

Parents can do it, too: Developing a model to coach parents in the use of music interventions for children with ASD (systematic review, conceptual framework and limited-efficacy study)

By

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**Parents can do it, too: Developing a model to coach parents in the use of music
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ABSTRACT

Early intervention has been considered best practice for children at risk or diagnosed with Autism Spectrum Disorders for at least a decade. However, professional services can be limited due to availability or cost constraints. Parent-mediated interventions, where parents are trained in effective strategies to support their child's development, have been investigated as a viable alternative. In music therapy, such services are scarce. The present work attempted to develop a model for parent coaching of music interventions anchored in the Parent-Early Start Denver Model (P-ESDM, Rogers et al., 2012). Three independent, yet connected, studies were undertaken: a systematic review of parent-mediated music interventions, development of a conceptual framework of parent coaching of such interventions, and a limited-efficacy study with an alternating treatment design. Results showed that parent education in music therapy is an emerging research interest, particularly in the last five years (2012-2017). An extensive narrative review of the literature in music, autism, and parent-mediated interventions showed that music could enhance the relationship-based treatment model by supporting the psychophysiological synchronicity of parent and children. Finally, a single-case study showed that parents can indeed learn the strategies and achieve initial fidelity, and that music might enhance the child's communicative responses, compared to the original P-ESDM. Future research should study different approaches to music training that complement the P-ESDM coaching, as well as other feasibility measures.

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CHAPTER I

INTRODUCTION

Given that this dissertation complied with an alternate format, the pertinent literature reviews—and references—are included within each independent project (Chapters II through IV). Most theoretical discussion happens in Chapter III (Conceptual Framework). This introduction serves to explain the general approach and overall goals of the work.

Autism Spectrum Disorders can put significant strain on parents, particularly during the preschool years when parents strive to adjust to the realities of the new diagnosis, find services for their child, and discover strategies to support their child’s development. At the same time, professional services are not always available due to location or economic constraints. Recent developments in autism treatment have attempted to overcome these barriers by providing parents with evidence-based strategies to apply at home. Results of such interventions are encouraging, showing that parents can learn the strategies effectively, that children show improved social communication behaviors, and that family dynamics improve when parents are empowered in this way.

In music therapy, comparable treatments are just emerging. Despite considerable interest and tradition in incorporating parents in treatment, research projects that specifically study parental contributions are circumscribed to the last decade. Moreover, conceptual frameworks that support such research and clinical work are limited.

The work reported in this document attempted to develop a model to coach parents in the use of music interventions for children with Autism Spectrum Disorders. This work took the form of three independent research projects, sustained by an underlying and overarching

question: *Can music therapy participate meaningfully in this emerging field of parent-mediated interventions?*

As a first step, it seemed reasonable to explore the current state of parent-mediated *music* interventions for children with ASD through a systematic review (Chapter II). With a clearer picture of the state of research in this area, the second study entailed the development of a conceptual framework to encourage research and clinical practice of parent coaching and parent-mediated music interventions for children with ASD. The conceptual framework made explicit the hypothesized relationships between the components of the intervention (parent coaching) and its outcomes, as well as provided theoretical support for the use of music as the active ingredient of the intervention (Chapter III). The third project explored some of these relationships and contributed to the refinement of the proposed conceptual framework through a single-case study (Chapter IV).

This work was anchored theoretically on the Early Start Denver Model and the Parent-Early Start Denver Model (Rogers et al., 2012), developed as a treatment for individuals with autism with significant research support. The researcher/interventionist is a board-certified music therapist trained and certified in this model. The adaptation to a music intervention attempted to expand the presentation of this model by introducing a well-accepted stimuli (music), while at the same time striving to introduce treatment strategies of demonstrated efficacy into the music therapy field. However, this project, and particularly the conceptual framework, expanded beyond this model to include literature in music neuroscience, music therapy and music psychology. This marriage of conceptual frameworks is emerging and should be considered a work in progress. Further empirical research should inform and improve its propositions.

CHAPTER II
A SYSTEMATIC REVIEW OF PARENT-MEDIATED
MUSIC INTERVENTIONS FOR CHILDREN WITH ASD

ABSTRACT

Early intervention significantly improves outcomes for children with ASD, but professional services are often limited due to time, cost or availability. Parent-mediated therapies could be viable options in these cases. The purpose of this study was to assess the existence of parent-mediated music interventions, understand the definitions of parent-mediated and parent coaching in the included literature, identify the characteristics of parent coaching currently used, and determine outcome, measures and findings within these studies. A systematic review was conducted with a comprehensive search of the main databases. After application of the inclusion/exclusion criteria, 19 articles were selected for data extraction. Data were consolidated in tables, and framework analyses were performed on descriptions of “parent-mediated,” “parent coaching” outcomes, measures and findings. Results of this systematic review found that the quality of the research and of the training/coaching models varied substantially. Main reasons to include parents as co-therapists included support for parents, better child outcomes, support for parent-child interactions, parent getting to know his/her child, parent gaining skills and knowledge, and parent expertise included in programming. Two styles of parent coaching were identified (a) behaviorally-based parent training and (b) collaborative approach. Salient findings referred to increased parenting skills, increased social interaction in children, better parent-child relationships, and generalization of parenting skills to daily activities. High attrition and significant parental effort limit the internal and social validity of some studies. Parent-mediated

interventions are increasingly researched as a valid mode of intervention. Music therapists might consider developing such interventions while accounting for parental resources.

Key words: parent-mediated, music-based, autism, ASD, parent coaching

Background

Autism Spectrum Disorder (ASD) impacts social communication and interactions from very early in life. Repetitive, inflexible behaviors and difficulties in communication can alter not only child development but also family functioning (May et al., 2015). Early intervention improves prognosis and is recommended as best practice (Zwaigenbaum et al., 2015), but professional services are often limited due to time, cost or availability in the region. Parent-mediated therapies, where the parents provide the treatment strategies, have been researched as viable options for these families (see Strauss, Mancini, SPC Group, & Fava, 2013, for a comprehensive review).

Several studies show that parents can achieve treatment fidelity within reasonable timeframes (2 to 12 weeks of one- or two-hour sessions), and within different treatment approaches, such as Pivotal Response Training (Coolican, Smith, & Bryson, 2010), Positive Behavior Support (Lucyshyn et al., 2015), relationship-based video-training (Poslawsky et al., 2014), and joint attention treatment (Ingersoll & Wainer, 2013). In those studies, parents maintained fidelity at follow up, and their ability to provide treatment correlated with child's improved communication skills and behavior (Coolican, Smith, & Bryson, 2010; Ingersoll & Wainer, 2013; Lucyshyn et al., 2015). Even when professional services were also provided, parental involvement increased child outcomes, and parental wellbeing and satisfaction (Oono, Honey, & Mcconachie, 2013; Zwaigenbaum et al., 2015).

Music therapy for individuals with Autism Spectrum Disorders has substantial research support. Preliminary scoping searches of systematic reviews and consultation of PROSPERO revealed that recent or ongoing systematic reviews include evaluation of music therapy for ASD (Geretgesser et al., 2014), history of music therapy treatment with this population (Reschke-

Hernandez, 2011), strengths and limitations of music intervention reporting in the ASD field (Reschke-Hernandez, 2012), movement and music therapy in ASD (Bhat, 2013), instruments for evaluation of outcomes in music therapy (Fusar-Poli et al., unpublished document), and music therapy for children with ASD (Simpson & Keen, 2011). Despite this considerable knowledge base, no reviews specifically exploring parent coaching, parent-mediated or family-centered perspectives with music-based interventions were found.

The absence of such a systematic review does not necessarily represent a scarcity of research studies with music and parents in the autism field. When performing a scoping search with the string “(parent OR caregiver) AND (mediated OR led) AND autism AND music” during the last ten years (2007-2016), 1,069 peer-reviewed articles and reviews were found. However, many of these articles did not use music as the primary intervention. In contrast, 11,051 articles describing parent-mediated intervention *without* music were found (i.e., when the search term “music” was excluded). When a more focused search was performed (i.e., search terms only in the title), 36 research studies of parent-mediated interventions without music were located, including several RCTs (Kasari et al., 2015; Siller et al., 2013), long-term follow-up of RCTs (Pickles et al., 2016), and a Cochrane review (Oono, Honey, & Macconachie, 2013).

Purpose Statement and Research Questions

Given the importance of supporting families with a member with ASD, the clear benefits of parent-mediated interventions, and the absence of a systematic review of parent-mediated *music* interventions, a systematic review of the literature was deemed necessary. The aim of this study was to understand the current state of research, and to support the creation of a conceptual framework for parent-mediated music interventions. The following research questions guided this investigation:

1. What parent-mediated/parent-led *music* interventions have been researched within the ASD field?
2. What is the researchers' understanding of "parent-mediated" or "parent-led" music interventions? What are their reasons to justify the use of parent-mediated interventions? What is their understanding of parent coaching/training?
3. What training do researchers/interventionists have to coach parents in these interventions?
4. Do these researchers/interventionists provide systematic parent coaching on the intervention?
5. What are the outcomes and measures for both parents and children?
6. What are the main results/contributions of these studies?

Method

Design

A systematic review with a configurative approach and framework analysis (particularly for questions 2, 5 and 6) was developed. In configurative reviews, the researcher attempts to include studies that "provide richness" of methodologies and approaches (Gough et al., 2012, p. 60). This variety of methodologies allows exploration of theory in an iterative and comprehensive process. Framework analysis, in turn, is a tool to synthesize the concepts emerging from the data in an initial conceptual framework through an inductive approach (Gough et al., 2012, and Ritchie & Spencer, 1994). The framework analysis method is part of a family of qualitative content analysis used to identify similarities and differences in the data, extract patterns of relationships, and draw conclusions that are then presented as themes (Gale,

Heath, Cameron, Rashid, & Redwood, 2013). Although most commonly used with interview and focus group data, it has also been used with data from documents and media (Gale, et al., 2013).

Inclusion criteria

Table 1 presents the conceptual and operational definitions of the terms that were used in this review and in the inclusion/exclusion criteria to ensure transparency of the selection process.

1. Articles from 2007-2016. This period was selected given that the scoping searches showed a substantial increase in publications related to parent-mediated intervention in ASD in the last 10 years.
2. Peer-reviewed articles, dissertations, and any type of published review (integrative, systematic reviews, etc.). This criterion was included to ensure a minimum quality of the publications reviewed.
3. In English, Spanish, or French, to ensure literature from other countries was included. The reasons for this criterion were that most of the music therapy literature has appeared in these languages, and that the researcher is completely fluent in the first two languages and has a solid reading knowledge of the third.
4. All research methodologies accepted. Since the purpose of this review was to support the development of a conceptual framework, the inclusion of different methodologies would enrich this endeavor.
5. Parent-mediated/led intervention. It was expected that parents/carers/caregivers were explicitly mentioned as responsible for the implementation of at least part of the therapy outside of the sessions and received at least a minimum of training and/or monitoring.

6. Music intervention. Intervention had music as its main and critical ingredient. Bundled interventions (e.g., evaluation of comprehensive programs) were included as long as the music intervention was reported as a clearly separate component.
7. Children receiving intervention under 12 years of age (see exclusion criterion #9).

Exclusion criteria: the order and numbering of the following criteria served as codes during the screening process.

1. Not published between 2007-2016
2. Not peer-reviewed articles, reviews or dissertations.
3. Duplicate
4. Not in English, Spanish or French
5. Invalid citation (citations provided by the databases without legible information)
6. Irrelevant topic (citations with unrelated topics, such as obesity, cancer, etc.)
7. Children not diagnosed with ASD
8. Theoretical/position papers without data collection. Articles without data collection (theoretical or position papers) were excluded given that outcomes, measures and findings were part of a research question, and such papers would not yield any information.
9. Children receiving intervention over 12 years old. It was considered that, even though interventions for children 0 to 12 years of age vary substantially, this variation would be less than those directed to teenagers. Moreover, interventions for adolescents might be less dependent on parents.
10. Parents not in leading/co-therapist role (as defined above).
11. Not music intervention

Table 1.

Conceptual and operational definitions used in the present review

Constructs	Conceptual definitions	Operational Definitions
Autism and Autism Spectrum Disorder	Neurodevelopmental disorder characterized by difficulties in social interaction and communication, and repetitive interests and behaviors (DSM-5, 2013). The areas more frequently affected are related to the development of joint attention and intersubjectivity, socio-emotional engagement, and understanding of nonverbal cues for communication.	Children with a professional diagnosis of ASD, preferably where state-of-the-art diagnostic tools are reported (ADOS-2, ADI-R, etc.)
Developmental disability or delay	Any condition that interferes with the common progression of language, physical, cognitive and behavioral development (CDC, 2018). For purposes of this review, “developmental disability” will be included, but an effort to differentiate ASD from other neurodevelopmental disorders should be made and reported	Children with a professional diagnosis of developmental disability or an indication of adaptations (e.g. IEP) for this reason.
Neurodevelopmental disorder	Neurodevelopmental disorders are a group of conditions with onset in the developmental period, often before the child enters grade school, and are characterized by impairments of personal, social, academic, or occupational functioning (DSM-5). For the purposes of this review, this term will be included given that ASD is sometimes used interchangeably with it, and participants are often grouped this way. However, this situation should be clearly noted and reported.	Children with a professional diagnosis of a neurodevelopmental disorder, or an indication of adaptations (e.g. IEP) for this reason.
Family-centered	For the purposes of this review, family-centered perspective refers to the intentional inclusion of the family unit in the treatment process. In this case, the parents and caregivers are considered recipients of the treatment.	Parents are included in the sessions, but receive no training outside of it, and had no responsibility to implement the therapy outside of the sessions.
Parent-led or parent-mediated perspective	Parent-mediated, in turn, refers to interventions where parents or caregivers become co-therapists; receive appropriate training and monitoring; and are involved in	Parents are explicitly mentioned as responsible for the implementation of at least part of the therapy outside of the sessions and receive training and/or monitoring.

setting goals, locating resources, and reinforcing children’s skills (cf. Zwaigenbaum et al., 2015). Parents or caregivers have a leading role.

Music intervention

“The intentional use of organized auditory stimuli (i.e., music) to effect desirable change in physiological and psychological functioning” (Robb, Burns, & Carpenter, 2011, p. 348)

The main intervention for the child with ASD has music as its main component, without which the intervention would not happen.

Music therapy in ASD

Clinical use of evidence-based music interventions to achieve individualized goals, within a therapeutic relationship by a certified professional with at least a Bachelor’s Degree in Music Therapy (American Music Therapy Association, 2017).

Services are provided by a professional with a degree in music therapy to an individual diagnosed with ASD

Parent coaching

Training practices that allow parents to learn and use responsive strategies to enhance their child development (Rush & Shelden, 2011). The basic principles of this approach include exploring parent’s and child’s priorities, interests and concerns, creating joint plans for treatment, embedding the strategies within their daily routines, establishing mutual commitments for follow-up, and monitoring progress.

The parent/caregiver is formally or informally trained in the use of the intervention during parent coaching. The article explicitly reports a minimum of parental training, monitoring and joint planning

Parent or caregiver or carer

For the purposes of this review, parent/caregiver/carer refers to any adult that lives in the same household than the child with ASD receiving therapy, that is directly responsible for a substantial amount of caregiving time, that has implicit or explicit decision-making rights regarding the child, that does not receive payment for his/her caregiving duties and might have a direct blood relationship with the child. The term is therefore not exclusive of biological parents, but can include adoptive or foster parents, grandparents, adult siblings, other family members, or close friends living in the household.

The authors report the relationship as “parent” or “caregiver”. Caregiving duties of the “parent” or “caregiver” are clearly stated or can be easily deduced by the report. That person spends daily time and has decision-making responsibilities towards the child.

Procedure

The following procedure implemented for this study was based on Boland and Cherry (2104), Campbell Collaboration (2011), and Gough and collaborators (2012):

Search Strategy. Consultation with a specialized librarian yielded the following search strategy (see Figure 1):

1. Databases included PsycInfo, PubMed, Web of Science, JSTOR, Google Scholar, ERIC, as well as aggregated databases such as Academic Search Complete, Music Index, Proquest Research Library, and Psychology and Behavioral Sciences Collections.
2. Search terms included “parent/caregiver/carer”, “music” and “autis*/developmental disabilit*/developmental disorder/neurodevelopmental disorder/ASD/developmental delay.” The use of truncation (e.g., autis*) ensured that all words with that root were included. Search terms were included with quotations (e.g., “developmental disorder”) and without them (e.g., developmental disorder) if the database yielded different results for each (e.g., Proquest Research Library, but not JSTOR).
3. “Related searches” (selected subjects from those suggested by the database), “Exploding,” “Expanders,” or “Related words” (use of synonyms and similar keywords), and “Major” (inclusion of subject headings for similar concepts) were used to locate all pertinent literature in databases that allowed these strategies (PsycINFO, ERIC, Academic Search Complete, Music Index, Proquest Research Library, Psychological and Behavioral Sciences Collections). “All Databases” were used in Web of Science. JSTOR and Google Scholar only allowed limited search strings with no qualifiers, and no combination of individual searches, which impacted

- the relevance of the resulting searches (i.e., Google Scholar provided 778 articles, most of which were irrelevant to the topic).
4. Combination of saved individual searches with Boolean terms (“OR” to include all possible articles, and then “AND” to narrow the results) was done for every database (except JSTOR and Google Scholar, which do not allow this process).
 5. Proquest Dissertation and Theses Global was included later when it was observed that very few dissertations were included in the previous searches. The same search strategy was followed.
 6. Filters were applied through the online databases for publication date (2007-2016), language (English, Spanish, French), and peer reviewed and/or type of publication (journal articles and dissertations; NOT book chapters, book reviews, conference proceedings, unpublished documents, etc.).
 7. Number of articles found for each search were recorded (see Appendix A for an aggregated table). Individual tables for each database, including search strings, are available upon request. A total of 2,463 citations were retrieved at this point.

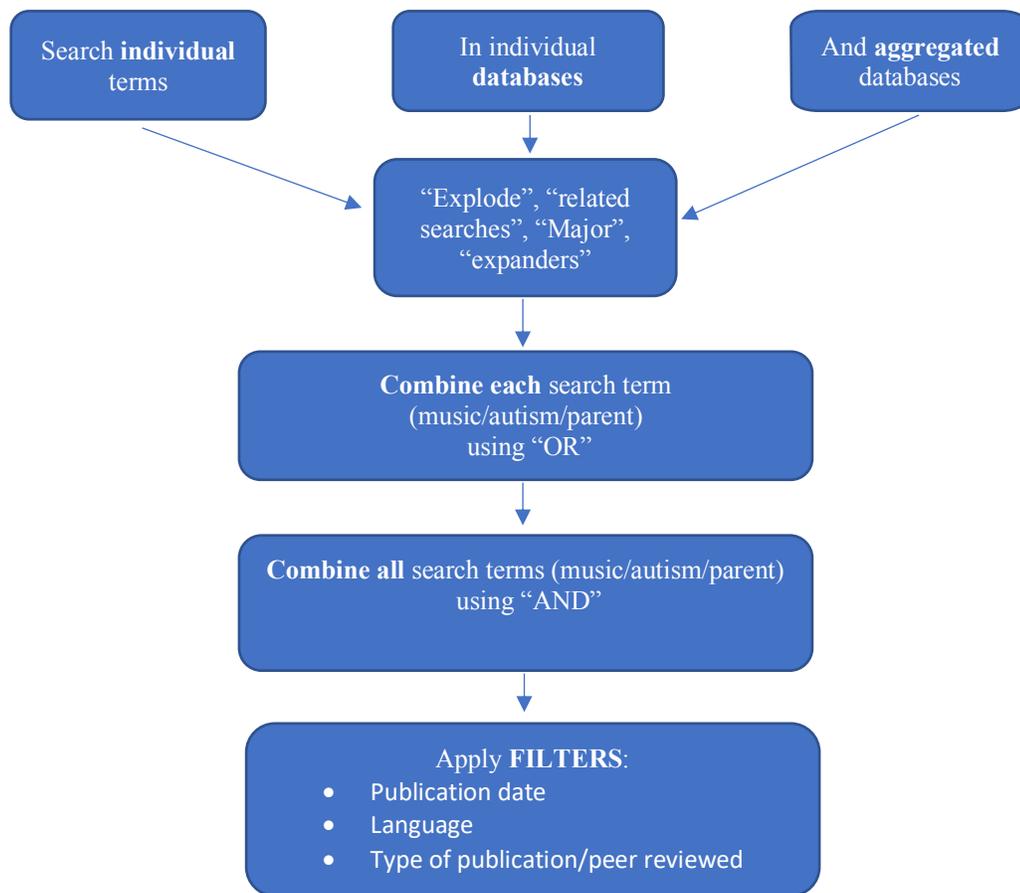


Figure 1. Search strategy for the systematic review of parent-mediated music interventions

Screening process. The online systematic review software Covidence (Veritas Health Innovation, Melbourne, Australia. Available at www.covidence.org) was used to screen the resulting citations. The researcher uploaded the citation files from the databases. The software automatically counted and excluded duplicates (175), but the researcher checked for accuracy.

1. *Title Screening* (2,288 articles): Given the large number of irrelevant articles from some databases, the researcher performed a quick screening of title and keywords in the abstract, excluding a total of 1,449 articles. The exclusion criteria 5 “invalid citation,” and 6 “irrelevant topic” were added at this point. Some articles that had

- been missed by the online databases or Covidence for type of publication (341), language (2), or duplicates (18) were excluded at this point as part of the total 1,449 excluded articles. Since Covidence does not allow assignment of inclusion/exclusion reason to each citation at this step, the excluded citations were downloaded to a spreadsheet and manually coded. This process served as a second screening, and improved accuracy. The remaining 839 articles were kept for abstract screening.
2. *Abstract Screening* (839 articles): Each abstract was read, and a decision was made based on inclusion/exclusion criteria as well as the conceptual and operational definitions mentioned in Table 1 (i.e., ASD, music intervention, and parent-mediated as defined in this table informed the inclusion criteria). Decisions were recorded directly in Covidence. When information from the abstract was insufficient to decide, the article was coded as “maybe” and transferred to the next stage (Full-text review). Once again, the excluded citations (755) were downloaded to a spreadsheet and manually coded with the exclusion reason.
 3. *Full-text review* of selected articles (84 +1): The articles and dissertations were read, and Inclusion/Exclusion criteria were applied again. Covidence does allow for exclusion coding at this step and was thus performed. Reference lists of these articles were hand searched. One article cited in one of the reviewed articles was considered relevant and was included (Nicholson et al., 2008). At this point, one article (Yang, 2016) was excluded as a duplicate because it was the published article of a dissertation (Yang, 2013), and the latter provided more detail for this review. A total of 66 articles were excluded at this stage. A screening tool with comments was filled out on paper for each *included* article (see Appendix B).

Data extraction (19 articles). This process was also done on paper using the data extraction tool (see Appendix C). An individual form was filled out for every article, and the resulting data were compiled in a spreadsheet for further analysis. For the “parent-mediated” and “parent coaching” definitions (question 2), relevant quotes were extracted from each literature review section or from intervention descriptions. A visual representation of the procedure is displayed in the PRISMA chart (Figure 2).

