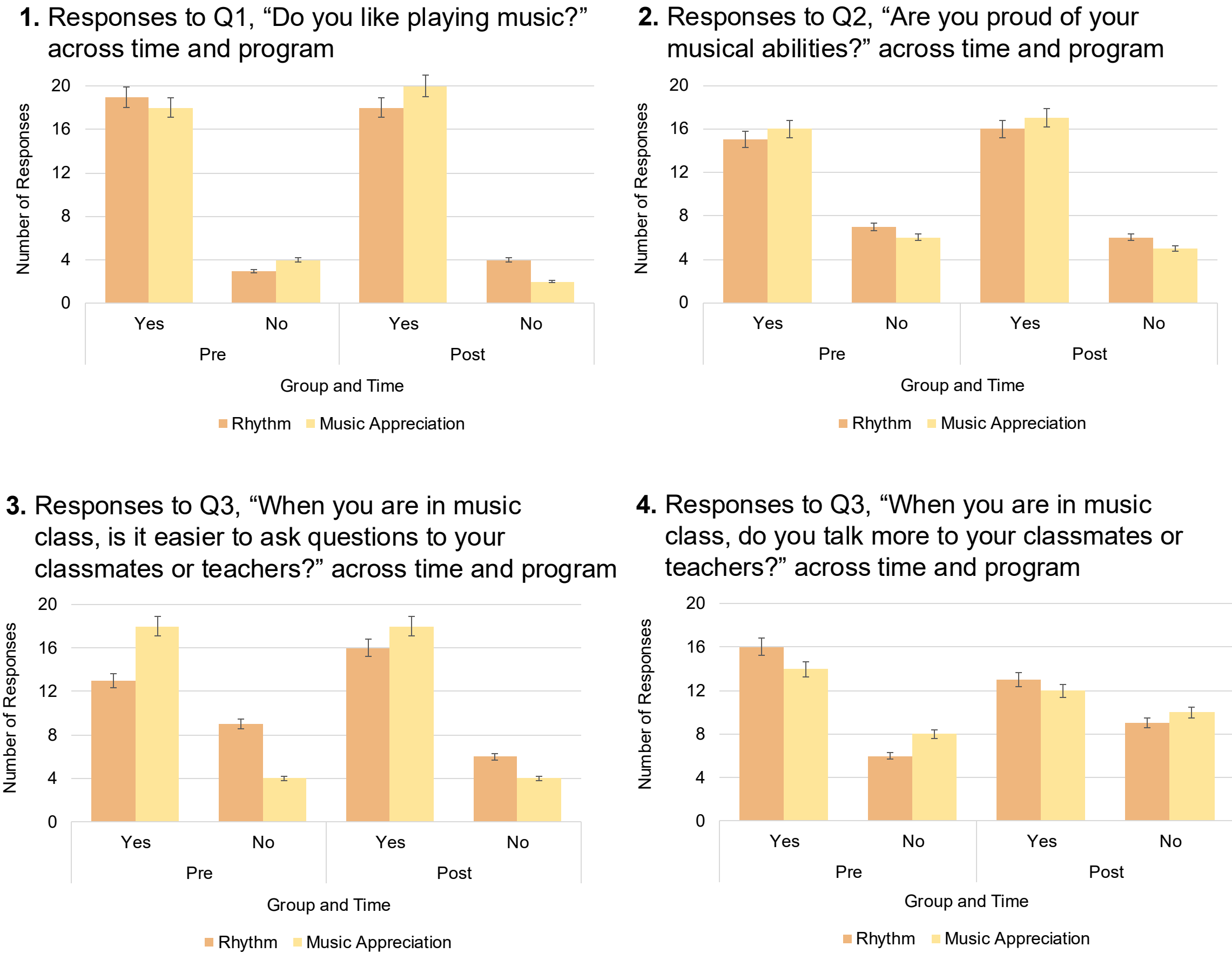
Objectives

Given the known musical strengths and interests of neurodivergent youth (Quintin, 2019; Stanutz et al., 2014) and the well-established benefits of rhythm and group music-making in the development of language skills (Huss et al., 2011; Rimmer et al., 2023) and social connectedness (LaGasse, 2014), **we aimed to study the impact of a rhythm-based (vs music appreciation-based) group music-making program on neurodivergent students' ratings of musical enjoyment and verbal social overtures.**

Hypotheses

1. **Regardless of condition, musical enjoyment will increase after participation in a musical program.**
2. **Increases in ratings of musical enjoyment will be greater for participants in the Rhythm group.**
3. **Verbal social overture ratings will increase for participants in the Rhythm Group.**

Results



- Musical Enjoyment**
- No significant differences in ratings of musical enjoyment were found after participation in musical programs ($p = >.05$).
 - Analyses revealed a **significant main effect of Question 1**, indicating that **students were more likely to answer “yes”** than “no” to this question **independent of program assignment or time** ($p = .012$).