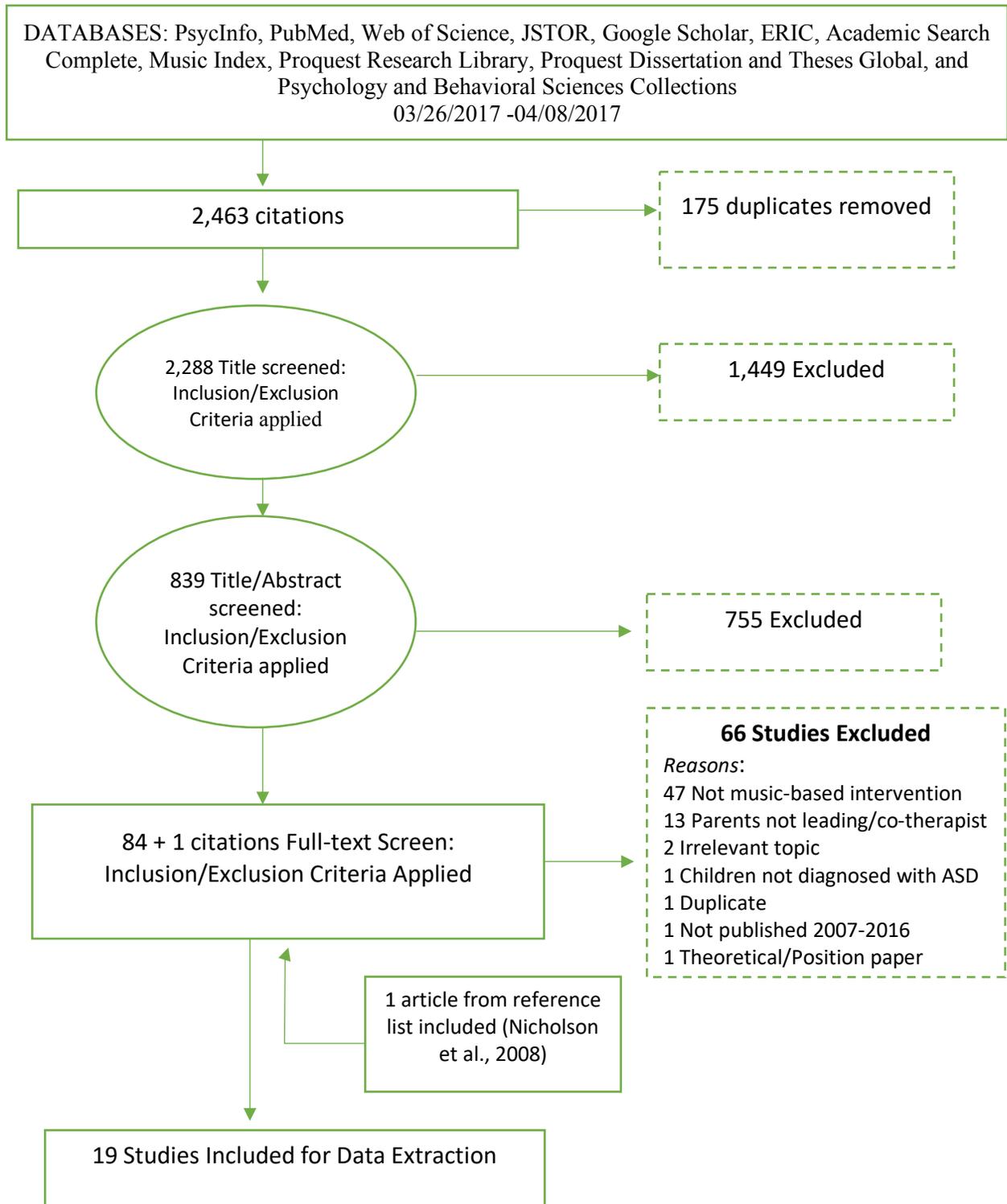


Figure 2. PRISMA chart of the systematic review

Quality assessment of included articles

Given the limited amount of literature on the topic, no article was excluded due to low quality, but quality assessments were performed. Considering that most of the music intervention literature is based on non-randomized studies, the Downs & Black Quality Assessment tool (Downs & Black, 1998) was selected as an appropriate quality assessment tool (Deeks et al, 2003). An individual form was filled out for each article, and the data were compiled in a spreadsheet and summarized in Appendix D.

Since not all questions on the quality assessment tool were applicable to all articles (e.g., random allocation for phenomenological studies), percentage scores with only relevant questions were calculated for each rubric of the tool (i.e., reporting, external validity, internal validity, power, and overall score). For intervention reporting, a point was given if the intervention, as a whole, was sufficiently explained. However, most studies did not report the musical aspect of the intervention as has been suggested (Robb et al., 2011). Music intervention reporting is analyzed as a separate item in the Results section.

Data consolidation and analysis

Data were consolidated in tables, including a PRISMA chart (Figure 2), PICOT (population, intervention, comparison, outcomes and time) information for interventions (Appendix E), and PROGRESS information (Place of residence, Race/ethnicity, Occupation, Gender, Religion, Education, Socioeconomic status, and Social Capital), when available, as recommended by Gough and collaborators (2012; see Appendix F). Framework analyses to extract the theoretical constructs for parent-led definitions, parent coaching, outcomes, measures and findings was performed. Compilation of data in tables and summaries for study information

(geographical area, PI and co-authors' discipline, study design, number of participants), parent coaching characteristics, and music reporting are also included.

Framework analyses

To answer question 2 (*What is the understanding of “parent-mediated” or “parent-led” interventions, and “parent-coaching” and the justification of their use, according to these studies?*), question 5 (*What are the outcome measures for both parents and children?*) and question 6 (*What are the main results/contributions of these studies?*), framework analyses with these subtopics were performed (results reported in Tables 4 to 7). Following Ritchie and Spencer's (1994) procedure, the framework analyses included the following steps:

1. *Familiarization*: This process generally involves the immersion in the data to find “key issues and emerging themes” (Ritchie & Spencer, 1994, p. 178). A review of all the materials, a selection of the pertinent sources, as well as an appraisal of the ease or difficulty of obtaining the data are considered and noted.
2. *Identification of a thematic framework*: This process involves abstraction and conceptualization of the data. The data are “sifted and sorted” to set up a thematic framework. Such analysis is informed by the research aims and are extracted based on recurrence or patterns observed in the data (Ritchie & Spencer, 1994, p. 179-180).
3. *Indexing*: The researcher conceptualizes the emerging themes from the previous steps in broader categories (e.g., parent outcomes, child outcomes, etc.), and a final list (index) of concepts is created.
4. *Charting*: A chart with the key concepts and corresponding examples from the data is created.

5. *Mapping, looking for associations and explanations:* In this step, the researcher creates visual representations of the findings, and looks for explaining patterns.

Results

Study information

Table 2 provides information on geographical area, discipline of principal investigator, discipline of co-authors, study methods, and number of participants for all studies reviewed. Almost a third of the studies (31%, $n = 6$) were done in the United States, and 26% (5) in Australia. Eleven studies were directed by music therapists; the rest by psychologists, ethnomusicologists, teachers, or a neurobiologist. Almost half (8) of the studies were performed by single researchers. Research methodologies included case studies (2), ethnography (1), phenomenological inquiries (3), grounded theory (1), multiple baseline design (1), single group designs (3), systematic reviews (2) and randomized controlled trials (3 RCTs). Most studies had small sample sizes (14 with less than 50 participants). Notably, three of the studies with more than 50 participants were music therapy studies (directed by a music therapist), but one of them was a systematic review/meta-analysis (Geretsegger et al., 2014).

Table 2.

Study Information Summary

Study Information	Description
Area (Country)	6 USA 5 Australia 2 Canada 1 Italy 1 New Zealand 1 South Korea 1 UK 1 Norway/Israel (review) 1 USA (review)
Discipline of PI	12 music therapy 3 psychology 1 music education 1 ethnomusicologist 1 curriculum & learning 1 neurobiology
Discipline of Co-authors	8 no co-authors 6 music therapy 3 psychology 2 speech pathology 1 special education 1 neurobiology 1 ethnomusicology
Study Design	2 case study 1 ethnography 3 phenomenology 1 grounded theory 2 multiple baseline design (one included qualitative interviews) 1 single group time series 4 single group pretest-posttest 2 systematic reviews 3 randomized controlled trials
Number of participants	< 15 participants—8 studies (6 music therapy studies) > 15 < 50 participants—4 studies (3 music therapy studies) 50 or more participants—5 studies (3 music therapy studies, including a systematic review) Not clearly reported – 2 (including a systematic review)

Parent-mediated interventions, parent coaching and professional training.

To answer question 1 (*What parent-mediated/parent-led interventions have been researched with music interventions, within the ASD field?*), question 3 (*What training do researchers/interventionists have to coach parents in these interventions?*), and question 4 (*Do these interventionists/researchers provide systematic parent coaching on the intervention?*), the data from the extraction tools were summarized in Table 3 and are explained below.

Regarding the existence of parent mediated music interventions (question 1), some emerging models were found. Some intervention models were based on published and well-established interventions within the autism field (e.g., SCERTS model, and Positive Behavior Support, PBS), while others were *ad hoc* or less researched programs with this population (*Turtle project*, DiRenzo et al., 2015; *Soundplay*, Pitts, 2016; *Sing & Grow*, Nicholson et al., 2008; and *Musical Bonds*, Yang, 2013).

Regarding therapist training for parent coaching (question 3), eleven of the 19 studies were directed and implemented by music therapists; however, in only four studies was the parent coaching /training provided by a music therapist (Nicholson et al., 2014; Pasiali, 2012; Williams et al., 2012; Yang, 2013). *Sing & Grow* is the only music therapy model that requires training and certification for implementation (Nicholson et al., 2014). SCERTS and PBS also require training but are not music interventions in their original format. Instead, music therapists were trained in them, and were part of more comprehensive programs (Ayson, 2011; DiRenzo et al., 2015). Nine studies mentioned providing varying degrees of monitoring or coaching for parents (question 4) (Ayson, 2011; Blair et al., 2011; DiRenzo et al., 2015; Nicholson et al., 2008; Pasiali, 2012; Pitts, 2016; Williams et al., 2012; Woo et al., 2015; Yang, 2013).

Table 3.

Parent training/coaching characteristics

Characteristics	Number of studies/Names	Citations
Formal Training	9	Ayson, 2011; Blair et al., 2011; DiRenzo et al., 2015; Nicholson et al., 2008; Pasiali, 2012; Pitts, 2016; Williams et al., 2012; Woo et al., 2015; Yang, 2013
Follow-up/monitoring	9	Same as above
Specific Model?	8	As above except Woo et al., 2015
Which model?	SCERTS Positive-Behavior Support (PBS) Turtle Project <i>Sing & Grow</i> (2) Soundplay <i>Musical Bonds</i> Mutually Responsive Orientation (not a model, but a guiding theoretical framework).	Ayson, 2011 Blair et al., 2011 DiRenzo et al., 2015 Nicholson et al., 2014; Williams et al., 2012 Pitts, 2016 Yang, 2013 Pasiali, 2012
Who provided training?	4 music therapist 2 psychologist 1 special educator 1 music educator 1 unspecified	Nicholson et al., 2014; Pasiali, 2012; Williams et al., 2012; Yang, 2013 DiRenzo et al., 2015; Woo et al., 2015 Blair et al., 2011 Pitts, 2016 Ayson, 2011
Certification in this model?	Yes, for <i>Sing & Grow</i> , SCERTS, and Positive Behavior Support	
Model mentioned, but formal training not provided	SCERTS (1 study) Family-centered music therapy (3 studies)	Bakan et al., 2008 Thompson, 2012; Thompson et al., 2013; Thompson & McFerran, 2015

Framework analyses: Understanding of “Parent-mediated” and “Parent Coaching”

For questions 2, 5 and 6, the researcher performed framework analyses. For the first step, *familiarization*, the researcher read the data compiled in a spreadsheet for each subtopic (parent-mediated, parent coaching, outcomes, measures and findings), and corroborated information

from individual data extraction tools. Emerging themes were noted. For the *identification of a thematic framework*, the researcher identified and listed keywords and main themes that could explain the authors' view of each construct (e.g., “parent-mediated” and “parent coaching”) and the reasons to justify the use of parent-mediated interventions. Regarding *indexing*, the researcher conceptualized the themes from the previous steps in broader categories (e.g., parent outcomes, child outcomes, etc.), and a final list (index) of concepts was created. The researcher then turned to the data again and coded the quotations and descriptions according to the identified concepts.

For *charting*, a spreadsheet with the key concepts and corresponding examples from the data was created. It was observed that *no clear definition* was provided in any study for parent-mediated/parent-led interventions (question 2). However, it was possible to extract a conceptual framework that supports the use of **parent-led/parent-mediated** sessions (Table 4), based on 6 main reasons to include parents in treatment: (1) support for parents, (2) better child outcomes, (3) support for parent-child interactions, (4) parent getting to know his/her child, (5) parent gaining skills and knowledge, (6) parent skills considered and involved in programming.

Table 4.

Conceptual framework extracted from parent-led/mediated definitions

Concepts	Quotes	# of studies	Citations
1. Support for parents	parent management, (parental) emotional responses, responsive to individual differences amongst children and families, inclusion of families in these experiences, provide social networking opportunities	5	McIntyre et al., 2013; Nicholson et al., 2014; Thompson & McFerran, 2015; Thompson, 2012; Williams et al., 2012
2. Better child outcomes	support across all daily activities, differentiated according to age of the child, new meaning to routine activities, open a gate to the outside world for the child, children's developing competence, support the skill development of the child, relevance of the goals for the child, stimulate child development	7	Ayson, 2011; Blair et al., 2011; DiRenzo et al., 2015; Nicholson et al., 2008; Thompson et al., 2014; Thompson & McFerran, 2015; Williams et al., 2012.
3. Support for parent-child interactions	interpersonal supports, communication and the relationship of the child, quality of parent-child relationships, parent-child attachment; inclusion of the families in these [music] experiences; increase positive parent-child interactions	9	Ayson, 2011; DiRenzo et al., 2015; Geretsegger et al., 2014; Jacquet, 2011; Nicholson et al., 2008; Thompson et al., 2014; Thompson & McFerran, 2015; Vaiouli, 2014; Williams et al., 2012.
4. Parent knowing child better	father's experience of the influence of nature and music on one autistic's learning experience; opportunities for parents to experience what motivates the child; parents engage in a wide range of sensorimotor experiences with their child; use of affect, behavioral and developmental matching; shared control	3	Osei, 2009; Thompson, 2012; Yang, 2013
5. Parents gaining skills and knowledge	music therapist is model and teacher first, then facilitator of the parent-child interaction; training procedures; parents' behavior associated with children's developing competence, parent's self-confidence in parenting skills; encourage active participation of the parent; opportunities for parents to develop skills to enhance child's development; responsive parents focus primarily on supporting and encouraging their children to participate	9	Jacquet, 2011; McIntyre et al., 2013; Nicholson et al., 2008; Osei, 2009; Thompson et al., 2014; Thompson, 2012; Thompson & McFerran, 2015; Woo et al., 2015; Yang, 2013.

6. Parent expertise involved	families are involved in the program; parents involved in establishing goals for intervention; home-therapy; value collaboration between the parent and the therapist; practitioners and families striving to work together in partnership; improved communication between therapist and parents.	6	Ayson, 2011; Blair et al., 2011; DiRenzo et al., 2015; Thompson et al., 2014; Thompson, 2012; Thompson & McFerran, 2015.
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With regard to **parent coaching**, two styles seemed to emerge from predominant themes in the intervention descriptions: (a) behaviorally-based parent training and (b) parent participation or collaborative approach. These resulting categories and quotations are summarized in Table 5.

Table 5.

Parent coaching/training styles extracted from descriptions/definitions

Quotes	Citations	
Behaviorally-based parent training	parent-log sheets; 10 hrs. of training over 3 days, training material, in-class lecture, case studies and role-play; behavioral parent training principles, non-didactic behavioral strategies such as demonstration, rehearsal, feedback and praise; workshop sessions and training; highly structured teaching style; rapid pacing of familiar and novel developing activities, cuing, guided assistance, and fading of assistance, redirection, multi-sensory stimuli, and manipulatives; behaviorally specific verbal suggestions, use of praise, modeling, and positive reinforcement; given a kit with the items needed...along with written instructions, brief training; music-based parent education program to teach parents.	Ayson, 2011; Blair et al., 2011; Nicholson et al., 2008; Pitts, 2016; Standley et al., 2009; Williams et al., 2012; Woo et al., 2015; Yang, 2013.
Parent participation and/or Collaborative approach	Parent participation (no intentional training), meetings with parents, group or individual counseling, experiential or therapeutic groups; opportunity to create musical heritages that the family can cherish; external support to foster healthy relationships and socio-emotional adaptation; ongoing consultation; gentle negotiation in the relationship between parent-therapist and child; collaborative approach to working therapeutically with children; promoting parental responsiveness, matching their children's interests, playing interactively and interpreting their intentions.	Bakan et al., 2008; DiRenzo et al., 2015; Jacquet, 2011; Pasiali, 2012; Thompson et al., 2014; Thompson, 2012; Thompson & McFerran, 2015; Yang, 2013

Regarding *mapping and looking for associations and explanations* (last step in the framework analysis), the relationship between reasons to implement **parent-mediated interventions** and **parent coaching styles** was explored. The six reasons that support the use of parent-mediated interventions (Table 4) seemed to have different prominence in each coaching/training style (Table 5). These associations were explored by defining training style of each study, and then counting the most salient themes within its parent-mediated definition. These patterns of relative importance are represented in Figure 3 and 4 by assigning relative circle *widths* depending on the number of studies that mentioned each specific concept. It should be noted that some studies (Bakan et al., 2008; Pasiali, 2012; Pitts, 2016; Standley et al., 2009) did not include specific parent-led/parent-mediated definitions or concepts. Even though some of these concepts are implied in those studies, the figures represent *actual* number of quotations from the studies. Given the missing information, interpretation of Figure 3 and 4 should be done cautiously.

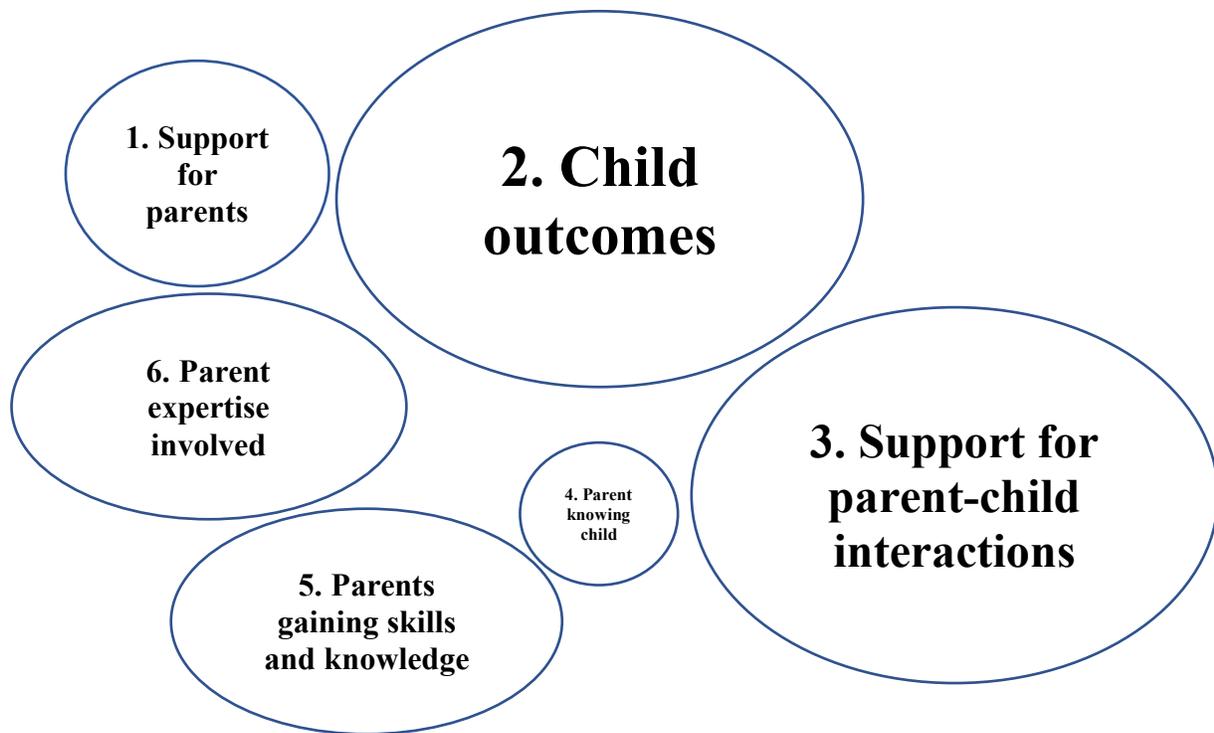


Figure 3. Patterns of relative importance of concepts: Behaviorally-based parent training

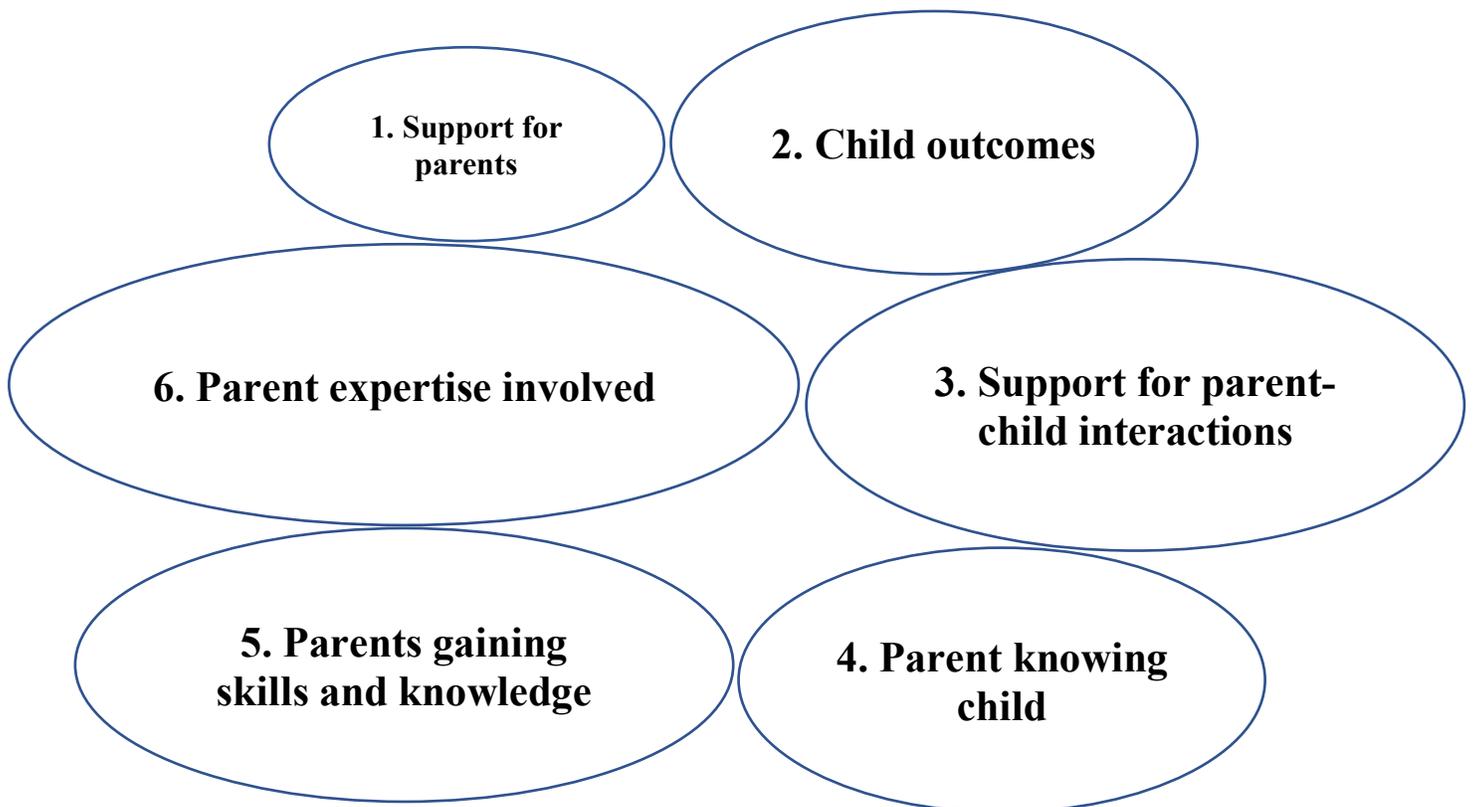


Figure 4. Patterns of relative importance of concepts: Collaborative approach

Framework analyses: Outcomes, Measures and Findings

Similar framework analyses were performed on the data for **Outcomes, Measures** and **Findings** (Question 6). These data were labeled and grouped (e.g., parental efficacy was used for all related concepts: self-efficacy, confidence, sense of competence, attitude towards own parenting, etc.) Four salient categories (themes) were extracted regarding the **outcomes**: parent outcomes, child outcomes, parent-child outcomes and therapist outcome. An index of each outcome category was then created, and the original data (spreadsheet with quotations) was coded with these categories (Table 6).

Table 6.

Outcomes of Parent Education Interventions that Included Music

Recipient	Category	Outcomes	References
Parents	1. Interactions with child	Positive physical and verbal interactions Decrease in negative interactions Seeing their child develop friendships with other children Actively seeking engagement during daily interactions;	Blair et al., 2011; Bakan et al., 2008; Nicholson et al, 2008; Pasiali, 2012 Thompson & McFerran, 2015; Williams et al., 2012; Yang, 2013.
	2. Parental efficacy	Educational activities in home Parent understanding, sensitivity, engagement and acceptance Insights for child learning Reinterpretation of behaviors Parent lead Confidence and creativity Optimism	McIntyre, 2013; Nicholson, 2008; Osei, 2009; Thompson, 2012; Thompson & McFerran, 2015; Vaiouli, 2014; Williams, 2012
	3. Mental health	Depression and anxiety	Nicholson et al., 2008; Williams et al., 2012
	4. Benefits and satisfaction	Communication with other parents Satisfaction Knowledge Parental perception of social skills in children, Generalization to daily routines. Materials for other therapists.	Ayson, 2011; Osei, 2009 Thompson & McFerran, 2015 Williams et al., 2012 Yang, 2013
	5. Music relevance	Use of music for development	Osei, 2009, Yang, 2013

Children	1. Social interaction	Active learning and organization Flexibility and resiliency Child engagement in activities and social interaction Engagement with peers and siblings Socioemotional reciprocity Social, play and communication skills Engagement in MT sessions Low anxiety and positive affect Joint attention	Ayson, 2011; Blair et al., 2012; Geretsegger et al, 2014; Kim, 2008; Nicholson et al., 2008, Thompson, 2012; Thompson et al., 2013; Vaiouli, 2014; Williams et al., 2012
	2. Emotional regulation	Flexibility and resiliency Problem behavior Social and emotional functioning Waiting and responding Positive verbal behavior	Nicholson et al., 2008; Standley et al., 2014 Thompson et al., 2013; Yang, 2013
	3. Cognitive abilities	IQ and FR NOTE: Baseline scores predicted beneficial outcomes	DiRenzo et al., 2015; Woo et al., 2015
	4. ASD symptoms	ADOS score at posttest.	DiRenzo et al., 2015; Woo et al., 2015;
	5. Language and communication	Receptive communication Non-verbal communication Verbal communication Play skills	Getsegger et al., 2014; Nicholson, 2008; Williams et al., 2012; Woo et al., 2015
	6. Self-help skills	Toilet training	Osei, 2009
	7. Child development	Developmental scores	Pasiali, 2012.
	8. Music Skills	Music behaviors	Pitts, 2016
	9. Sensory behaviors	Sensory responses	Woo et al., 2015
Parent-child	1. Parent-child interaction	Quality of parent-child relationships Change in perception of relation, of child and own responses towards child	Kim, 2008 Getsegger et al., 2014 Thompson & McFerran, 2015
Therapist	1. Role in relation to dyad	Preserve the family from medical intrusions. Emphasize positive. Promote expression of needs. Respect each family dynamics.	Ayson, 2011 Jacquet, 2011 Nicholson et al., 2008 Thompson & McFerran, 2015
	2. Intervention effectiveness	Most valuable music therapy strategies	Jacquet, 2011 Yang, 2013
	3. Social validity	Cultural background Cost effectiveness Generalization to daily activities Attrition	Blair et al., 2011 Nicholson et al., 2008 Woo, et al., 2015
	4. Professional interactions	Interactions and integration with treatment team	Ayson, 2011

Measures were listed and categorized in six groups: published scales/measures, *ad hoc* scales, behavioral observation (with clear operational definitions and coding manuals), informal observations, interviews, self-reports/self-reflections (Table 7).

Table 7.

Measures used in studies reviewed

Citation	Published scales	<i>Ad hoc</i> scales/result	Behavioral observation	Informal observation	Interviews/Survey	Self-reports
Ayson, 2011.	SCERTS				X	
Bakan et al., 2008.		X		X		
Blair et al., 2011.			X			
DiRenzo et al., 2015.	ADOS; Leiter-R					
Geretsegger et al., 2014.		*				
Jacquet, 2011.					X	
McIntyre et al., 2013						
Nicholson et al., 2008	CRQ; ECLS-BC; K-6; NEILS; PPBS.		X			
Osei, 2009.						X
Pasiali, 2012.	DECAS			X		
Pitts, 2016	ESCAL		X		X	
Standley et al., 2009		+				
Thompson et al., 2013	MBCDI-W&G; MTDA; PCI; SRS-PS VSEEC.				X	
Thompson, 2012				X		
Thompson & McFerran, 2015					X	X
Vaiouli, 2014			X	X		X
Williams et al., 2012	CQR; ECLS-BC; NEILS; PPBS.	Posttest questionnaire	X			
Woo et al., 2015	ADOS; Leiter-R; RDLS; SSP.				X	
Yang, 2013		PUMP; feedback sheet	X		X	X
TOTAL STUDIES	8	4	6	4	8	4

Published Scales: **ADOS:** Autism Diagnostic Observation Schedule (Gotham, Pickles, & Lord, 2009); **Leiter-R** (Roid & Miller, 2002). **CRQ:** Child Rearing Questionnaire (Paterson & Sanson, 1999); **ECLS-BC:** Early Childhood Longitudinal Study -Birth Cohort (National Center for Education Statistics, 2004); **K-6** (Kessler, et al., 2003); **NEILS:** NEILS Scales of Developmental

Competency (SRI International, 2003); **PPBS**: Parental Perceptions and Behavior Scales (Institut de la Statistique du Quebec, 2000). **DECAS**: Devereux Early Childhood Assessments Scale (Lebuffe & Naglieri, 1999). **ESCAL**: Every Sheffield Child Articulate and Literate (n.d.). **MBCDI-W&G**: MacArthur-Bates Communication Development Inventories-Words & Gestures (Fenson, et al., 2007); **MTDA**: Music therapy diagnostic assessment (Oldfield, 2006); **PCI**: Parent-child inventory (Gerard, 2005); **SRS-PS**: Social Responsiveness Scale-PreSchool (Constantino & Gruber, 2005); **VSEEC**: Vineland Social-emotional Early Childhood Scale (Sparrow et al., 1998). **RDLS**: Reynell Developmental Language Scales (Reynell & Gruber, 1990); **SSP**: Short Sensory Profile (Tomchek & Dunn, 2007).

Ad hoc Scales: *effect size for parent-child interaction, calculated from data in Kim, 2008, and Nicholson et al., 2008. + scale adapted from ItSEA (Briggs-Gwan, Carter, 1998) and Standley & Hughes, 1996. **PUMP**: Parental Use of Music and Play

The **findings** of the reviewed studies were categorized and mapped into the outcome index, dividing them in positive, null and negative results (see Appendix G for a comprehensive listing of results). The **main positive results** across studies refer to increased parenting skills (acceptance of child, responsiveness and positive interactions), increased social interaction and receptive communication in children, better parent-child relationships, and generalization of music activities or parenting skills to daily activities. **Null results** were reported in some studies regarding parent-perceived warmth and self-efficacy, parental perception of child behavioral problems outside of treatment, child social engagement outside of treatment and child vocabulary production and understanding. **Negative results** were mainly related to attrition and parental added effort to implement the strategies at home. In other words, several studies (Nicholson et al., 2008, Williams et al., 2012, and Woo et al., 2012) had high attrition, which limits the internal validity of their results. Furthermore, high parental effort needed to implement the strategies at home, despite parent-reported satisfaction, limits the social validity of these interventions.

Quality assessments

These assessments (Appendix D) indicate that the strongest area for most of these studies was the reporting score (55% average score, range 14 to 85%), whereas internal validity (specifically, selection bias) was the weakest (29% average score, 0 to 83%). As mentioned in the methods section, the reporting score was given if the intervention as a whole was well-

reported. The specific items of music intervention reporting (Robb, et al., 2011) are described below. Regarding research design, only 3 studies used comparison conditions, and were randomized. Studies that used bundled interventions did not report the number of participants that received a music intervention (DiRenzo et al., 2015; Woo et al., 2015). Therefore, the ability to affirm that the outcomes were due to the music intervention is compromised in most studies.

Quality of the music intervention reporting.

Characteristics of music interventions, when available, were compiled in a spreadsheet. A summary of this information is reported in Table 8. The components of the music intervention that were best described by most studies ($n = 16$, 84% of the studies) refer to intervention strategies (i.e., improvisation, songwriting, music-assisted relaxation, etc.) and setting (i.e., community, clinic and client's home). The aspects that were least reported referred to music structure (either published music being provided, or original/improvisational music being described) and music/non-music materials (5% and 25% of studies, respectively). Procedures and session formats were described in several studies, but only Yang (2013) provided enough specificity to make those sessions replicable. Fidelity measures of treatment implementation were reported in 40% (8) of the studies, and only 2 studies with music therapists as principal investigators reported the use of a complete, manualized procedure to ensure fidelity (Nicholson et al., 2008; Williams et al., 2012). Notably, both studies referred to the same music therapy program: *Sing & Grow*.

Table 8.

Music Intervention Reporting

	Studies	Music therapist as PI	Non-music therapist as PI
Music-based intervention terms	19	music therapy, musical activities, musical opportunities; musical experiences; music-based play; musical interaction; musical playtime	<i>medical ethnomusicology</i> (Bakan et al., 2008); <i>music and movement</i> , (Blair, 2011); <i>music therapy</i> (DiRenzo et al, 2015); <i>music workshops</i> ; <i>music intervention</i> (Pitts, 2016); <i>music stimulation</i> (Woo et al., 2015).
Clear definition of terms (descriptions of sessions not included here)	3	1 (Geretsegger, et al., 2014)	2 (<i>medical ethnomusicology</i> : Bakan et al., 2008, p.7; <i>music therapy</i> , DiRenzo et al, 2015, p. 32).
Rationale for Music use or selection	10	active participation; non-verbal communication; non-threatening context; to allow parents to express warmth and intimacy; to increase auditory awareness	lack of familiarity with instruments; preference; classical music; tailored to child's abilities to enrich communication
Published music provided	1	1 (Yang, 2013)	0
Original or improvisational music described	1	0	loud-soft explorations, drone tones, introducing unfamiliar instruments (Bakan et al., 2008)
Music materials described	5	3 (Nicholson et al., 2008; Standley et al, 2015; Thompson et al., 2013; Yang, 2013)	1 (Bakan et al., 2008)
Non-music materials described	3	2 (Standley et al, 2015; Yang, 2013)	1 (Bakan et al., 2008)
Intervention strategies	16	Improvisation (3) Movement and music (7) Recreating music by singing or playing (8) Instrument/vocal play (10) Listening (5) Songwriting (2) Music-assisted relaxation (4) Orff-type activities (1) Books and music (2) Not reported (2)	Improvisation (1) Movement and music (2) Recreating music by singing or playing (2) Instrument/vocal play (2) Listening (1) Musical games (1) Not reported (1)
Intervention length (session duration and frequency)	11	9 reported (6-16 weekly sessions). 45 to 60-min sessions	2 reported (6 sessions, Bakan et al., 2008; 2 training sessions, and school year, Pitts, 2016)
Certification and Credentials	15	12 MT-BCs or RMT; 1 MT student	1 PhD in Curriculum & Learning 1 ethnomusicologist

Number of interventionist	11	8 reported: 1 interventionist, 2 reported multiple (17 and 22 interventionists, Nicholson et al., 2014; Williams et al., 2012).	1 reported: 2 interventionists (Bakan et al., 2008)
Fidelity measures	6	4 reported: manualized training and supervision (Nicholson et al., 2008; Williams et al., 2012), therapy guide (Thompson et al., 2013), field notes for self-reflection (Pasialia, 2012)	2 reported: improvisational guidelines (Bakan et al., 2008), trained observers (Blair et al., 2011)
Size of group	6	parent-child, and music therapist, sometimes family members	0
Setting	16	community setting: 3 clinic or hospital: 2 client's home: 7	community setting: 2 clinic or hospital: 1 client's home: 1

Discussion

The purpose of this systematic review was to explore the state of published research in parent-mediated music interventions for children with autism spectrum disorders (ASD). The guiding questions referred to the existence of parent-led/mediated music interventions (question 1), understanding of parent-led/mediated interventions and parent-coaching and reasons for their use (question 2), interventionists' training to coach parents (question 3), existence of systematic parent training (question 4), outcomes and measures used in these studies (question 5) and findings of such interventions (question 6).

As was expected after the scoping searches, an emerging body of parent-mediated music interventions was evident (Question 1). Within the music therapy field, three models were found: *Sing & Grow* (Nicholson et al., 2008; Williams et al., 2012), *Musical Bonds*, (Yang, 2013), and Family-Centred Music Therapy (Thompson, 2012; Thompson et al., 2013; Thompson & McFerran, 2015). These models have different intervention strategies, broadly categorized as (a) mainly improvisational, (Thompson, 2012) and (b) mainly structured, pre-defined sessions (Nicholson et al., 2008; Williams et al., 2012; Yang, 2013). However, these distinctions are not

clear-cut since all structured models also used tailoring of the music to family needs and improvisation as therapeutic strategies. Of these models, only *Sing & Grow* had complete, manualized fidelity measures of implementation, and training processes (Question 3).

No study provided a clear definition of “parent-mediated interventions” or “parent-coaching” (Question 2). Notably, only the Family-Centred approach (Thompson, 2012) presented a conceptual framework for the inclusion of parents in therapy. Nonetheless, relevant quotes were found in each study’s literature review or intervention description. A framework analysis of these quotes showed that parent-mediated interventions are considered important in the treatment of children with ASD when music is involved. The six main reasons for including the parents in the sessions were: emotional support for parents, better child outcomes, support for parent-child interactions, parents getting to know their child better, parents learning new skills and knowledge of ASD, creation of parent networks, and inclusion of parental expertise in treatment. These reasons are in line with previous intervention reviews and best practices in ASD that have found that parent involvement in therapy promotes child development, and parental well-being and satisfaction (Oono, Honey, & Mcconachie, 2013; Zwaigenbaum et al., 2015).

Regarding parent-coaching (Question 4), two main styles were extracted from the intervention descriptions: behaviorally-based training and collaborative approach. Interestingly, Thompson and McFerran (2015) mentioned that “in contrast with parent training programmes (Vismara, Colombi, & Rogers, 2009), where professionals teach parents a prescribed set of skills, family-centred approach is a collaborative approach to working therapeutically with children.” (p. 4). However, more recent publications on the non-music model referenced by Thompson and McFerran (the Parent-Early Start Denver Model, P-ESDM, Estes et al., 2014) indicate that the P-ESDM does, in fact, consider a collaborative approach for goal-setting, and

utilizes adult learning and coaching (where the parent's expertise is incorporated) as models for training. Also, as mentioned, all the behaviorally-based music models reviewed included components of tailoring and improvisation within the sessions. The underlying theoretical differences, therefore, might not be as stark as implied by Thompson and McFerran (2015).

The most frequently used measures (Question 5) were published scales and interviews (eight studies each). Notably, only three music therapy studies (where the principal investigator was a music therapist) used published scales. This situation is unsurprising, considering that most music therapy studies ($n = 9$ of 12) had samples of less than 30 subjects, and the use of published scales and statistical analyses might prove inadequate. On the other hand, the frequent use of behavioral observations ($n = 6$ of 19 studies, Table 7) seemed an appropriate alternative for feasibility and limited-efficacy studies, which some of these studies indeed are (Blair et al., 2014; Nicholson et al., 2008; Pitts, 2016; Vaiouli, 2014; Williams et al., 2012; Yang, 2013).

Findings of the reviewed articles were categorized in parent outcomes, child outcomes, parent-child outcomes and therapist/intervention outcomes (Question 5 and 6). Positive results refer to increased parenting skills, increased child social interaction and receptive communication, better parent-child relationships, and generalization of music activities to daily life. On the downside, some of these interventions seemed to require significant parental effort to implement at home, and produced high attrition, despite reported high parental satisfaction (Nicholson et al., 2008, Williams et al., 2012, and Woo et al., 2012).

Quality of the Evidence

Quality assessments were performed only to determine the state of the research, and not as an exclusion criterion for this review. These assessments indicate that the strongest area for most of these studies was the intervention reporting, whereas selection bias was the greatest

threat to the internal validity. It should be noted that the reporting score only includes intervention reporting as a whole, and not music intervention reporting (MBI reporting, Robbs et al., 2011). In fact, MBI reporting seemed less than satisfactory: the most reported aspect was intervention strategies (80% of the studies), whereas music descriptions (published music provided or improvisation described) and materials were significantly lacking (5% and 25% of the studies, respectively). Fidelity measures for treatment implementation were used in only 40% of the studies.

Another limitation is the variability within the studies reviewed. Only 12 of the 19 studies were conducted by music therapists. Outside of the music therapy field (where the principal investigator was not a music therapist), music was assigned different levels of importance. For example, Osei (2009) considered music an essential component of the child's learning, whereas Woo, and collaborators (2015) used music listening as part of a bundled intervention, with one of the treatment groups (partial treatment) *excluding* music. On the other hand, Osei (2009) conducted an ethnography of his personal experience with his child with autism; his spontaneous discovery of music as a teaching tool was uninformed by any previous training. Contrastingly, Nicholson and collaborators, (2008), and Williams, and collaborators (2012) (all music therapists) reported on multisite, manualized interventions with many participants and trained interventionists. However, not all participants had an ASD diagnosis (only 25% in Nicholson et al., 2008; and 15% in Williams et al., 2012). Therefore, the variability in the amount and use of music within the studies makes comparisons and overall conclusions difficult.

Limitations

The greatest limitation of this review might be that it was performed by a single researcher; systematic reviews are ideally performed as team efforts. On the other hand,

systematic reviews need to be tailored to time, staff and funding constraints (Boland, Cherry, & Dickson, 2014; Gough et al., 2012). Also, strategies to address bias within these limitations have been proposed (Boland, Cherry and Dickson, 2014), and were included in this review: circumscribed and clearly defined research questions, consultation with specialized librarian to define a well-constructed search strategy, *a priori* selection of databases, predefined inclusion/exclusion criteria, conceptual and operational definitions of constructs, documentation of search strategies and number of citations, rationale for decision-making at each step, and rigorous data management. Additionally, the scoping searches indicated that the amount of available literature in the topic was very limited. The use of all these strategies allows confidence that most relevant literature was included in this review.

Implications for practice

Literature not eligible for this review (e.g., Jacobsen & Thompson, 2016; Oldfield & Flower, 2008; Strange et al., 2016; Warren & Nugent, 2010) indicates that music therapists have included families as significant elements of the therapeutic arena for a long time. On the other hand, specific components that distinguish parent-mediated music interventions are the inclusion of formal parent coaching/training and monitoring, accountability measures, and parents as co-therapist, and not only as participants in the sessions. Parent coaching is the formalized education that professionals provide to ensure fidelity of parent-mediated interventions. Both parent-mediated interventions and parent coaching are at a beginning stage in music therapy, according to this study.

It should be noted that there is no implication that parent-mediated interventions are *better* than family music therapy (i.e., parents as participants). Instead, a clear distinction was established for this investigation in light of current research in ASD that indicates that parent-

mediated interventions are a viable alternative when professional services are scarce, or as a complement to them. On the other hand, these interventions might require excessive parental effort to implement at home. Music therapists might consider developing and investigating this type of interventions, while being mindful of parental availability and resources.

Recommendations for future research

Consistent with previous reviews (Burns, 2012; Geretsegger et al., 2014; Kim & Stegemann, 2016; Silva et al, 2016; Silverman et al., 2016), this study indicates the need for music intervention reporting with greater detail in procedures, music descriptions, and materials, to make the interventions replicable. Additionally, including fidelity measures of treatment implementation would not only support valid results, but could also enable professional training on effective models.

From a systemic perspective, it can be stated that family interventions are moderated by multiple factors. Report of complete demographic information (such as a PROGRESS report, see Appendix F) would help readers understand the potential for generalization of these interventions. In the same line, assessments of social validity need to be considered.

Clarification of conceptual frameworks and researchers' stance could allow for informed comparisons between models. Furthermore, research of complex interventions might benefit from a stepwise approach where feasibility and pilot studies of limited efficacy are sequenced and followed up with larger-scale effectiveness studies (Robb, 2013). Finally, exploration of multi-layered models that include observed and latent measures of psychosocial measures (e.g., parental perceptions, parent-child bonding, social interaction), individual measures (e.g., child language and communication), as well as music psychological measures (e.g., arousal and sensory responses to music) might prove interesting and useful.

Conclusions

Parent-mediated music interventions for children with ASD are increasingly researched as a valid and valuable mode of intervention, mainly within the last five years (2012-2016). The quality of the evidence is limited due to atheoretical presentations of interventions, incomplete music reporting, lack of fidelity measures, inclusion of non-ASD populations, and varied outcome measures. However, important findings include the feasibility of using music within parent-mediated interventions, its potential to support parent and child outcomes, its alignment with best practices in ASD treatment, and social validity (high parental satisfaction) of music as an intervention for all family members. A possible next step in this line of research could be the creation of a conceptual framework that explicitly states constructs and hypothesized relationships. This theoretical rationale would allow the investigation of the role of music within a parent-mediated intervention, and would improve intervention design (Burns, 2012).

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CHAPTER III
A CONCEPTUAL FRAMEWORK OF
PARENT COACHING OF A MUSIC INTERVENTION FOR CHILDREN WITH ASD

ABSTRACT

Parent education has been included in several ASD treatment models, but scarcely within the music therapy field. The aim of this study was to develop a conceptual framework of music-based parent coaching for ASD. A constructionist approach that combined a well-researched treatment model (P-ESDM), extant literature, clinical experience, and reflection, was used to produce a conceptual framework of parent coaching of music interventions for ASD. A graphical representation, with definition of each variable in the model and their relationships, is included. This conceptual framework presents a parent coaching model, grounded in the Parent-Early Start Denver Model, to teach parents relationship-based music strategies that support their child's social communication development. Music is hypothesized to be a mediator, enhancing the psychophysiological synchrony between the dyad, while increasing child motivation and attention within a non-threatening and playful environment that can easily be incorporated during everyday family routines. The intervention would also increase parental responsiveness, which in turn, would support a child's development. Moderators of the intervention include child characteristics, parental wellbeing, and parental background. Parent coaching is currently researched as one of the most useful strategies within the ASD field. The hypothesized and known relationships in this conceptual framework require further research but serve as a starting point for parent coaching of a music intervention.