- Musical Enjoyment by Program Over Time**
- No significant differences in ratings of musical enjoyment were found between groups after participation in musical programs ($p = >.05$).

- Verbal Social Overtures by Program Over Time**
- No significant difference in ratings of verbal social overtures were found between conditions after participation in the musical programs ($p = >.05$).

- Exploratory Analyses**
- Exploratory analyses revealed a significant, positive correlation between musical enjoyment pre- and post-program for the Rhythm group ($p = .003$), and a significant, positive correlation between musical enjoyment and verbal social overtures post-program for the Music Appreciation group ($p = .004$).

Methods

Participants

- 44 neurodivergent students between 7-12 ($M = 11$) were recruited from a specialized school for neurodivergent youth in Montreal, QC:
 - Participants included 16 children on the AS, 11 with IDD, 12 with co-occurring AS and IDD, and 5 with other developmental conditions.

Table 1. Participant Characteristics

	Rhythm Group				Music Appreciation Group				<i>p</i>
	<i>n</i>	<i>M</i>	<i>SD</i>	Range	<i>n</i>	<i>M</i>	<i>SD</i>	Range	
Age	22	11	1	7-12	22	11	1	8 - 12	.638
Raven's 2	22	77.32	19.34	42 - 119	22	78.41	14.71	55 - 118	.834
PPVT-5	22	75.14	18.82	44 - 120	22	74.00	13.22	53 - 99	.818
Digit Span	22	4.00	4.36	1 - 17	22	4.59	3.55	1 - 12	.625
AQ-10	21	5.57	2.40	1 - 9	20	5.90	1.70	2 - 8	.620
WHODAS-2	20	30.04	6.83	16.36 - 47.00	20	28.17	7.90	14.00 - 39.00	.403
ASRS	22	62.0	9.6	47 - 81	22	66.5	10.7	47 - 83	.146
Years of musical training	21	0.24	0.70	0 - 3	19	0.32	0.58	0 - 2	.757
Instruments played	21	0.29	0.72	0 - 3	19	0.16	0.38	0 - 1	.281
Hours per day playing instrument	21	0.24	0.44	0 - 1	19	0.16	0.38	0 - 1	.728
Years of music theory	21	0.14	0.36	0 - 1	19	0.11	0.32	0 - 1	.559

* $p < .05$.

Group Characteristics

- Groups did not differ in cognitive functioning (assessed using Raven's 2, PPVT-5, and the Digit Span subtest from the WISC-5), autism characteristics (assessed using the AQ-10 and the ASRS), adaptive functioning (assess using the WHODAS 2.0), or musical experience (assessed using a questionnaire adapted from the musical training subscale of the Goldsmith's Musical Sophistication Index (GMSI)).

Music Programs

- Students participated in weekly music programs over 14 weeks in 45-minute sessions during school hours.
- Participants were randomly assigned by classroom

Experimental Group: Rhythm Program $n = 22$

- Rhythmic production: copying rhythms, creating rhythms
- Learning to read and replicate rhythmic sequences as a group
- Practicing a wide range of rhythmic structures varying in complexity
- Use of percussion instruments (hand drums, maracas, djembe, etc.)

Comparison Group: Music Appreciation Program $n = 22$

- Listening to music
- Dancing
- Learning about different music genres and how to identify them
- Learning about different instruments and how to identify them
- Learning about the instrument families in the orchestra

Musical Enjoyment and Verbal Social Overtures

- Students were administered a 4-item musical enjoyment and verbal social overture questionnaire (adapted from the GMSI) pre- and post-program:

Musical Enjoyment:
Q1. *Do you like playing music?*
Q2. *Are you proud of your musical abilities?*

Verbal Social Overtures:
Q3. *When you are in music class, is it easier to ask questions to your classmates or teachers?*
Q4. *When you are in music class, do you talk more to your classmates or teacher?*

Discussion & Conclusion

- Ratings of musical enjoyment did not differ by program or change over time; however, **ratings in both groups were consistently high before and after the music programs.**
- Findings demonstrate that **neurodivergent youth enjoy music-making activities.**
- As such, **results support the use of music as an enjoyable, strength-based tool for neurodivergent youth** and point to **neurodivergent persons' heightened enjoyment of music.**