Keywords: parent-mediated, music-based, autism, ASD, parent coaching

Introduction

Autism Spectrum Disorder (ASD) affects social communication, daily routines and interactions, and has significant impact on family functioning (Steiner et al., 2012). Despite being considered best practice, early intervention services are often restricted due to time, costs, or availability constraints. This situation might leave parents without the necessary support in a critical moment: when an ASD diagnosis is suspected, or confirmed, and when such interventions might have their greatest effect (Rogers, Dawson, & Vismara, 2012). Parent-mediated therapies, where the parents implement the strategies in daily routines, have been researched as viable options for these families (see Strauss, Mancini, SPC Group, & Fava, 2013 for a comprehensive review). Concurrently, some treatment models have incorporated parent education to ensure that those interventions are effective and maintain fidelity to the original model (Coolican, Smith, and Bryson, 2010; Ingersoll & Wainer, 2013; Lucyshyn et al., 2015; Poslawsky et al., 2014; Rogers et al., 2012, 2014; Schertz & Odom, 2007). Even if professional services are also provided, parental involvement increases child outcomes, and parental wellbeing and satisfaction (Oono, Honey, & Mcconachie, 2013; Zwaigenbaum et al, 2015).

Background

Intervention models in ASD have included parents in treatment for many years (Diggle & Mcconachie, 2003; Oono, Honey, & Mcconachie, 2013). However, parent-mediated interventions within the ASD field have been increasingly used in the last decade (Kasari et al., 2014). Given that parent-mediated interventions and parent coaching are relatively new concepts, and mostly nonexistent in the music therapy literature, it seems reasonable to clarify their meanings and use within this conceptual framework.

Parent-mediated interventions

For the purposes of this project, parent-mediated intervention refers to the intentional inclusion of the family unit in the treatment process. Interventions are constructed such that parents are considered co-therapists; receive appropriate training and monitoring; and are involved in setting goals, locating resources, and reinforcing children's skills (Zwaigenbaum et al 2015). Even though the main purpose of this perspective is better child outcomes, parallel benefits for parents, such as empowerment, parental wellbeing, and parental self-efficacy, are expected and measured (Steiner et al., 2012; Wainer et al., 2017).

Parent education

Although sometimes used interchangeably, parent-mediated intervention and parent education are not synonymous. Parent-mediated intervention refers to the child-centered intervention that the parents provide to support their child's development. In contrast, parent education is "the educational effort [by professionals] to enhance and facilitate parent behaviors that will influence positive developmental outcomes in their children" (Steiner et al., 2012, p. 1219). Within the ASD field, professionals have provided variable amounts and quality of parent education to support parent-mediated interventions, as will be discussed later in this document.

Music therapy, Parent-mediated interventions and Parent education

Behavioral evidence supports the use of music to address core deficits in ASD (see Geretsegger et al., 2014, for a comprehensive review). At the same time, there is strong evidence that music therapists have included parents in sessions for a long time (Allgood, 2005; Oldfield & Bunce, 2001; Oldfield & Flower, 2008; Pasiali, 2012; Strange et al., 2016; Warren & Nugent, 2010). However, few music therapy studies have incorporated a parent-mediated perspective and parent education in the treatment of children with ASD, as defined here. In a systematic review

of music-based parent-mediated interventions for children with ASD (Chapter II), only three models that include some level of parent education were identified: *Sing and Grow*® (Nicholson et al., 2008; Williams et al., 2012), Family-Centred Music Therapy (Thompson et al., 2012), and *Musical Bonds* (Yang, 2013).

Sing and Grow® is a music-based intervention that provides group music therapy sessions to parents and children at risk of developmental delays (Nicholson et al., 2008; Williams et al., 2012). This model is provided by professional music therapists and requires training and certification. A significant component of the model is behaviorally-based parent training. Parents participate in the sessions and receive in-the-moment feedback to promote parenting skills. They also receive a CD and songbook with the expectation that they will use them at home. The intervention is anchored in attachment theory, behavioral parent training, and interaction theory (Nicholson et al., 2008). The music is expected to enhance parental responsiveness (although a specific mechanism is not explored) and create a non-threatening environment for positive interactions. This intervention has been studied in mixed samples (adolescent mothers, families in poverty, and families with a child with disability), limiting generalization of results to the ASD population. On the other hand, two large sample studies showed encouraging results on child outcomes (communication and play skills), and parent satisfaction, while reporting no change in parent-reported warmth and self-efficacy (Nicholson et al., 2008; Williams et al., 2012).

Thompson (2012) presented a model of Family-Centred Music Therapy (FCMT) that purports to work in partnership with the parent, “follow the child’s lead”, “entice the child with motivating activities”, use “positive affect”, become “a play partner”, “keep the child’s anxiety low”, “match the child’s abilities”, use “social communication development theories”, and allow

the “child to initiate the interaction” (p. 111). The FCMT has significant parallels to the Early Start Denver Model (ESDM) and Parent-ESDM (P-ESDM), which is the basis of the present conceptual framework (Dawson et al., 2010; Rogers et al., 2012). A clear point of divergence with the P-ESDM is that the FCMT model keeps the music therapist at the center of the model as the play partner who directly interacts with the child and models the expected behaviors for the parent during the music therapy sessions. Furthermore, Thompson (2012) considers that the “less structured intervention” (p.113) is the most conducive to parent-child interaction, although she acknowledges that “to keep the session positive... the activities needed to be structured for success” (p. 113). As will be discussed, adult structuring of “unstructured” play activities is considered essential for effective interventions in the present study. Finally, although parent education is mentioned in further studies of the FCMT model, and parental perceptions of parent-child interactions are qualitatively assessed, objective measures of parental learning are not included (Thompson et al., 2013; Thompson & McFerran, 2015).

On the other hand, significant contributions of the FCMT model are its consideration of extant theories of social development, its attention to child initiation and interests, and its adherence to best practices in early intervention, such as parent involvement, playful interactions, and multimodal education. These practices are increasingly demanded in the ASD field.

An emerging model, *Musical Bonds*, was investigated in Yang’s doctoral dissertation (2013). Yang proposed a home-based parent education program that addressed parental responsiveness during parent-child interactions. According to Yang, music creates safe and stimulating environments where the parents can engage in playful, nonverbal interactions, while learning about their children. Furthermore, music structure supports language learning, auditory

awareness, emotional sharing, and attention (Yang, 2013). Significant contributions of this model were the naturalistic training environment (family home), behavioral definitions and measures of parental responsiveness, session plans included in the document (which allows for replicability), and follow-up interviews to determine maintenance 3 months later. As with previous models, *Musical Bonds* is intended for children with any disability, not exclusively ASD.

Although treatment models that view parents as participants are indeed invaluable, those interventions have a different therapeutic intent than parent coaching. Except for *Musical Bonds* (Yang, 2013), which is indeed a parent education program, the former studies conceptualize the music therapist as the interventionist who directly interacts with the child, while parents observe and learn. In fact, some of these models would be better conceptualized as parent participation models, where the parent is involved in the session, but has limited input in the planning, and remains a recipient of the therapy. Another important limitation is that those models have been implemented with individuals with a variety of disabilities. Even though the general concepts of parent-child interactions and parental responsiveness are similar regardless of the child's disability, the specific needs (e.g., joint attention skills) and therapeutic strategies might differ substantially among populations (e.g., Freeman & Kasari, 2013; Kasari, Freeman, & Paparella, 2006; Venuti et al., 2012). Additionally, most studies have limited conceptual frameworks stating known or hypothesized relationships between the outcomes and active ingredients of these interventions. Given the increasing participation of parents in therapy, a conceptual framework that supports research and clinical practice within music-based parent coaching in ASD is needed.

Purpose statement

The purpose of this study¹ was to create a conceptual framework for parent coaching of music interventions for children with ASD. A previous study (Hernandez-Ruiz, 2017) showed initial feasibility of a music therapy program to coach parents within a well-researched relationship-based model for ASD, the Early Start Denver Model (Dawson et al., 2010), and its parent-mediated counterpart, the Parent-ESDM (P-ESDM, Rogers et al., 2012). This document is a follow-up of that study. It attempts to provide theoretical support for modifying the P-ESDM to include music as an active ingredient of the intervention.

Conceptual framework: Basic Definitions

The following conceptual framework uses precise constructs for its presentation. To ensure clarity, definitions of some of these constructs are included here.

Autism Spectrum Disorder (ASD). ASD is a neurodevelopmental disorder characterized by difficulties in social interaction and communication, and repetitive interests and behaviors (DSM-V, 2013). In the domain of social interaction and communication, the areas more frequently affected relate to the development of joint attention and intersubjectivity, socio-emotional engagement, and understanding of nonverbal cues for communication.

Music therapy vs. music interventions. For the purposes of this study, music therapy is conceptualized as the professional discipline that requires a minimum of a bachelor's degree (in music therapy), board-certification and/or licensure (in the states and countries where these exist). Music therapy is supported by extensive research and professional practices. Certified music therapists use evidence-based interventions to achieve individualized goals, within a

¹ This document is considered a study, and not a review, since the constructivist process of reviewing the literature, integrating knowledge, incorporating clinical wisdom, and proposing an explanatory theoretical model goes beyond the expectations of any literature review.

therapeutic relationship (adaptation of the American Music Therapy Association's definition, 2017). In contrast to "music therapy," music interventions are therapeutic interventions where music is the active ingredient that supports behavioral change (Robb, Burns, & Carpenter, 2011). Ideally, interventions are designed and implemented by music therapists, although music interventions by other professionals are indeed found in the literature.

Mediator. A mediator is an intervening variable that explains the mechanism of action of a predictor (in this case, P-ESDM intervention) on the outcomes (Baron & Kenny, 1986).

Music as a mediator. In this conceptual model, I propose a definition of music therapy (discipline) as *the art and science of using music as a mediator of behavioral change*. Within this definition, music would be considered the intervening variable between the predictor (parent coaching), parental responsiveness (another mediator), and the dyad's outcomes (parent, child and parent-child outcomes).

Moderator. This variable modifies the direction and/or strength of the relationship between the predictor and the outcomes. It is independent from both predictor and outcomes, and it helps establish *when* and *for whom* the intervention is more efficacious (i.e., which family characteristics enhance or diminish the effect of the intervention) (Baron & Kenny, 1986).

Conceptual framework: A statement of relationships

A conceptual framework is a logical argument that presents definitions of variables, and the relationships between them, oftentimes represented graphically (Ravitch & Riggan, 2012).

The conceptual framework that emerged from the present study (Figure 5 and summary below) is provided here as a roadmap to the ensuing presentation of extant literature that supports it.

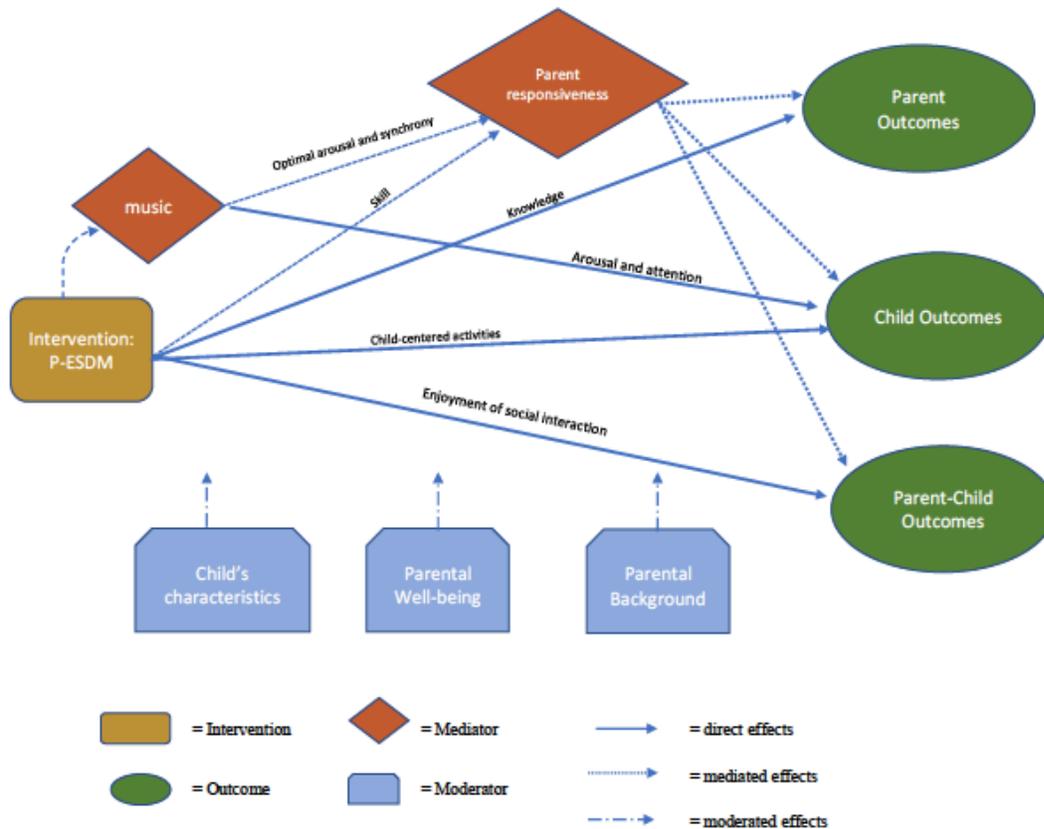


Figure 5. Conceptual framework of parent coaching based on the P-ESDM

In this conceptual framework, the P-ESDM is the intervention and predictor of child, parent, and parent-child outcomes, mediated by parental responsiveness. In other words, the P-ESDM provides parents with discrete skills that enhance their ability to support their child's development (child outcomes), increasing their own self-efficacy (parental outcomes). Additionally, the P-ESDM creates child-centered interventions that increase the child's motivation to learn and participate (child outcomes). Furthermore, the effect of the intervention depends on parental responsiveness. That is, parents' ability to respond sensitively to their child's communication bids and behaviors determines child's learning (parental responsiveness as a mediator). Promoting the enjoyment of social interaction (relationship-based feature of the P-ESDM) supports better parent-child outcomes.

Within the proposed model, when music is present, it is a mediator between the P-ESDM coaching and child outcomes, through impacting parental responsiveness. In other words, music creates a non-challenging and playful environment, where the parent becomes more responsive to his/her child, which, in turn, promotes child learning. Music is also hypothesized to have a direct effect on child outcomes, by increasing the child's attention, focus and motivation. Moreover, music allows synchronization of physiological arousal and behavioral responses that creates an engaging routine between the dyad (parent-child outcomes). This sequence of effects (P-ESDM → Music → Parental responsiveness → outcomes) corresponds to a sequential mediation model.

Parental wellbeing is considered a moderator that can impact either parental responsiveness (his/her ability to respond to the child) or parent coaching (by enhancing/obstructing parental learning of the strategies presented during coaching). Other moderators include child characteristics, and parental background. The variables in this model and their relationships are explained and supported by extant literature below.

Conceptual Framework: Integration of the Literature

The following literature was reviewed, integrated and combined with the researcher's clinical experience, in an iterative process, to develop the conceptual framework depicted above. Each variable in the model is now explained.

The intervention: Parent education and P-ESDM

The intervention in this conceptual framework is based on the Early Start Denver Model (ESDM; Rogers & Dawson, 2010) and the Parent-ESDM (Rogers, et al., 2012). This model is framed within parent education—more specifically, parent coaching. For clarity, a brief

exploration of parent education definitions and principles is provided before the description of the ESDM and P-ESDM.

Parent education (parent coaching and training)

Parent education is the intervention provided by trained and experienced professionals to the parents of children with disabilities to enable them to support their child's development in daily activities (Ingersoll & Wainer, 2103). Parent education is different from psychoeducational parent groups in that it is not only concerned with providing knowledge, but rather with *developing skills* (Steiner et al., 2012). Broadly speaking, parent education could be divided in two distinct categories: **parent training** and **parent coaching**. In the former, short, discrete training sessions are provided to teach parents specific skills (e.g., Besler & Kurt, 2016; Reagon et al., 2009). The goal is determined by the practitioner, and the technique is pre-established, and many times, based on ABA principles (e.g., Barton & Lissman, 2015), but are also present in relationship-based programs (e.g., Solomon et al., 2007). Treatment efficacy is measured through changes in parenting practices decided by the professional, such as limit setting, handling misbehavior, or providing specific praise. In one study, functional relationships were found between this training and positive parenting, but the strength of the relationship was low (Barton & Lissman, 2015).

On the other hand, research in the last decade has shown that including parents in goal setting and intervention planning increases time effectiveness, sustainability, parental buy-in, family empowerment, and benefits to all family members (Klein & Kemper, 2016; Pinnock et al., 2008, Shire et al., 2016; Steiner et al., 2012). This finding is true regardless of the specific approach: behaviorally-based (Cavkaytar & Pollard, 2009; Young et al., 2013), or relationship-based treatments, such as play narration (Lane et al., 2016), “coordinated movement play”

(Chiang et al., 2016), and parent home-based communication intervention (Brown & Woods, 2015). In other words, **parent coaching**, where the parent actively participates in decision making, and engages in self-reflection with a practitioner, seems to show better child and parental outcomes, and higher social validity, than parent training.

Importantly, *structured* parent coaching has shown better functional relationships and stronger effects than less structured interventions (Shire et al., 2016). Structured parent coaching is understood as the intervention where the parents have *in vivo* practice of parent- and therapist-chosen skills, with immediate feedback, and clearly defined behavioral outcomes for both child and parent. Less structured interventions are those where parents follow “every child’s bid while losing structure and coherence of the larger play routine (high responsivity, low strategy use)” (Shire et al., 2016, p. 1745). Equally ineffective are overly directive parents, who have low responsiveness, but clear didactic strategies, and who miss the opportunity to incorporate children’s interests and communication into the interaction (Shire et al., 2016).

In fact, recent recommendations for parent education in ASD include: naturalistic settings, individualized coaching tailored to the particular needs and routines of the family, *in vivo* practice, with less modeling (to avoid positioning the professional as “the expert”), collaborative approach, and strength-based practice, both regarding the parent’s and the child’s skills (Schertz et al., 2012; Steiner et al., 2012). Apparently, a delicate balance of parental interests and skills, professional feedback and structure, and child needs should be attained to provide effective parent coaching.

Early Start Denver Model (ESDM)

The intervention in this conceptual framework is anchored in the ESDM. The ESDM is a research-based clinical model that integrates applied behavioral analysis (ABA) principles with a

developmental, relationship-based approach to create a comprehensive, manualized and structured intervention for children with ASD symptoms, aged 12 to 48 months (Dawson et al., 2010). This model promotes a child-centered, responsive style that embeds behavioral teaching objectives within the child's play and interests (Rogers et al., 2012).

Parent-ESDM

The ESDM was designed as an intervention model and training for professionals in the ASD field. In its original presentation, the therapists implemented an intensive 20 hours per week schedule (Dawson et al., 2010). Recently, advances in parent coaching, and parent-mediated therapies, as well as socioeconomic pressures, have set the stage to share this therapeutic intervention with parents (P-ESDM) as an effective alternative or complement to professional treatment (Estes et al., 2014, 2015; Fulton et al., 2014; Rogers et al., 2012; 2014). Some of the principles of this intervention as they are taught to the parents in a manualized approach (P-ESDM, Dawson, Rogers, & Vismara, 2012) are discussed in Hernandez-Ruiz (2017).

The P-ESDM is both a parent-mediated intervention (i.e., parents implement the strategy with their child), and an evidence-based model to coach parents (Rogers & Vismara, 2015). It is a step-by-step approach that teaches parents relationship principles associated with ESDM such as gaining child's attention, sustaining the interaction, encouraging verbal and non-verbal communication, and incorporating play skills within everyday routines and interactions. Importantly, parents are not taught to elicit specific behavioral learning objectives (Estes et al., 2014). A collaborative approach is considered essential for the social validity of the approach, and for increased outcomes. The P-ESDM has a parent coaching manual with 10 intervention themes and a clear developmental curriculum (Rogers & Vismara, 2015). As mentioned,

structured parent coaching, such as this, have shown greater efficacy than parent psychoeducational programs or parent participation programs (Shire et al., 2016).

In some studies using the P-ESDM, parents achieved fidelity within eight to nine 1-hour sessions, and children showed improved communication outcomes (Estes et al., 2014; Rogers et al., 2012). Although they did not show a difference in outcomes with a community group, the P-ESDM group achieved similar fidelity with approximately half the intervention hours (Rogers et al., 2012). Parents in the P-ESDM group had significantly higher parent-therapist alliance, and they did not report an increase in stress, as compared with parents in community groups. Given that time of diagnosis and start of treatment is a particularly stressful time, the lack of increase in stress of these parents could indicate better adjustment to the challenges of the diagnosis (Estes et al., 2014).

In a long-term follow-up of effects, the children maintained gains in intellectual abilities, adaptive behaviors, symptom severity, and limited challenging behaviors, significantly different from the community group. These outcomes occurred even when therapy was reduced to 4 hours per week, compared to 15 hours during the P-ESDM coaching (Estes et al., 2015). Successful developments of this model include community-based delivery, telehealth adaptation, preschool groups, and infant parent-mediated therapy (Rogers et al., 2014; Ryberg, 2015; Vismara et al., 2013). In a controlled trial of the latter, parents showed skill acquisition during the 12-week coaching and reported high satisfaction and alliance with the therapeutic team (Rogers et al., 2014). From this comprehensive experience, the P-ESDM manual was improved, and P-ESDM training for professionals provided.

ESDM and P-ESDM: Mechanisms of change

Recent trends in intervention research require that researchers theorize and investigate the mechanisms of change within the interventions (i.e., *how* and *why* an intervention works) instead of limiting their research to effectiveness studies (i.e., *whether* the intervention works) (Melnyk & Morrison-Beedy, 2012). Regarding the mechanistic explanations of the ESDM and P-ESDM, Sullivan and collaborators (2014) proposed potential mechanisms based on neuroscientific findings of ASD and on ESDM characteristics, as described below.

One of the most consistent neurological findings in ASD is alterations in white matter (Schipul, Keller, & Just, 2011). Frequently, people with ASD show increased or modified patterns of white matter. These patterns can enhance cognitive abilities that require connections between smaller regions of the brain, within a single lobe (i.e., local connectivity), such as visual and pitch processing (Schipul, Keller, & Just, 2011). This neurological profile might explain the common observation that people with ASD are particularly adept in processing pitch (DePape et al., 2012).

These alterations in white matter produce diminished *integration* processes, which require connection between different areas of the brain (i.e., global connectivity) (Aitken, 2008; Sullivan et al., 2014). This type of multimodal integration is particularly important for complex cognitive processes, such as the ones observed in the mirror neuron system (Sullivan et al., 2014). The mirror neuron system seems to be responsible for affect identification, imitation, empathy, and social learning. The white matter alterations in ASD might limit multimodal integration. These limitations lead to a lack of bodily synchrony and social coordination—due to the lack of imitation and empathy—that, in turn, create impaired social interactions (Sullivan et al., 2014).

These neurobiological differences in children with ASD impact their ability to respond to environmental (social) stimuli. Theoretically, such limitations could be overcome by either modifying the biology or the environment. According to the experience-expectant neuroplasticity theory (Greenough et al., 1987), learning is a combination of biological readiness with timely environmental stimulation. In Sullivan and collaborator's (2014) opinion, early intervention by the ESDM capitalizes on the experience-expectant neuroplasticity by increasing the salience and coherence of the social stimuli in a timely fashion, thus facilitating its processing by a compromised biology (ASD brain). The latter is supported by an EEG study, which observed normalization of evoked response potentials (ERPs) after ESDM treatment of children with ASD when responding to social and non-social daily routines (Dawson et al., 2012). A larger response to social stimuli (faces) correlated with improved social skills in the ESDM group compared to controls (Dawson et al., 2012). Given the need to provide intensive, constant and consistent stimulation, Sullivan and collaborators (2014) considered that the parent coaching element of the ESDM was essential to create this change.

Two other features of the ESDM might also explain the changes produced by the ESDM. Abundant research has found that learning is more meaningful when provided in context. Further, optimal arousal levels and affective engagement are necessary to achieve such learning (Dolcos et al., 2011; Markovic, Anderson, & Todd, 2014). One of the main techniques of the ESDM, the social-sensory routines (SSRs), provides contextual learning (i.e., relevant verbalizations, joint attention bids, repeated structure), that is immersed in arousing (sensory) and affectively engaging (social) interactions. After establishing its reward value, the parent makes its repetition contingent on the child's communication efforts, thus reinforcing the learning and value of the social interaction (Sullivan et al., 2014).

A third feature, the promotion of complex neural networks and long-distance connectivity, is supported by multimodal, multi-domain, and thematic teaching. In ESDM and P-ESDM, the adult follows the child's interest (to enhance motivation), and then introduces a "theme" with multiple objects and sensory stimulation. S/he then elaborates through verbal, play and social strategies, while monitoring arousal levels, with transitions being critical for attention and engagement. All these characteristics might indeed provide a multimodal context for complex and long-distance neural connectivity (Sullivan et al., 2014).

In summary, the characteristics of the ESDM that explain its mechanisms are: a) early intervention with constant, contingent, multimodal learning in context, b) stimuli salience that supports processing by a compromised brain, and c) stimulation provided by the most significant figure in the child's life, the parents. Collaborative, structured, and strength-based parent coaching (P-ESDM) gives the parents the tools to implement the ESDM at home and supports the effectiveness of this parent-mediated intervention.

The mediators: Parental responsiveness and Music

This conceptual framework is based on a sequential mediated model. In other words, the effect of the intervention is partially explained by two intervening variables: parental responsiveness and music. Parental responsiveness is considered to explain the effect of the intervention (P-ESDM) on child outcomes by increasing the parent's ability to respond to the child's communication. Music, in turn, would mediate that effect of parental responsiveness by increasing parental arousal and synchrony. Given that in its original form the P-ESDM is not a music-based intervention, parental responsiveness could be considered the main mediator, and will be addressed first. The effect of music on parental responsiveness is addressed as a second

mediator (see Figure 5). Finally, a direct effect of music on the child with ASD is explored at the end of this section.

Parental responsiveness

One of the most consistent findings regarding parent-mediated interventions is that their effectiveness depends on parental responsiveness. In this study, parental responsiveness refers to the parent's "immediate, contingent, and affectively positive reactions" to the child's communicative gestures, attention and activity, particularly during play (Ruble et al., 2008, p. 158). It also refers to appropriate timing, flexibility in interactions, acceptance of speech and emotions, amount of interaction, and non-punitive conflict handling (Biringen et al., 2014), as well as consistent response to child's overt and subtle behaviors (Harker et al., 2016).

Parental responsiveness seems to be essential for enhanced child development. Parental responsiveness has been associated with improved language development and socialization in typically developing children, and children with disabilities, even when controlling for child gender, maternal education, and socioeconomic status (Buchanan, 2009; Hudson et al., 2015; Ruble et al., 2008; Siller & Sigman, 2008; Siller et al., 2014). Therefore, in this model, parent education (the P-ESDM music-based parent coaching) is hypothesized to increase parental responsiveness (mediator), which, in turn, promotes child outcomes. As such, parental responsiveness is considered the main variable to be modified by the music-based coaching (i.e., point of intervention). Further discussion of parental responsiveness in ASD is included as support to this hypothesis.

Specifically, in families with ASD, spontaneous parental responsiveness has been studied regarding parental verbal behaviors, play behaviors, and requests/directives (e.g., Flippin & Watson, 2011; Freeman & Kasari, 2013; McDuffie & Yoder 2010). Within naturalistic

observations of parent-child interactions during play, mothers of children with ASD have shown increased use of child's name to gain the child's attention, more references to themselves (mother), more use of commands and suggestions, and more difficulty in matching the appropriate play level of their child, compared to mothers of typically developing children, and of children with Down syndrome (Freeman & Kasari, 2013; Venuti et al., 2012). Even with an older child (i.e., a 9-year old boy), the use of monitoring, scaffolding, modeling, reminding, and contingent feedback was used by a mother to encourage play and socialization (Okcun & Akcin, 2012). Although these findings might indicate less parental responsiveness or more intrusiveness in parents of children with ASD, it can also be explained by their children's well-documented difficulties in responding to joint attention bids and limited play skills (Ruble et al., 2008). Parents might have realized through everyday experience that a more directive approach elicited better responses.

Further support for this statement can be found in the literature. Recent research has distinguished between parental responsiveness (ability to maintain child's focus of attention, and the use of developmentally appropriate language) and directiveness (amount of parental commands or suggestions to redirect the child's focus of attention, Harker et al., 2016). A few years ago, it was considered that non-directive commands would engage child's attention in play longer than directive bids for attention. Directive interactions were considered appropriate for skill acquisition (e.g., teaching self-help skills), but not to promote social interaction (e.g., Ruble et al., 2008). However, more recent research has uncovered a more nuanced reality: parental cues that align to child's interests during play, even if directive, sustain child attention longer than those which redirect attention or introduce a new focus of attention (Brigham et al., 2009). Moreover, follow-in commands (a directive that follows child's interest) with multiple orienting

cues (i.e., gestural, verbal, and, object showing) support child's attention on the joint activity and prompt language better than non-demanding cues (McDuffie & Yoder, 2010; Walton & Ingersoll, 2015). This finding corresponds with behavioral observations that *structured* parenting (where parents have high directiveness, but also high responsiveness) is more effective than unstructured ones in producing child engagement, language production, and play skills (Stein et al., 2012).

Apparently, parental responsiveness, even if paired with high directiveness, is optimal for social development. However, an important modifier of this assertion was reported by Siller and collaborators (2013). The investigators found that maternal insightfulness *at baseline* moderated the effect of the intervention on maternal synchrony (i.e., parental responsiveness). In other words, the parent-mediated intervention promoted more maternal synchrony compared to controls; however, this effect was enhanced/limited by the mother's initial ability to understand her child's behaviors and describe them in a "rich and nuanced way"—maternal insightfulness (Siller et al., 2013, p. 541). The authors argue that parent coaching that promotes parental self-reflection would support this maternal insightfulness, and therefore, responsiveness (Siller et al., 2013, 2014).

Another very important, but less studied, effect of parental responsiveness relates to attachment. Children with ASD have shown similar attachment behaviors with caregivers once idiosyncratic communication behaviors are considered (vanIJzendoorn et al., 2007). On the other hand, a smaller percentage of children with ASD seem to achieve secure attachment, and more of them show a disorganized attachment, compared to children with intellectual disabilities, with language delays, and with typical development (vanIJzendoorn et al., 2007; Marcu et al., 2009). Children with ASD that had a disorganized attachment showed less frequency, diversity and

complexity of symbolic play (Marcu et al, 2009). Interestingly, initial evidence showed that parental sensitivity was *not* associated with more secure attachment in children with ASD—in contrast with the development of secure attachment in typically developing children, which is indeed associated with parental sensitivity (Marcu et al., 2009). However, a parent-mediated (and parent coaching) intervention that addressed maternal synchrony did increase attachment of children with ASD (Siller et al., 2014). Given the established importance of attachment on development, this finding is encouraging, and deserves further research.

An important caveat of these correlational studies refers to the fact that the direction of the effects can be reversed. In other words, child responses could be the result of parental responsiveness, as discussed before, or parental behaviors could be the result of the child's response (or lack, thereof) to social stimuli (e.g., Cassel et al., 2013; Hudson et al., 2015). This fact is consistent with a transactional model of development, which considers both partners active agents that shape the interaction while simultaneously receiving its effects (Sameroff, 2009). Furthermore, children's responsiveness to bids of attention has been found to predict language rate of growth, *independent* of parental responsiveness (Siller & Sigman, 2008). Notwithstanding this undeniable perspective, in this conceptual framework, parental responsiveness is considered an antecedent, and not a consequence since it is the point of intervention where parent coaching could have an effect. Child responses are considered outcomes of the intervention. Child responsiveness at baseline is included as part of “child characteristics” (moderator) later in this document.

In summary, parental verbal and nonverbal behaviors that align with the child's interests prolong child's attention in joint activity, support language initiation, and teach new social skills, even if parental behaviors are directive (Walton & Ingersoll, 2015). A possible mechanism of

this effect, as was mentioned in the P-ESDM description, is that salient and contingent social stimuli allows the child with ASD to process the interaction (Ruble et al., 2008). Structured, multimodal strategies, in an affectionate and playful interaction, within natural environments, seem to be indispensable ingredients of effective parent-mediated interventions. Parent coaching that promotes parental insightfulness (i.e., self-reflection) would increase parental responsiveness, and therefore, support the parent-mediated intervention (Siller et al., 2013).

Music

In the present framework, music is hypothesized to have both an effect on parental responsiveness (mediating a mediator), and an effect on child outcomes through increasing child motivation and arousal (music as a mediator). Both relationships are explored.

Music and its effect on parental responsiveness. In this model, music is hypothesized to increase parental responsiveness. Clinical and neuroscientific studies of music and parent-child interactions justify this assertion.

Beyond the studies reviewed in the introduction, several music therapy studies have addressed parental responsiveness based on clinical observations of effects. Oldfield and Bunce (2001) reported the effect of early intervention music classes not only on toddlers, but on parents' self-confidence and hope, which "was a starting point for... strengthening or improving their relationship with their children" (p.33). The authors theorized that the music allows parent and child to "go back to a preverbal stage and recreate basic sound responses and exchanges" (p. 30), while creating a family ritual in a playful environment.

More recently, Walworth (2009) measured parental responsiveness in developmental music groups for premature and full-term infants. Although not significantly different from the no-contact group, parents in the music groups increased positive parenting behaviors (responsive

to toy play, responsive to distress, and focus), and decreased negative behaviors (prohibition, interrupting, miss, and lack of involvement) after the music sessions. Two important limitations of this study were self-selected participants, and a posttest-only design. However, this study points to an increasing interest in engaging parents in early intervention music therapy services, and the ability of music-based intervention to impact parental responsiveness.

Outside of the ASD field, two recent music therapy studies addressed parental responsiveness, or similar constructs. Puyvelde and collaborators (2014) studied mother-infant intersubjectivity with depressed mothers and their infants. Intersubjectivity is explained as the interpersonal cycle of communication, is based on joint attention, and is highly dependent on parental responsiveness. Puyvelde, and collaborators (2014) found that improvisational, pentatonic music paired with “mimicry,” had a positive effect on number and duration of intersubjectivity moments. Moreover, in the last session (session 5), mothers and infants seemed more able to create and sustain autonomous playful interactions (Puyvelde et al., 2014).

Similarly, Jacobsen and collaborators (2014) found that parents of emotionally neglected children increased parenting skills, and mutual attunement (i.e., listening, acceptance and understanding) when involved in music-making with their children. Importantly, parental responsiveness as measured by the Assessment of Parenting Competencies (Jacobsen & McKinney, 2014, in Jacobsen et al., 2014), did not show significant differences between groups (music-based intervention and community service). However, this population might be notably different in parental psychopathology and parent-child attachment, compared to families with ASD.

Beyond a behavioral effect, music could create optimal psychophysiological arousal for the parent and child with ASD, making the interaction more pleasurable (bio-behavioral

synchrony theory, Feldman, 2012). The bio-behavioral synchrony theory posits that “over time and repeated experience, parent and child become sensitized to the physiological and behavioral cues of the partner, particularly to its intensity, rhythms, and temporal qualities” (Feldman, 2012, p. 155). The specific interaction patterns are culture-dependent: industrialized cultures tend to rely on active parenting, while more traditional cultures rely on physical proximity and touch. However, these affiliative behaviors produce similar attachment outcomes. Interestingly, this synchronicity generalizes to other relationships, and seems to persist throughout the individual’s life (Feldman, 2012).

The maternal behaviors that sustain bio-behavioral synchrony, such as gaze, motherese, positive affect, and touch, are associated with activation of specific brain networks, affiliative hormones and autonomic responses. Feldman (2012) found that oxytocin regulation and heart rate coordination (vagal tone) of mother and child is modulated by a close match in social behaviors, such as gaze and voice, during play. Moreover, Nucleus Accumbens (NAcc)² activation was found for synchronous mothers, whereas amygdala activation was found for anxious mothers, indicating that parenting has different valence and possibly underlying feelings (i.e., pleasure vs. worries and fear) in synchronous and intrusive mothers (Feldman, 2012).

A first exploration of this theory on the ASD population found that more bio-behavioral synchrony (i.e., concurrent sympathetic arousal measured through electrodermal activity) was associated with lower levels of ASD symptoms in the child (Baker et al., 2015). In other words, increased ASD symptoms seemed to interfere with the child’s ability to detect and synchronize to behavioral and physiological cues from the parents, limiting social interaction.

² The NAcc is part of the reward system

These findings have direct implications for intervention design: teaching parents to identify moments of synchrony, lack of synchrony, and avoidance in their behaviors could enhance their maintenance of the interaction (Feldman, 2012). More importantly, music, with its known effect on arousal (e.g., Bernardi, Porta, & Sleight, 2005), NAcc activation (Menon & Levitin, 2005; Salimpoor et al., 2011), and rhythmic synchronicity (e.g., Lagasse & Hardy, 2013; Lense & Dykens, 2016; Over & Molnar-Szakacs, 2009) could support both child and parent arousal, parent synchrony (responsiveness) at a physiological level, while at the same time increasing the salience of the behavioral cues for the child to follow. Although hypothesized, these effects deserve consideration based on this literature.

Music and its direct effect on children with ASD. For this conceptual framework, it was theorized that music would serve as a mediator of the effect of the P-ESDM on parental responsiveness, while simultaneously having a direct effect on the child him/herself. Regarding the direct effect of the music on children, some recent findings of music and prosocial behaviors support this relationship.

Typically developing babies and toddlers are finely attuned to nonverbal behaviors that explain social interactions. Apparently, music, and particularly rhythm, seems to enhance synchrony that functions as a cue for social understanding. Trainor and Cirelli (2015) found that typically developing toddlers responded with more helpful behavior towards an adult if that adult previously moved synchronically (“bounced to a song”) with their mother, while she carried the toddler. If the adult partner moved asynchronously, the toddlers showed less helpful behavior with the stranger in a later encounter. In a subsequent experiment, children who had observed asynchronous behavior and later saw a “friendly exchange” between the adults, reacted with surprise (Cirelli, 2017). Moreover, when children were sung familiar songs by a stranger, their

prosocial behaviors were higher, compared to a spoken version of the song. Interestingly, when the song was unfamiliar, the pattern was reversed, and the spoken version elicited more prosocial behaviors. The researchers hypothesized that the child's recognition of "error" in the familiar spoken song elicited a negative response, which did not happen when the spoken song was unfamiliar (Cirelli, 2017).

Music, particularly infant-directed singing, might also serve as a scaffolding platform for social interaction. Research with typically developing infants regarding 'songese' (infant-directed singing) has shown that mothers give multimodal signs (movement, touch, voice and tempo) to allow infants to process the hierarchical structure of music (Longhi, 2009). More specifically, they tend to extend and accentuate the upbeat of each 4-beat phrase. This accentuation acts as an anacrusis that probably highlights the coming downbeat. The children show more synchronous behaviors to both the emphasized upbeat and subsequent downbeat, with a clear understanding of the musical structure (Longhi, 2009). This temporal scaffolding seems to support the construction of musical expectancy, which regulates attention and arousal.

Even with mothers with depression, who might have subdued and unexpressive communication, infants engage in neutral or positive interactions similar to children with mothers without depression (de l'Etoile, 2012). As with adults, fulfillment of infant's expectations seems to create positive affect and foster attunement and harmonious communication with the adult. In this way, the songese is not only supporting musical learning, but also the nuances of complex human interactions that are critical for language and social development (de l'Etoile, 2006). Longhi (2009) hints to the use of songese for children with developmental disorders whose neurological profile would limit the perception of such nuances; de l'Etoile (2015) indeed found this effect on infants with Down Syndrome. Apparently, by

amplifying the nuances of social interactions, music supports the synchrony between parent and child, which is the foundation of social learning.

In fact, retrospective comparisons of two infants, with ASD and typical development, showed the supportive effect of motherese (song-like, infant-directed speech) in a child with ASD (Cassel et al., 2013). As expected, the child with ASD showed an impaired response to both regular language and motherese, compared to the typically developing child. Furthermore, the mother of the child with ASD decreased her use of motherese very quickly, as early as the first trimester of the child's life, compared to the typically developing child. This decrease might have been motivated by a reduced response from the child (Cassel et al. 2013). On the other hand, the child with ASD showed a better response to motherese than to spoken language by the 12th month of age, while the typically developing child responded equally well to all types of speech. Consequently, parents of the child with typical development linearly decreased the use of parentese and substituted it with typical language. The mother of the child with ASD sustained her use of motherese after the second trimester, probably to compensate for the child's lack of response to language (Cassel et al., 2013). Although this study clearly points to language impairments in ASD, it also illustrates the supportive effect of a musical stimulus on receptive language in ASD.

A possible mechanism of the effect of music (particularly rhythm) on socialization has been explained through the involvement of the basal ganglia in both music and social stimuli (Lense, & Dykens, 2016). The basal ganglia have been related to the perception of regularity and error prediction in sensory stimuli. Both social communication and beat prediction involve the understanding of underlying rhythmicity. Reduced or impaired basal ganglia would limit the individual's ability to detect such rhythmicity, as is the case in children with Williams Syndrome

and autism (Lense & Dykens, 2016). In fact, Lense and Dykens suggest that music might increase “prediction of a dynamic world [which] is key to social engagement... because it provides a structured rhythmic framework that guides attention and increases predictability” (p. 10). A similar proposition, albeit based on neuroscience literature with neurotypical adults, was made by Overy and Molnar-Szakacs (2009). They indicated that a “minimized prediction error” (p. 494) would support emotional contagion for a shared affective and synchronous experience in music.

In this section, possible causal mechanisms of the effect of music on children’s social communication have been proposed: rhythm and socialization, motherese/songese as scaffolding of musical and social interaction, and the role of the basal ganglia role on beat and social prediction. In this way, music enhances (i.e., mediates) the P-ESDM intervention by promoting parental responsiveness, promoting bio-behavioral synchrony between the dyad, and increasing arousal and motivation in the child him/herself. Other factors that can limit or enhance this music-based P-ESDM intervention are discussed.

The moderators: child’s characteristics, parental well-being, parental background

As mentioned, a moderator is a variable that modifies the direction and/or strength of the relationship between the intervention and the outcomes. It can help predict *when* and *for whom* the intervention is more efficacious. Few studies have investigated moderators of parent-mediated interventions in ASD (e.g. Kinard et al, 2017; Farmer et al., 2012; Rogers et al., 2012; Sullivan et al., 2013), and none within the music therapy research. Nevertheless, a model of moderators is hypothesized here based on relevant literature.

Child characteristics (ASD severity, joint attention skills, and age of treatment initiation). Child characteristics considered potential moderators of this music-based parent

coaching intervention are ASD severity, joint attention skills, and age of initiation of treatment (as well as more intensive intervention). A child's ASD severity, particularly disruptive behaviors, impacts the quality of the interaction with the parent (e.g., Baker et al., 2015; Farmer et al., 2012). More severe behavioral difficulties, sensory hypo-reactivity, and lack of communication and reciprocity modifies parental play behaviors, and increases parental stress and sense of competence, which could, in turn, impact treatment efficacy (Kinard et al., 2017; Wainer et al., 2017). Furthermore, joint attention and engagement are created through reciprocal interactions starting in infancy. When the neurobiology of one of the partners interferes with such reciprocity, the relationship suffers (Sullivan et al., 2014). In a moderation analysis, Sullivan (2013) found that a minimum of receptive joint attention, initial social orientation, and object use were required for a relationship-based treatment (ESDM) to be effective. Finally, age of treatment initiation and number of intervention hours seems to moderate treatment effects (Rogers et al., 2012). In other words, earlier, intensive intervention, focused on parent-child interactions, yields better outcomes. However, child's age, sensory reactivity, initial joint attention, and disruptive behaviors moderate these effects.

Parental wellbeing

Parental characteristics such as resolution of the diagnosis, narrative of ASD, parental attachment, fatigue, depression, anxiety, (i.e., mental health status), and co-parenting relationship are considered indicators of an encompassing (i.e., latent) variable in this study: parental wellbeing. Parental wellbeing is hypothesized to enhance or limit the effectiveness of the intervention.

Resolution of the diagnosis is defined as the degree to which parents have worked through complex feelings associated with raising a child with disabilities (Wachtel & Carter,

2008). Mothers and fathers of children with ASD seemed to have increased difficulty to resolve the diagnosis, probably due to the oftentimes delayed diagnosis and lack of physical features to represent it (Feniger-Schaal et al., 2013). Researchers have found low percentages of resolution in families with ASD (20% for both parents, to 47% for only one parent (Milshtein, 2010; Feniger-Schaal et al., 2013). Resolution did not depend on time since diagnosis, parent characteristics (education, age) or child characteristics (IQ, adaptive behaviors, age) (Milshtein, 2010; Feniger-Schaal et al., 2013). This lack of resolution was associated with higher perceived negative impact on family functioning, particularly in mothers (Milshtein, 2010). On the other hand, appropriate maternal resolution of diagnosis was associated with better parental verbal and non-verbal scaffolding during play (Wachtel & Carter, 2008). Interestingly, Feniger-Schaal and collaborators (2013) found that resolution was positively associated with maternal sensitivity during free play, but not when playing with a puzzle. Arguably, free play would require more emotional engagement from both partners, where lack of resolution would have a greater effect. Importantly, resolution of diagnosis seems to be distinct from depression or parenting interaction style (Wachtel & Carter, 2008). Given the importance of scaffolding and emotional connection during play for a child with ASD, resolution of the diagnosis seems a significant variable to consider.

Narratives regarding ASD. Despite the above, Hutman, Siller, and Sigman (2009) argue that it is not maternal resolution, but qualities of the mothers' narratives about the ASD, and particularly their insightfulness, that predicts synchronous play with their child. The authors define insightfulness as "reflective function and mind-mindedness," that is, their ability to take their child's perspective, even if it conflicts with their own expectations, and the recognition of psychological separateness from the child (p. 1261). In fact, Hutman and collaborators (2009)

found that a high percentage of their participants were not resolved, consistent with other studies, yet a third of them were insightful. It was this insightfulness, which the authors relate to cognitive flexibility, that correlated with synchronous play. As mentioned, an evaluation of a parent-mediated (and parent coaching) intervention indeed found that maternal insightfulness at baseline moderated parental responsiveness (Siller et al., 2013). Since research in this area is emerging, both constructs—resolution of diagnosis and narratives of ASD—are preserved in this model. Further research should discriminate the most impactful moderator for parent coaching.

Parental attachment. Another line of research has documented parental attachment as a meaningful variable in parenting efficacy. More specifically, parents with secure attachments had children with ASD who had better initiation and response to two-way communication, problem-solving communication, symbolic play, and verbal communication (Seskin et al., 2010). Apparently, parents with secure attachment representations had greater reflective functioning, and emotional availability, which increased their responsiveness, results consistent with Hutman and collaborators (2009). Counterintuitively, parents with insecure-preoccupied attachments also seemed highly responsive to their children (Seskin et al., 2010). However, it could be argued that such attachment, despite being effective for the demands of a child with ASD, comes at a high cost to parental wellbeing.

Mental Health (Fatigue, depression, anxiety). Related to parental cost, research shows that raising a child with ASD can significantly increase parental demands on time, economic resources, and physical wellbeing (Karst et al., 2012; Stewart et al., 2017). Mothers of children with ASD have shown moderate levels of fatigue, but significantly higher than community samples (Giallo et al., 2011). Additionally, these levels were associated with depression, anxiety, and stress. A regression analysis showed that maternal sleep (often disrupted by children's sleep

difficulties), perceived need for social support, and quality of physical activity were significant predictors of fatigue. Fatigue was also associated with lower parenting efficacy and satisfaction, although this association was not significant when depression, stress, sleep quality, and need for social support were considered (Giallo et al., 2011). The latter indicates a complex interaction between these variables, making it difficult to pinpoint a single cause. Notwithstanding, it is evident that these factors impact parenting self-efficacy and availability. It is reasonable to assume that fatigue, stress, depression, and anxiety (i.e., mental health) would moderate the efficacy of parent coaching and should be considered when designing an intervention.

Co-parenting. Another important factor that impacts parental self-efficacy is the quality of the co-parenting relationship. May and collaborators (2015) found that mothers and fathers of children with ASD had similar (high) parenting stress. Interestingly, for mothers, ASD-specific parental self-efficacy was strongly associated with parenting stress. In contrast, for fathers, parental self-efficacy was more strongly associated with co-parenting. The authors argue that such discrepancy might be due to the fact that mothers tend to be the primary caregivers, while fathers' parenting is mediated by the mothers' lead, and thus more closely related to co-parenting. Most importantly, for both parents, enhanced parenting self-efficacy was *unlikely* to influence parenting stress when co-parenting was poor (May et al., 2015). An intervention that intends to increase parental self-efficacy, such as the one in this conceptual framework, should consider family systems, and particularly co-parenting relationships, as a moderator.

Parental background

Cultural and personal factors of parents not amenable to modification, but that can enhance or interfere with parent coaching, are included in this section. Specifically, “cultural” background (including language barriers, and access to services), gender, and broad autism

phenotype are hypothesized to impact the efficacy of parent coaching, based on the available literature.

Cultural background. Contrary to expectations, formal educational level of parents does not seem to impact treatment selection and, probably, commitment. In fact, long standing cultural beliefs (such as supernatural explanations of ASD) can coexist with more current biological explanations, even in highly educated parents. Such beliefs, in turn, influence treatment choice (Shyu et al., 2010). Although these results were obtained in an Asian country, with clear cultural differences, the lack of impact of parental formal education was also found in two Western studies (Carlson et al., 2014; Drouillard, 2012). Highly educated parents reported selecting treatments based on its research support; however, their actual selections seemed inconsistent with that assertion, and were instead similar to less-educated parents who did not take research into consideration (Carlson et al., 2014; Drouillard, 2012). Even highly educated parents chose an average of six established, eight emerging, and two unestablished treatments, covering the gamut of evidence-based and non-evidence-based practices (Drouillard, 2012). Further, parents of children with ASD seemed to have a “shotgun approach,” selecting treatments based on symptoms, and not integral treatment interventions (Drouillard, 2012, p. 70). Parents chose a variety of treatments simultaneously (more than five and up to 16) making the identification of the successful intervention less obvious (Carlson et al., 2014; Drouillard, 2012).

When exploring the cause of these behaviors, Drouillard (2012) found that parents who have a strong sense of personal control over ASD seemed to select medication-based treatments, apparently looking for recovery. Further, higher levels of acceptance of the diagnosis correlated with fewer evidence-based treatments, maybe based on the belief that accepting the child (and not changing him) is the best course of action (Drouillard, 2012). Also, lower levels of

acceptance, higher age of child, and time since diagnosis, correlated with increased number of treatments, irrespective of their research support.

Concomitant to personal beliefs towards treatment, cost and availability were two important factors that determined treatment choice (Drouillard, 2012; Karst et al., 2012). Given that treatments are often paid by parents out-of-pocket, and that parent coaching would require significant time and effort from the parent, intervention design should be mindful of parental burden and barriers to access.

Other aspects of cultural background, particularly when working with populations with several vulnerabilities (i.e., poverty, language barriers, immigration status) might have an important impact on parent coaching. For example, Hausman-Stabilie, and collaborators (2011) found that working with undocumented Mexican mothers posed unforeseen challenges, for which they had to develop novel treatment strategies. They had to adopt a non-directive style, ensure confidentiality, incorporate localisms (since Spanish across Latin America, and even across Mexico, is not the same), and be mindful of Spanish as a second language for some of these mothers—since they spoke indigenous languages as their first language. They had to modify their timeline to build relationships more gradually, and work in collaboration with staff to ensure buy-in. Similarly, in a health education program for Latina mothers of children with developmental disabilities, Magaña and collaborators (2015) incorporated peer leaders to overcome their distrust towards “doctors” and established institutions.

Gender. An emerging area of research incorporates gender as a significant factor in parent education. As is easily apparent, fathers are currently more involved as caregivers. However, they have not been included at the same pace in training and research (Flippin & Crais, 2011). The latter seems unfortunate since fathers seem to provide important resources to both the

family dynamics and the child with ASD. Fathers tend to be more active, use more rough-and-tumble play (which can be highly engaging for children with sensory difficulties), be less stressed, and express more satisfaction when considered part of the parenting team (Flippin & Crais, 2011; Shave & Lashewicz, 2015). On the other hand, parent education for fathers might need a more “hands-on” approach, peer support, and awareness of shifting gender roles, which encourage current fathers to modify traditional male roles often without providing them with clear models to follow (Shave & Lashewicz, 2015).

Broader Autism Phenotype. Finally, a factor that is scarcely explored as a moderator of parent education is the Broader Autism Phenotype (BAP). The BAP is defined as the appearance of autistic behavioral traits in relatives of individuals with ASD, as a partial genetic expression of ASD characteristics (Klusek et al., 2014). Only one study included in this framework measured the BAP in relation to resolution of diagnosis (Milshtein et al., 2010). Arguably, the existence of autistic traits in the parents could hinder their parental responsiveness, and thus, their ability to support their child’s social communication (Karst et al., 2012). Contrastingly, the BAP might make them ideal instructors since they would have first-hand experience with the struggles of social communication limitations and might have developed strategies to overcome them. Even if these traits are not present, mindful consideration of parents’ learning style, personal characteristics, and resources can enhance intervention design.

The outcomes: parental, child, and parent-child outcomes

One of the difficulties in reviewing the parent-mediated literature is that measured outcomes have spanned a wide variety of standardized and *ad hoc* measures, with no clear consensus on the most important outcomes to study. These outcomes include child language,

cognitive development, joint attention and social skills, parent-child interactions, parenting stress, and parent fidelity, and satisfaction (see Table 9 for further detail).

Table 9.

Outcomes measured in selected parent-mediated studies

Recipient	Outcome	Selected References
Parent	Positive affect	Dunst, et al., 2010; Jull & Mirenda, 2011; Lerner, et al., 2011
	Perception of child	Siller, et al., 2014; Ingersoll, et al., 2016
	Stress	Siller, et al., 2014; Karst, et al., 2015
	Optimism	Karst, et al., 2012
	Objectivity and self-reflection	Siller, et al., 2014; Tsuji & Takumaya, 2016
	Self-efficacy	Karst, et al., 2015
	Coping strategies	Kuhaneck, et al., 2015
	Satisfaction and social validity	Jull & Mirenda, 2011
Child	Intervention fidelity	Ingersoll, et al., 2014; Rogers, et al., 2014; Patterson, et al., 2012
	Adaptive behaviors	Ingersoll, et al., 2016
	Social skills	Lerner, et al., 2011
	Positive affect	Dunst, et al., 2010; Jull & Mirenda, 2011
	Verbalizations	Dunst, et al., 2010
	Expressive vocabulary	Ingersoll, et al., 2016
	Spontaneous language	Ingersoll, et al., 2016
	Synchronous reciprocal interactions	Jull & Mirenda, 2011
	Imitation	Patterson, et al., 2012
	Attachment	Siller, et al., 2014
Intellectual functioning	Karst, et al., 2015	
Other	Family “chaos”	Karst, et al., 2015
	Parent-therapist alliance	Lerner, et al., 2011; Rogers, et al., 2012, 2014
	Generalization and maintenance	Rogers, et al., 2012
	Long-term effects	Estes, et al., 2014

Recently, a perspective towards a more systemic view of these outcomes is apparent in the literature. In fact, current recommendations indicate the need to include long-term effects, generalization and maintenance outcomes, ecological validity (e.g., parental burden, parental use of strategies after end of treatment, peer parent coaching), strength-based outcomes (resilience, coping strategies), parental wellbeing (e.g., mental health, marital satisfaction), family functioning (e.g., interactions with siblings, and other family members) and overall quality of life

(Karst et al., 2012; Kuhaneck et al., 2015; Noyes-Grosser et al., 2014; Patterson et al., 2012; Wainer et al., 2017).

Furthermore, research informed by stakeholders seems critical to endorse the most relevant outcomes of early intervention in ASD. A study worth noting is Noyes-Grosser and collaborators (2014). These authors conducted a thorough survey with professionals and parents of children with ASD that yielded a conceptual map of outcomes for both child and family (see a summary of this map in Table 10).

Table 10.

Relevant Early Intervention Outcomes (Noyes-Grosser et al., 2014)

Stakeholder	Child Outcomes	Family Outcomes
Parents	<ul style="list-style-type: none"> • Expressivity and interaction • Behavior and cognitive development • Socialization and engagement 	<ul style="list-style-type: none"> • Advocacy and collaboration with professionals • Family and community support • Skills and knowledge to support child development • Anticipation of child’s needs and behavioral challenges
Professionals	<ul style="list-style-type: none"> • Connection with others • Emotional reciprocity • Social awareness and engagement • Independence • Adaptation and school readiness • Cognitive and behavioral development 	<ul style="list-style-type: none"> • Family empowerment • Family education and advocacy • Supporting learning and behavior and skills • Supporting social development • Connection and support for Family wellness

As is apparent from Table 10, both parents and professionals held similar perspectives. Yet, professionals seemed to provide more specific objectives, and with longer-term impact (e.g., independence and school readings), informed by professional language. This is unsurprising,

considering that parents of newly diagnosed children might not yet be aware of those needs, while professionals are trained to consider them. This is not to say that professionals “know better,” but rather that professionals, with experience with multiple children and knowledgeable of the ensuing process, can support parents to move from the immediate needs to longer-term planning for their children. On the other hand, parental input is essential to determine which outcomes would support family functioning better (Noyes-Grosser, 2014). In this sense, parents’ desire to acquire “skills and knowledge to support their child’s development” is a strong argument for parent education (Noyes-Grosser et al., 2014, p 341).

Outcomes measured in music-based studies

Consistent with the ASD literature and stakeholders’ perspectives, interventions with music and parent education/participation have addressed these needs and outcomes (Chapter II). Similar to the ASD literature, the outcomes are measured with different levels of specificity, and yield variable results. See Table 6 (in Chapter II) for comparison.

Outcomes in this conceptual framework

An integral intervention such as the P-ESDM would purportedly address many, if not all, of these outcomes. As indicated, a music-based parent coaching would support these outcomes through increasing physiological and behavioral synchrony and increasing child motivation and arousal. Investigating such a complex array of outcomes poses significant methodological challenges. To simplify the first statement of this conceptual framework, and support initial empirical research, the only hypothesized outcomes within this model are:

- *Parent*: increased parental responsiveness (mediator—measured as increased percentage of positive, contingent, and warm responses to child’s communication bids) and

increased parental self-efficacy (parent outcome—measured as parent reported increase in sense of competence)

- *Child*: increased communication behaviors (child outcome—measured through behavioral observations of non-verbal and verbal behaviors)
- *Parent-child interactions*: increased reciprocity (parent-child outcomes—measured as increased percentage of back-and-forth productive, affectionate, communicative cycles, defined as initiation- response -follow-up actions/verbalizations between the dyad).

These outcomes are in line with the stated mechanisms in this framework, and align with current recommendations (Karst et al., 2012; Kuhaneck et al., 2015; Noyes-Grosser et al., 2014; Wainer et al., 2017). Future iterations of this conceptual framework should investigate other meaningful outcomes, and include long-term, generalization, and maintenance measures.

Knowledge Framework

Recent trends in music therapy encourage transparency in reporting of both intervention design and knowledge framework in research (Matney & Ghetti, 2016; Robb et al., 2011). Knowledge framework is understood here as the conjunction of epistemology, theoretical orientation, methodology and methods (Matney & Ghetti, 2016).

Regarding the epistemological stance, this study was situated within a constructionist perspective (Crotty, 1998). Its composition was the result of an iterative process of interrogation of previous beliefs, consolidation of literature, reflection of clinical practice, and discussion with other professionals, with an implied belief that “meaning and truth occur through human interaction with objects” (Matney & Ghetti, 2016). Furthermore, multiple perspectives within the researcher were integrated: researcher as clinician, researcher as reviewer of previous models, researcher as parent. On the other hand, this conceptual framework has been framed within a

causal modeling structure (predictors, mediators, moderators and outcomes), which can, arguably, be included in a post-positivist theoretical orientation (Crotty, 1998; Matney & Ghetti, 2016).

Regarding methodology and methods, an extensive narrative review of multidisciplinary literature (developmental psychology, family and systems theory, ASD clinical research, applied behavioral analysis, music therapy, etc.), as well as incorporation of the clinical and professional training of the researcher, which evolved for 12 years, is reflected in this work. Further research and stakeholders' input should improve this framework.

Researcher's Stance

My main research and clinical interest is to develop effective parent coaching through music-therapy based programs for families of young children with an autism spectrum disorder. The reason for this interest is based on my passion, knowledge and experience in the field. I have worked for 12 years with this population. I received extensive on-the-job training, as well as several graduate diplomas and specializations in Autism Spectrum Disorders at the University of California, Davis (USA), McGill University, (Canada) and IPN (Mexico), as well as in Systemic Brief Therapy (Mental Research Institute, Palo Alto, CA). I received my Master's degree in Music Therapy in a US Midwestern university, and am currently enrolled in a PhD program in the same university. Also, I am a certified therapist in the ESDM, and received the training for the P-ESDM.

Regarding my perspective of professional services for Autism Spectrum Disorders, during my clinical practice it was oftentimes frustrating to observe our limited capacity to provide services, either because of the small number of trained professionals, or because of the inability of the family to pay for them. On the other hand, I have seen parents being the best

support for their young children. I believe that giving them the tools to support their child's development through everyday interactions is our best bet for significant, cost-effective and long-term interventions. Although the latter is my greatest motivation for this line of research, I am aware that it could be a strong bias, as I am heavily invested in creating intervention programs based on this belief. Finally, I expect to find positive results in children's behaviors when parents learn to support their daily interactions guided by behavioral and relationship-based principles. Previous research and personal experiences support this notion.

Discussion

This study created a conceptual framework of parent coaching of music interventions based on the Parent-Early Start Denver Model (Rogers et al., 2012, 2014). The iterative process of literature review, conceptualizations, and definition of constructs produced the framework depicted in Figure 5. This conceptual framework states that the main intervention is a music-based parent coaching grounded in the Parent-Early Start Denver Model (Rogers et al., 2012, 2014). This model teaches parents relationship-based strategies to support their child's social-communication development. Music is hypothesized to function as a mediator, enhancing the psychophysiological synchrony between the dyad, and increasing child motivation and attention, within a non-threatening and playful environment that can easily be incorporated into everyday family routines.

The main outcomes, hypothesized for this first iteration of this conceptual framework, are increased parental responsiveness (as a mediator of child outcomes), parental self-efficacy (parent outcomes), and increased child communicative behaviors. Other outcomes would include parent outcomes (e.g., decreased stress), and parent-child outcomes (e.g., increased reciprocity). Moderators of the intervention include child characteristics (age at treatment initiation, baseline

joint attention, and ASD severity), parental wellbeing (resolution of diagnosis, narratives about ASD, mental health status, attachment, and co-parenting relationship), and parent background (cultural background, gender, and broader autism phenotype).

Strengths

This conceptual framework emerged from an extensive literature review, paired with the researcher's clinical experience and training, and is based on a well-researched, coherent autism treatment model (ESDM and P-ESDM, Rogers et al, 2012, 2014). Not only the relationships between variables, but their theorized mechanisms have been made explicit to support their consolidation or falsification with further empirical research. Conceptual and operational definitions of terms in this study, and in a previous systematic review (Chapter II), are provided to clarify distinctions, and to further the discussion of the effect of music-based interventions on children with ASD and their families.

Limitations

Purported relationships in this model could be argued in the opposite direction. For example, increased parental responsiveness can be considered a byproduct of parental self-efficacy: if the parent feels more efficacious, s/he is more able to respond to his/her child. Arguably, increased parental responsiveness can also be conceived within a feedback loop with parental self-efficacy: if the parent is more responsive, his/her relationships to the child will be more successful. These in turn would feed his/her sense of self-efficacy.

Although these transactions are acknowledged as a possibility in this model, they are not represented since the author wanted to create a parsimonious model that could be tested empirically. Furthermore, in intervention research, it is important to determine the point of intervention. Causal modeling (without feedback loops) allowed a clearer identification of the

point of intervention and the direction of change. Eventually, the self-sustaining feedback loops would make the intervention unnecessary, which would be a desirable outcome, since it is in the family's best interest to create a "family bubble" (Jacquet, 2011) where the interventionist is not needed.

Future Research

Further investigation of this conceptual framework is needed to determine its accuracy and usefulness. Music as a mediator is the most important, yet hypothesized, assertion in this conceptual framework. Behavioral research that could establish a functional relationship among the P-ESDM, music and parental responsiveness, is necessary as a first step in this line of research. If this relationship is established, an intervention manual needs to be assessed for fidelity. Later, efficacy and effectiveness studies, including long-term effects and moderation analyses, need to be undertaken. Concurrent qualitative inquiries of stakeholder perspectives should also prove valuable. The incremental nature of such research would support the necessary improvements of this conceptual framework.

Implications for practice

Despite its hypothesized nature, this conceptual framework is solidly grounded in extant literature within the ASD field. Therefore, tentative implications for music therapy practice can be included. First, parents need to be included in the planning *and implementation* of interventions for young children with ASD to the extent they consider valuable. Second, parents of children with ASD face singular parenting challenges due to the child's neurological constraints. Well-studied strategies within daily routines can empower them while providing constant and contingent stimulation to the child. Third, given its potential to enhance parent and

child psychophysiological responses, music can be a meaningful tool for children with ASD and their parents.

Finally, a music therapist, knowledgeable of ASD characteristics and needs, can modify her own treatment strategies to be implemented by parents. Further training in parent coaching models and strategies will enhance the sharing of these skills with parents.

Conclusion

Parent coaching is currently researched as one of the most cost-effective, empowering, and useful strategies within the ASD field. A thorough review of literature, along with a systematic review of parent-mediated interventions in music therapy (Chapter II), informed the construction of a conceptual framework of a music-based parent coaching, grounded on the Parent-Early Start Denver Model (Rogers et al., 2012, 2014). The hypothesized and known relationships in this framework require further research but serve as a starting point for music-based parent coaching.

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CHAPTER IV

PARENT COACHING OF MUSIC INTERVENTIONS FOR CHILDREN WITH ASD:

A LIMITED-EFFICACY STUDY

ABSTRACT

A previous study of parent coaching of music interventions for children with ASD had promising results (Hernandez-Ruiz, 2017). However, limitations indicated the need for individual parent coaching; for comparisons between music and non-music conditions; and for behavioral and fidelity measures. The aim of this study was to test the limited-efficacy of parent coaching of a music intervention based on the Parent-Early Start Denver Model (Rogers & Vismara, 2015). An alternating treatments design with a parent-child dyad was implemented, with two interview-, three baseline-, and ten treatment sessions, with music and non-music conditions in each treatment session. Behavioral video analysis of parental verbal and nonverbal responsiveness, child joint attention and verbal behaviors, and parent and therapist fidelity provided quantitative data. A final interview with a parent addressed concerns, preferences, and suggestions for improvement. Parental verbal responsiveness seemed lower during the music condition, but non-verbal responsiveness increased notably during the music condition. Parent fidelity was achieved in the 6th session. Child receptive joint attention increased in the music condition only, and initiating joint attention was higher in most sessions during the music condition. Parental comfort with the music did not seem ideal with the brief time allotted to training despite familiarity with the music used. Music-based parent coaching to enhance social communication of preschoolers with ASD seems feasible and potentially efficacious. The parent seemed to learn the strategies and achieve fidelity, and music seemed to enhance child communicative behaviors. This study provides initial support to a conceptual framework of parent coaching of music interventions

(Chapter III). Further research should investigate other approaches to teaching the music, alternative session schedules, and more precise measures of parental responsiveness.

Key words: parent coaching, music-based, autism, ASD, music intervention, ESDM

Background

Parent coaching has been researched as one of the most cost-effective, empowering, and useful strategies within the ASD field (Oono, Honey, & Mcconachie, 2013). A thorough review of literature (Chapter III), along with a systematic review of parent-mediated interventions in music therapy (Chapter II), informed the construction of a conceptual framework of music-based parent coaching, grounded on the Parent-Early Start Denver Model (Rogers et al., 2012, 2014). The hypothesized and known relationships in this framework (Chapter III) require further research but serve as a starting point.

The conceptual framework in Chapter III posits that the Parent-Early Start Denver Model (P-ESDM, Rogers et al., 2012, 2014) has a direct and positive effect on child outcomes, by creating child-centered, relationship-based interventions. It also proposes that the P-ESDM enhances parent outcomes by providing parents with knowledge and skills for better parenting. Within this framework parent-child interactions would be improved by creating pleasant social routines that enhance communication. Such outcomes are thought to be mediated by the parent's ability to respond effectively to his/her child (parental responsiveness). The proposed framework conceptualizes music as a mediator of parent coaching through optimization of psychophysiological arousal of both child and parent, and through synchronization of their social communication. Such optimization would increase parental responsiveness, and child attention and motivation (see Figure 6 for a graphic representation of the conceptual framework).

A previous feasibility study with a music-based intervention anchored in the Parent-Early Start Denver Model (P-ESDM, Hernandez-Ruiz, 2017) had promising results within a very economical (two 30-min sessions per week) and ecologically valid intervention. All participating families found the intervention culturally and age-appropriate, enjoyable and supportive of

interactions with their children. However, limitations of that study indicated that future research should consider parent coaching of single dyads in individual sessions, since coaching parents with different skill levels and different needs might not be optimal within a group setting. It also indicated the need to include fidelity measures of the P-ESDM (Rogers & Dawson, 2010; Rogers & Vismara, 2015), and behavioral observations of parent and child outcomes, as more objective measures of efficacy.

Another limitation of that study (Hernandez-Ruiz, 2017) indicated the need to compare strategies with and without music to confirm (or reject) the hypothesized relationship and mediating effect of music, as presented in the conceptual framework (Chapter III). For the purposes of this project, only the highlighted variables and relationships of the conceptual framework were investigated (see Figure 6 below, variables of interest highlighted in color): namely, the effect of music on parental responsiveness, as a mediator of the P-ESDM, and child outcomes, as a product of increased parental responsiveness. However, the emphasis was *not* on child outcomes, but rather on the functional relationship between music and parental responsiveness.

Purpose statement

The purpose of this study was to test initial internal validity of a conceptual framework of parent coaching of music interventions based on the P-ESDM (Chapter III), as well as the limited-efficacy of the intervention. Limited-efficacy studies are a type of feasibility study that intend to answer whether an intervention shows promise of success within a limited timeframe, a small convenience sample, and/or a highly controlled setting (Bowen, et al., 2009). Intermediate, rather than final, outcomes are typically the focus of investigation (Bowen, et al., 2009). In the

present study, the specific aim was to investigate the effect of music on parental responsiveness as an intermediate variable within the conceptual framework. The guiding research question was:

Does music-based P-ESDM coaching increase parental responsiveness compared to non-music-based P-ESDM coaching?

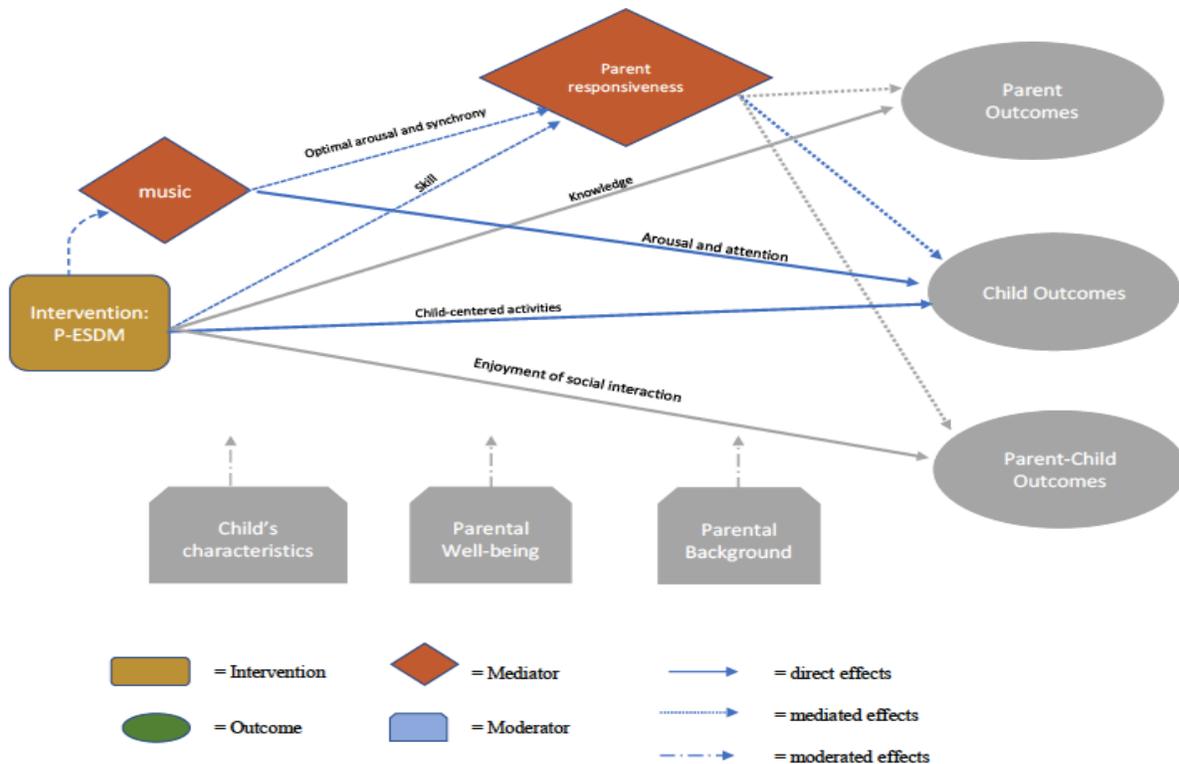


Figure 6. Variables from the conceptual framework investigated in this limited-efficacy study

Method

Design

Given that internal validity (i.e., extent to which change can be attributed to treatment), and not external validity (i.e., generalization) is the aim of this investigation, a non-concurrent alternating treatments design (ATD) was considered sufficient (Barlow, Nock, & Hersen, 2009; Geist, & Hitchcock, 2014). Three parent-child dyads were recruited and started the process, but

only one finished the program. Only data of the latter were analyzed, but information on attrition is included to inform future research.

The program included two preparatory sessions (to obtain informed consent, and assess child and parental needs), and three baseline sessions to measure parental responsiveness and child communication behaviors. These preparatory and baseline sessions happened in the first two weeks of the program. Afterwards, the music therapist provided 10 one-hour individual treatment sessions (see Table 11 for the program structure).

Table 11.

Program structure

Stage	Session	Procedures
Interview and Curriculum Checklist	Two 60-minute session	First session: Get informed consent, apply M-CHAT to determine eligibility, explain procedures, and apply ESDM Curriculum Checklist (parent interview). Parents filled out a demographic questionnaire. Second session: apply ESDM Curriculum Checklist (child observation), and P-ESDM Parent Goal Form.
Baseline	Three 20-min sessions of free play in 3 different days within one week.	Baseline measures: 10-minute video recording of parental responsiveness and child behaviors (3 times in one week)
Treatment	Ten biweekly 1-hour Music and Non-Music sessions presented in AB or BA design. (See session structure in Procedures)	Biweekly measures: P-ESDM Parent Fidelity Sheet, P-ESDM Therapist Fidelity Sheet, and video recording of parental responsiveness and child behaviors
Interview	One 60-minute session with parent participant	Semi-structured interview to assess participant experiences.

Each session addressed one topic (one P-ESDM strategy) presented twice: with music and without music. To avoid order effects, the paired conditions were counterbalanced across the 10 sessions (music-no music or no music-music). During each session, the parent was introduced to the topic, and s/he had the opportunity to practice the strategies immediately after. Video recordings for behavioral observations were performed at three different points in the session:

- a) During the 10-minute free play (see session structure below) to assess parental use and learning of P-ESDM strategies
- b) During the first coaching portion: to assess the effect of the coaching with/without music on parental responsiveness and child social communication behaviors
- c) During the second coaching portion: to assess the effect of the coaching with/without music (opposite condition than b) on parental responsiveness and child social communication behaviors.

Additionally, a semi-structured interview after all treatment sessions explored parental perceptions and concerns.

Participants

This study received approval from the Human Subjects Committee-Lawrence (Study ID #2342). Recruitment was done by word of mouth and flyers placed in public spaces that allow for this, such as public libraries, community centers, churches, and child development centers. During the first preparatory session, parents were informed of the purpose of the study and signed the informed consent for themselves and their child. They received a copy of the informed consent form. Three parent-child dyads started the process. The first dyad (D1) completed the program. The second dyad (D2) only completed the two preparatory sessions. The third dyad (D3) completed the preparatory sessions, baseline sessions and two treatment sessions, after which the mother withdrew.

The first dyad (D1) included a 4-year old boy diagnosed with ASD and one of his parents (father). The father was a single 42-year old male, Caucasian, with a bachelor's degree. The child was highly verbal (although echolalia and non-communicative, repetitive language was observed), with cognitive skills above age average (as reported by father and demonstrated in his

academic knowledge), had no siblings, and received speech and occupational therapy at home by the school district. The mother did not participate in the program (parents are divorced), but she was informed by the father of the process and agreed to implement the strategies at home. The therapist did not meet the mother and did not monitor the implementation. However, the father was the main caregiver, as reported by himself, and thus the program was mostly implemented by him outside of the sessions.

As mentioned, two participants initiated the process but did not finish it. One of them, D2, was a 21-year old married mother, unemployed, living with her parents, and with self-disclosed learning disabilities. Her 2-year old son was scheduled for diagnostic evaluation two months later but was already considered at-risk for ASD. She participated in the first two preparatory sessions only. During the first session, when the researcher interviewed the mother regarding the child's skills using the ESDM Curriculum Checklist (Rogers et al., 2009), it was noticed that the mother was surprised and concerned when she realized that her child was not able to perform certain behaviors. The researcher reassured her that she was not diagnosing her child, but only assessing his skills. However, it seemed that the mother became aware of her child's difficulties to a new degree. Also, the mother asked several personal and inappropriate questions of the researcher, apparently in an attempt to build a more personal relationship. During the second session, she asked whether the researcher had a child with a disability; when the researcher replied that that was not the case, the mother seemed disappointed. The reason she provided for declining further participation was that "I just don't feel like it is a great match for my son at this point and with everything I have going on for him I feel it would be over-wheeling (*sic*) to add more."

The third participant, D3, was a 41-year old woman, married, with two children (second with ASD), who had agreed to participate in the project at her husband's insistence. The husband communicated with the researcher and set up all appointments, including the baseline and treatment sessions. The participant seemed reluctant to schedule the sessions. When this observation was shared by the researcher during the second preparatory session, the mother said that she had been "tired and distracted" but she was willing. However, during the sessions, she did not follow most of the researcher's suggestions and sniggered uncomfortably when implementing some of the strategies. She repeatedly mentioned that her child could do "a lot more at home" and that she had no problem getting him to cooperate at home. She also seemed uncomfortable incorporating any music strategy. Despite the researcher's explanation that the intent was to generalize the child's skills to new environments, the mother did not seem to see the need to participate in the project. After the second treatment session she emailed the researcher withdrawing her participation: "It is just not the right fit for us."

Intervention description

The P-ESDM is an evidence-based intervention to coach parents in behavioral and relationship-based routines with their young children with ASD. It is a step-by-step approach that teaches parents relationship principles associated with ESDM such as gaining child's attention, sustaining the interaction, encouraging verbal and non-verbal communication, and incorporating play skills within everyday routines and interactions. Importantly, parents are not taught to elicit specific behavioral learning objectives (Estes et al., 2014). A collaborative approach is considered essential for the social validity of the approach and for increased outcomes. On the other hand, the P-ESDM has a parent coaching manual with 10 intervention themes and a clear curriculum.

Following Robb, Burns, and Carpenter’s (2011) music-based intervention reporting guidelines, the intervention designed for this study is described in detail in Appendix H. The music intervention for this project is anchored in ESDM principles as delineated in Hernandez-Ruiz (2017). In turn, Table 12 delineates the parent coaching structure (music and non-music coaching) according to the P-ESDM (Rogers & Vismara, 2015).

Table 12.

Music and Non-Music Session Structure based on P-ESDM

Section	Description	Parent and Child behavior
Greeting and check-in (5 min)	MT greeted parent and asked about the week’s progress (successes, challenges, concerns)	Parent provided information about the week Child played with available toys
“Warm Up” Activity (DATA COLLECTION —video recording) (10 min)	MT asked parent to play freely with child and observed. MT filled out ESDM Parent Fidelity Sheet . MT did not provide any guidance.	Parent and child engaged in free play.
Introduction of the Topic/Song (5 min)	MT presented the topic of the day (intervention) and explained procedures. She modeled with child <i>only</i> if necessary. If it was a music portion, she modeled the music for the parent.	Child played with available toys
Coaching 1 (10 min) (DATA COLLECTION —video recording)	MT coached in the moment and provided musical support if necessary	Parent performed the intervention engaging the child
Introduction of the Topic/Song 2 (5 min)	MT presented the same topic and explained procedures. She modeled with child <i>only</i> if necessary. If it was a music portion, she modeled the music for the parent.	Child played with available toys
Coaching 2 (10 min) (DATA COLLECTION —video recording)	MT coached in the moment and provided musical support if necessary	Parent performed the intervention engaging the child
Closing (summary and clarification) (5-10 min)	MT summarized and provided opportunities for clarification. Provided written summary (Refrigerator List)	Parent expressed doubts, if any, and received a written summary.

Measures

For participant eligibility and description, and treatment planning.

Demographic survey. This one-page *ad hoc* survey asked questions regarding parental educational status, employment, age, marital status, and ethnicity; and questions regarding child's age, gender, number of siblings, birth order, main caregiver, other therapies, therapies to be initiated in the following 8 weeks, and current medications (Appendix I). It took 5 minutes to complete.

M-CHAT-R/F: The Modified- Checklist for Autism in Toddlers-Revision with Follow-up (M-CHAT-R/F; Robins, Fein, & Barton, 2009) is a validated parent-report screening tool to assess risk of Autism Spectrum Disorder. This scale was used to determine participant eligibility since the study was directed to children diagnosed or at-risk of ASD. The M-CHAT-R/F is a 20-item scale that takes approximately 10 minutes to complete with parental input, and less than two minutes to score. An implementation and scoring manual is available. The researcher has clinical experience and training to use this measure.

ESDM Curriculum Checklist (Rogers & Dawson, 2009): this published scale evaluates developmental needs and strengths in a child with autism, through parental report, direct observation, and teacher report, if available. It takes approximately 3 hours to complete (equally divided among parental report and direct observation). For this study, general comments about the child's communication skills in the D1 dyad are included, but the individual assessment is not reported. This checklist was only intended to guide the intervention by determining treatment goals and objectives. It was completed by the researcher who has clinical experience and certification to use this measure.

Parental outcomes.

Parental responsiveness. For the purposes of this study, parental responsiveness was operationalized as a parental verbal or nonverbal response that happens no later than 2 seconds after the child's communication bid or attention behavior (looking at a toy, reaching, etc.), that supports the child's goal (e.g., if a child reaches for a toy, the parent gives it to him, or verbally acknowledges his desire), and that shows positive affect (devoid of behavioral manifestations of anger, frustration, or indifference). All three elements (timing, goal-oriented, and positive affect) needed to be present to count the behavior.

ESDM Parent Fidelity Sheet (Rogers & Vismara, 2015). As part of the manualized intervention, the Parent Fidelity Sheet and coding manual of the P-ESDM provided behavioral benchmarks to evaluate the implementation of the model in a session (Rogers & Dawson, 2010; Rogers & Vismara, 2015). The current researcher is certified in the ESDM and trained and experienced in the P-ESDM. Due to the intent of comparing this intervention with and without music, some modifications were introduced (such as music modeling and musical support, as described in Appendix H). However, it was considered that the principles of the P-ESDM were preserved. Therefore, using the Parent Fidelity Sheet to evaluate parental performance seemed appropriate.

Child outcomes.

Child response to joint attention (RJA) was measured by counting the following orientation gestures to parental communication bids: orienting body towards parent, taking a toy that is offered, responding with eye contact, approaching parent when called, and looking at object when pointed at.

Child initiation of joint attention (IJA) was measured by counting the following non-verbal communication bids: showing a toy, initiating eye contact, reaching gestures, touching the parent, and approaching the parent. Vocal and verbal gestures were not included since they were counted in a separate category (see below).

Child verbalizations and vocalizations were counted even if they did not have a clear and conventional communicative intent. Given that children with autism frequently have idiosyncratic communication patterns, *all* vocal behaviors were treated as intentional, and counted as such. Some of the intervention strategies were intended to shape these vocalizations into functional behaviors.

Final Interview.

The researcher used the Final Interview Guide (see Appendix J). This guide was designed based on a published protocol for a comparable post-intervention focus group of a parent-mediated intervention (CDC, n.d.).

Setting and Materials

For clarity, materials for the intervention (music and play sessions) are included in the Intervention Manual (Appendix H). Only materials and settings for data collection are included here.

The setting for all sessions was a mid-sized carpeted room, commonly used for research projects within the School of Music. The room was empty except for the cameras, instruments and toys for the session. Two fixed cameras (a Sony® HDR-CX405 and an iPhone 6s Plus equipped with a 0.36x super-wide-angle lens, Kobra Tech Cellphone Lens kit) were set up in the room at opposite angles. The video from both cameras were cut and pasted in a single screen using Camtasia® 2 software. Only the video from one of the cameras was coded, but the other

was used for corroboration, if needed. The ESDM Curriculum Checklist, and Parent Goal Form were available on a clipboard for the researcher during preparatory sessions. Data sheets for Parent Fidelity, Treatment Fidelity, “Refrigerator Lists” (see Intervention Manual), and session plans were available on a clipboard during every treatment session. The researcher used a printed copy of the Final Interview Guide (Appendix J) during the last 60-minute session with the parent in D1. Video Analysis Data sheets were used to count operationalized behaviors from the videos (Appendix K).

Procedures

Preparatory sessions. During the first session, the researcher met with the parent to ask for informed consent and explain procedures. The researcher then asked the parent to fill out the demographic survey, and asked questions to determine the child’s developmental level, according to the ESDM Curriculum Checklist (parental report). The M-CHAT R/F (Robins, Fein, & Barton, 2009) was not implemented with D1 because it is a screening tool that should not be used when the diagnosis has been confirmed, as in this case. During the second session, the researcher engaged in play activities with the child to elicit the behaviors assessed in the ESDM Curriculum Checklist (direct observation). She followed the procedures delineated in Dawson and Rogers (2010). She then interviewed the parent briefly to determine the parent’s goal for treatment (Parent Goal Form, Rogers & Vismara, 2015). At the end of the session, the researcher scheduled appointments for three free-play sessions (for baseline data collection) to happen in the following week.

Baseline sessions. The researcher set up the cameras before the session. She greeted the parent and child, and allowed them to settle for five minutes, providing appropriate toys and instruments (toy list recommended in Rogers & Dawson, 2010). She then started recording with

both cameras for 10 minutes. She stopped the recording and thanked them for their participation. She helped the child transition out of the activity with a goodbye song. She then agreed with the parent on the appointment schedule for treatment sessions (total session time = 20 minutes).

Treatment sessions. The researcher set up the cameras before the session. The basic procedures in Table 12 were followed for each session. Please refer to the Intervention Manual (Appendix H) for further detail.

Final Interview. Twelve weeks after the completion of the treatment sessions, the researcher set up an appointment for the 60-minute semi-structured interview with the parent participant in D1 at a mutually convenient time. During the interview, the researcher greeted the participant, offered coffee and cookies, and invited him to sit at the table. She then followed the guide, explained the procedures, rules, and recording conditions. She started the audio recording and asked the guiding questions (see Appendix J for the Final Interview Guide and Appendix L for the transcription).

Results

Parental outcomes

Parental responsiveness.

A trained observer (Observer 1) did a frequency count of defined behaviors (see operationalization in Method section) for each 10-minute excerpt of the Coaching 1 and Coaching 2 periods. The researcher also coded 25% of the sessions for reliability. The interrater reliability scores were calculated by dividing the observer score by the researcher score (percentage interrater reliability).

Parental Verbal Responsiveness. As can be observed in Figure 7, in the non-music condition, parental verbal responsiveness showed a slight increase (tendency line) throughout the

sessions, except for sessions 9 and 10, which showed an important decrease. Notably, the parent demonstrated very high responsive behaviors during the first session, but these were not sustained in other baseline sessions. During treatment, he showed an immediate increase (session 1) and particularly high verbal responsiveness in sessions 6 and 10. The music condition (Figure 7) showed very little increase throughout sessions, and mainly lower scores than the non-musical condition in seven out of 10 sessions. However, in session 1, 2, and 8, the musical condition showed higher verbal responsiveness than the non-music condition. The interrater reliability for this behavior was 88%.

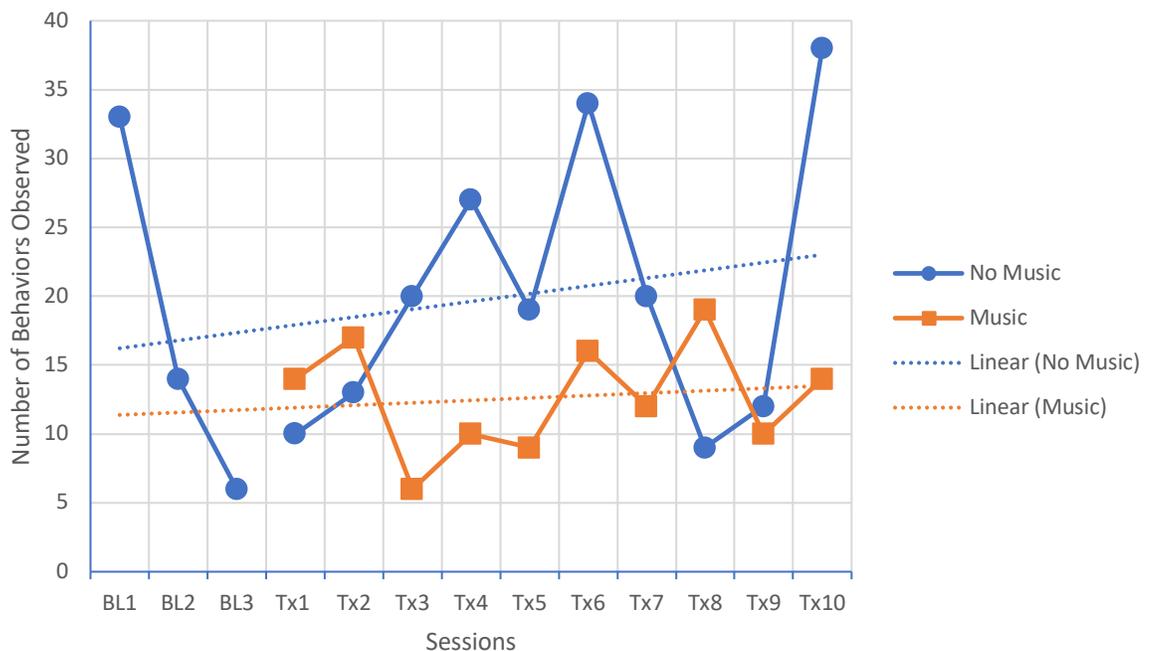


Figure 7. Parental Verbal Responsiveness

Parental Non-verbal Responsiveness. Similar to verbal responsiveness, the first session showed a high score, but was not sustained during baseline (Figure 8). During treatment, the music condition showed a clear increase throughout the sessions, being higher than the non-music condition in sessions 7 and 8. Similar to verbal responsiveness, this behavior showed a

sharp decrease in session 9, with a slight recovery in session 10. In the non-music condition, non-verbal responsiveness showed an immediate effect of treatment (session 1 - 3) and a sharp increase in session 4, which was not sustained in the following sessions. The tendency line in fact shows a decrease in non-verbal responsiveness in the non-music condition across all sessions. The interrater reliability for this behavior was 86%.

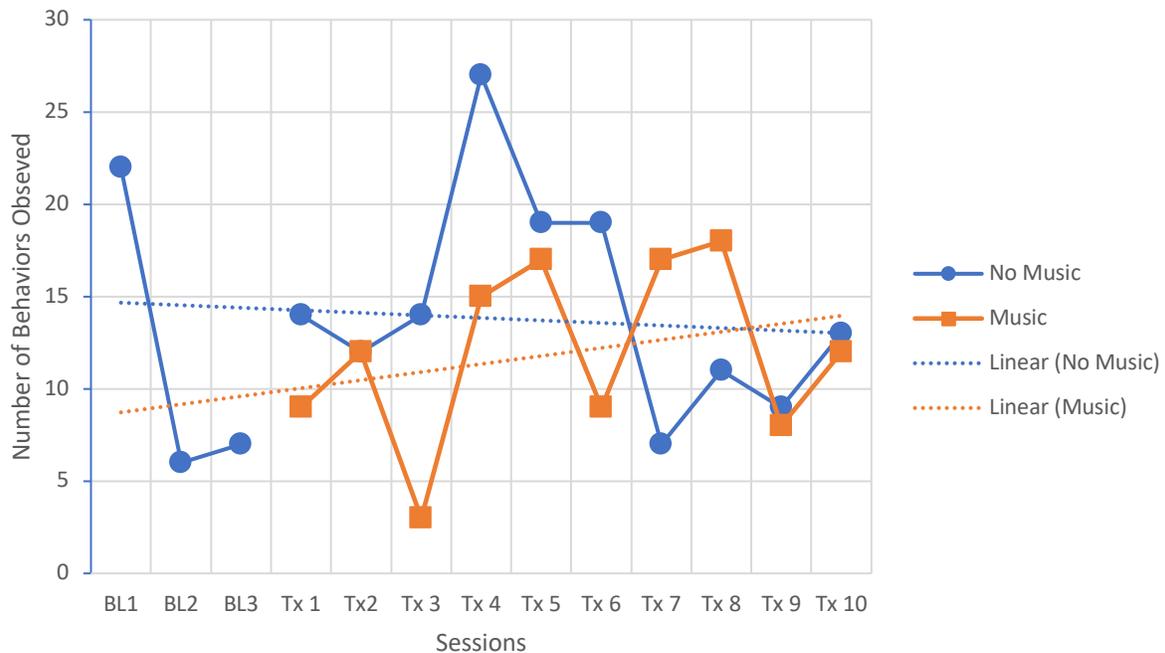


Figure 8. Parental Non-verbal Responsiveness

Parent fidelity. The ESDM Parent Fidelity Sheet was scored by the researcher during the Warm-up Activity (free play with no coaching, see Table 11). This period was chosen because the P-ESDM uses this time of free play to assess parental learning from previous sessions. The 10-minute excerpts were randomized, and a trained observer (Observer 2) scored the ESDM Parent Fidelity Sheet for 30% of the sessions for reliability. The baseline level shows scores

between 52 and 58% with an immediate increase due to treatment (67% in treatment session 2)³. Data showed a consistent increase in scores, reaching fidelity (80%) for the first time in session 4, but staying consistently above this level in sessions 6, 7 and 8. As with other behaviors, parent fidelity decreased in sessions 9 and 10, but remained above baseline. Interrater reliability for this measure was 90%.

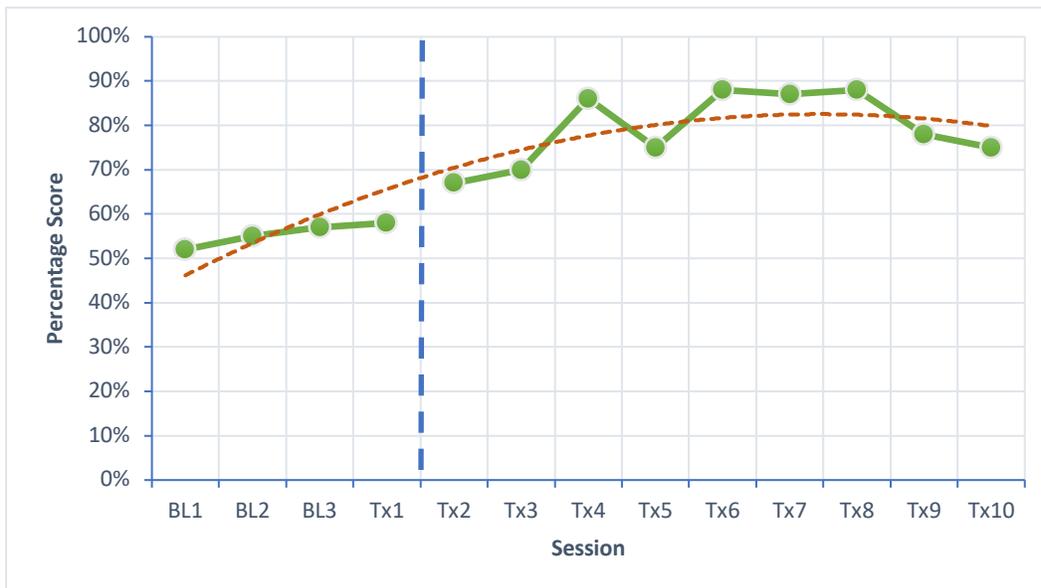


Figure 9. Parent Fidelity (maximum score = 100%)

Child outcomes

A trained observer (Observer 3) did frequency count of defined behaviors (see operationalization above) for each 10-minute excerpt. The researcher coded 30% of the sessions for reliability.

³ The first treatment session for this measure was, in fact, baseline because the recording period happened during the Warm-up Activity, i.e., before the coaching occurred.

Child Receptive Joint Attention.

For the child's receptive joint attention (RJA, Figure 10) was very low at baseline, and the data again showed an immediate effect of treatment in both conditions. For the music condition, the scores were higher than the non-music condition in sessions 5, 6, 7 and 8, and almost equal to the non-music condition in sessions 9 and 10. Congruent with parental data, sessions 9 and 10 showed a sharp decrease. Nonetheless, the tendency line showed a clear increase in RJA throughout the sessions for the music condition. The non-music condition showed an initial treatment effect in session 1, and a sharp increase in session 2, but it decreased (and became lower than the music condition) by session 5. It also showed a sharp decrease (even lower than baseline), with no recovery, in the last two sessions. The overall tendency was a slight decrease in RJA in the non-music condition. The interrater reliability for this behavior was calculated by doubling the scores of Observer 3, and calculating the ratio of agreement with the researcher (observer1 divided by researcher). This choice was made because it was observed that Observer 3 consistently coded about half of every JA behavior, probably due to the difficulty in establishing starting and ending points of these subtle non-verbal behaviors. The interrater reliability score after adjustment was 96%.

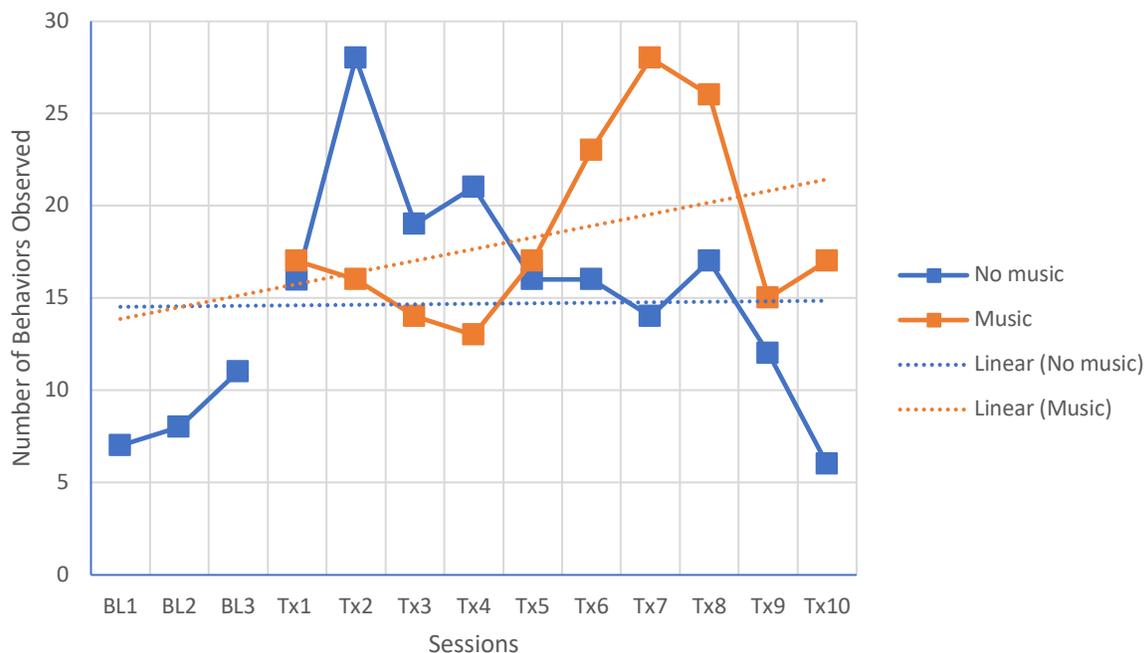


Figure 10. Child Receptive Joint Attention

Child Initiation of Joint Attention.

Child's initiation joint attention (IJA, Figure 11) showed a very low baseline, with one or two initiation bids. The treatment effect in both conditions was immediate, with a higher effect for the music condition in eight out of 10 sessions. Further, the music condition showed a very sharp increase in the first session, which was not sustained and decreased to baseline level in sessions 4 and 5. However, this behavior showed a clear recovery in sessions 6 to 8. Similar to previous behaviors, sessions 9 and 10 showed a decrease in the behavior, but higher than baseline. The overall tendency in the music condition is a slight decrease, probably driven by the last two sessions. The non-music condition also showed a similar pattern: clear treatment effect, decrease from sessions 2 to 7, sharp increase in session 8, and sharp decrease on session 9 and 10. The overall tendency for the non-music condition was an increase in IJA. The interrater

reliability score was calculated in the same way as the RJA (doubling scores from the Observer 3), which yielded a score of 94%.

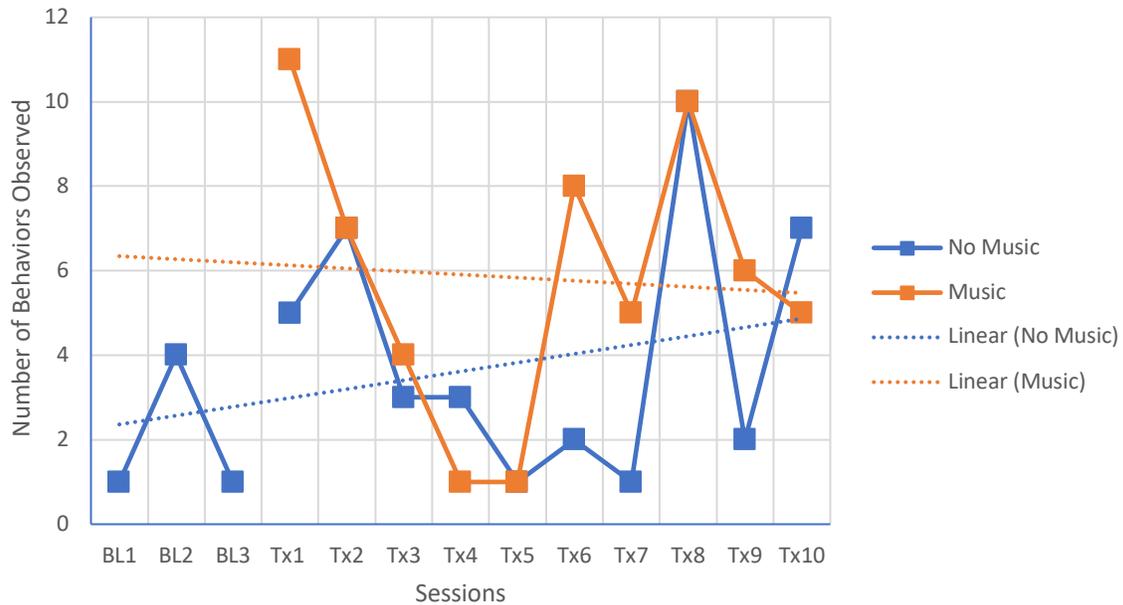


Figure 11. Child Initiation Joint Attention

Child Verbal Behaviors.

Child Verbal Behaviors (Figure 12) showed a high frequency at baseline. As a reminder, this behavior was counted if *any* vocalization or verbalization occurred; communicative intent was not considered. An overall decrease was observed in both conditions. For the music condition, this was particularly evident in Sessions 3, 4, 5, 7 and 8, with a sharp *increase* in Session 6, 9 and 10. Four of the ten treatment sessions (sessions 2, 6, 9 and 10) showed a slightly higher score in the music than the non-music condition. As mentioned, the non-music condition showed a gradual overall decrease in verbal behaviors. The interrater reliability for this behavior was 92%, and no adjustment was necessary.

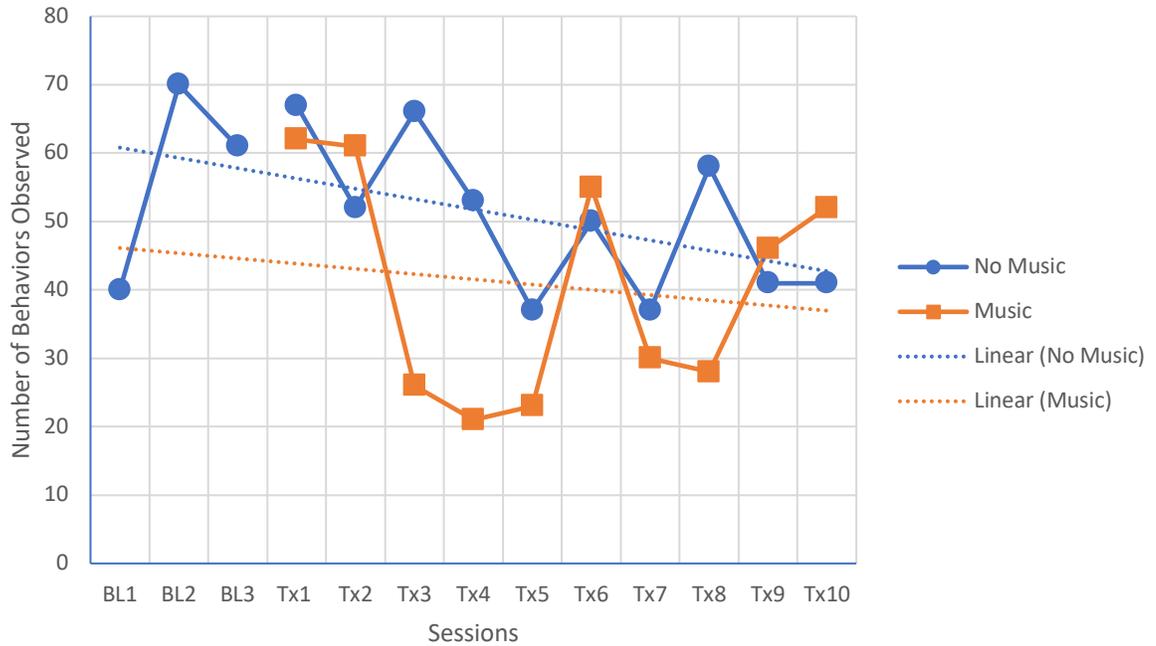


Figure 12. Child Verbal Behaviors

Intervention fidelity

To assess similar implementation of the treatment across sessions, the P-ESDM Intervention Manual (Rogers & Vismara, 2015), the modified Music-based Intervention Manual for this study (Appendix H), and the Therapist Fidelity Sheet (Rogers & Vismara, 2015) were used. Based on previous use of this tool (Rogers et al., 2014), the interventionist reported on her own performance immediately after each session, and a trained observer (Observer 2) coded 30% of the sessions for reliability, using the same tool. Those scores showed consistent fidelity (above 80%) for nine out of 10 sessions, with session 2 being at the 78%. A slight improvement is noticeable over time, with a score of 92% in the last session (Figure 13). The percentage interrater reliability for this measure was 95%.

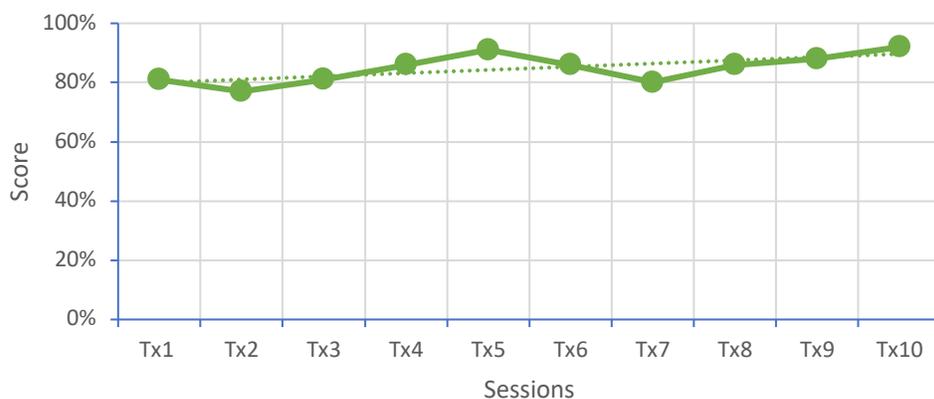


Figure 13. Therapist Fidelity Scores (maximum = 100).

Parent comments (Final interview with parent in D1)

A semi-structured interview with the participating parent provided information to assess strengths and challenges of the intervention (see Appendix L for full transcription of the interview). Based on parental responses, the questions were modified or skipped. Framework analysis of the qualitative data was performed to extract main themes, which were compared to behavioral observations.

Preferred aspects of the program. The parent shared that his favorite part of the program was seeing his son’s excitement in coming to the sessions, particularly for something that is also “towards his benefit, rather than just recreation.” He also mentioned that he liked that “it wasn’t passive... that helped in getting more out of it by participating, rather than trying to observe and take mental or physical notes...” He commented that he was not expecting to be the focal point of the intervention, but that it “was a nice surprise.” Also, his favorite session was the one where they developed a game with toy animals, “and had them walk to the wall and back, and having A. imitate back.” During this session was particularly effective in creating a playful joint activity with his child by imitating him, narrating his behaviors, and following his interests.

Disliked aspects. The parent shared that he was “not sure that there is anything specifically that bothered [him].” He acknowledged that sometimes there were frustrations, such as occasional difficulty in getting his son to participate in a certain activity. However, he also indicated that “there weren’t any times when I walked out of here going ‘why did we do that? That was completely ineffective’ ... Maybe there were things... more enjoyable... but there was nothing necessarily that I disliked.”

Support for learning. When asked what elements supported his learning, the parent highlighted the music therapist’s coaching: “some things worked better than others, but...it never got to the point where it was so frustrating that *you* didn’t suggest a change of course before, you know, I threw up my hands or whatever (laughing).” He also mentioned that the back-and-forth between discussion and interaction with his son sometimes felt rushed, but also appropriate to analyze the interaction and reflect: “it helped me to think about, like, ok, what happened in the moment, to reflect on it a little bit more.” As a third element, explaining the strategies and their rationale seemed helpful to this parent: “ok, this is not just how we do things, but this is *why* we do things.” A fourth component that supported the parent learning referred to the therapist’s interaction with the child. The parent reported that:

I did feel like you had a very good manner with A., that you connected with him, and that he certainly enjoyed playing with you and interacting with you, too...probably being a researcher, or someone who is working with kids, you need to have an aspect of that, if not, you know, have that at the forefront. But I certainly felt that if I walked into a colder, more kind of clinical, kind of you in a white lab coat, and spoke directly to me and said [faking stern voice] “OK, this is what we are going to do,” I don’t think I would have

been as comfortable or as bold taking the leads that you wanted me to take, [and] if you didn't have that kind of connection with the kid, too.

Challenges to implement the strategies. When asked what was challenging to implement the strategies, either during the program or during the ensuing weeks, the parent commented that he had struggled with the child having “his own agenda” and being unwilling to move on to another activity. To overcome this challenge, he resorted to strategies learned in this program and previous readings such as warning the child two or three minutes before the activity ended. The parent also mentioned that it was somewhat challenging to think analytically about his interactions with his child: “to actually go ‘Ok, this is how you are interacting with him, now take a step back, and try to observe what is happening, while you are also trying to be on the same plane with him and playing’.” However, as mentioned before, he could see the value in this approach.

Interference with learning. The parent mentioned that “not knowing who was behind that [one-way] mirror” affected his performance because he felt observed and judged. Due to an omission on the therapist's part, the parent assumed there would be observers behind the mirror. During the interview, the parent was reassured that nobody had observed the sessions, and only video recording happened in the room (of which the parent was aware). The therapist apologized for the lack of clarification.

Generalization to everyday activities. The parent spontaneously noted a few instances where the child had generalized skills learned during the sessions. Particularly, he mentioned that his child started “animating and personifying objects... when he makes his toys dance, and stuff like that.... Something I had never really seen him do before... something that I have seen him do with animals and toys since.” He also mentioned that his son had started spontaneously

showing toys and sharing interests: “there are times when I’m making dinner, or something, and he is playing by himself, and he’ll say, ‘Daddy’ you know, like ‘help me, please’ or he’ll come and show me something or whatever... he will go through the different colors of his cars and want me to repeat them after him...”

Differences with other music experiences. When asked how music changed his experience, the parent noted that “the biggest difference was engaging in *making* the music as opposed to playing it on a stereo or playing it on the TV and participating with a recorded source.” He also mentioned that this experience was more “goal-oriented and structured”, and that “this was more of a 50-50 with him, in terms of creating and helping him do some of the initiation whether it be picking what instruments he wants to play and going towards a circle, as opposed to a more chaotic or less structured activity.”

Comparison between the music and non-music coaching. When asked about the effect of music versus non-music activities, the parent observed more collaboration and reciprocity in the music condition. He considered that “with music... engagement might have been a little freer... more collaborative with him, as opposed to me trying to insert myself or insert him into an activity we would do together.”

Comfort with music. The parent reported some difficulty in leading the activity while singing, particularly if not familiar with the music. He mentioned that “when you gave me the option to pick a song, I would pick one that I was already more familiar with... it was easier for me to... to initiate with A., to engage with A., when I did not have to think like ‘what’s the next line?’”

Suggestions to learn the music. When asked, the parent agreed that learning the music before the session could support learning the strategies: “if I had a recording that we could have

listened to at home, it would've probably been a lot easier..." He mentioned the use of links to videos or recordings to learn the music. Interestingly, he also wondered about the effect of previous rehearsal on parents feeling pressured to "*perform* a song" during the sessions. However, overall, he considered that knowing the music beforehand would be better than "being put on the spot...[because] instead of thinking about the kid, instead of thinking about engaging with... you're thinking about 'I don't know what comes next' (laughing)."

Beliefs regarding professional sharing and parent implementing treatment strategies. The parent mentioned that he felt "pretty comfortable" with the coaching approach of this intervention, once he "figured out that's how it was going to be [parent facilitating and being the focal point of the intervention]." He mentioned that it was not necessarily his initial expectation but that it was "a nice surprise." He saw the value in this approach in that it made him "a little bit more conscious... [because] as a parent sometimes, especially of a child who's happy to sit there and line up his cars... for 10 or 20 minutes... sometimes it's a lot easier, you know, you are like 'oh, well, he's entertaining himself, I'm gonna go, you know, clean the bathroom counter,' or whatever..." Participating in this program allowed him to be conscious of the need to engage with his son: "if I am doing something that I can drop what I'm doing, usually I will go and engage with him when he wants to engage with me... and certainly be conscious of those times when I'm not engaging with him..." He also seemed to see the value of parent facilitation in that even though parents might resort to "the path of least resistance...all parents are going to employ strategies to help with their children's development and independence and responsibility." Further, he mentioned that knowing that this model had research behind it was helpful: "it's extremely helpful to know that... there's a method, there's... thought behind it, and it's not just, 'I just made this up' you know?"

At the same time, the parent wondered if other parents would be as comfortable as him (a theater professional) in facilitating the sessions: “with my theater background, you know... I have some experience with going to a rehearsal and ‘OK, we are going to do this theater game’... I was able to adapt to that kind of thing, but you might have/had some parents who aren’t comfortable being demonstrative in that way.”

Regarding the setting, the parent noticed that the room for this research study did not “necessarily excite a kid”, which could be “good because it allows for more focus, but of course, kids don’t live in rooms like this.” He wondered what would happen if the intervention were done in a home environment, where children have access to “toys thrown all around the floor.”

Finally, to highlight the importance of parent participation, he commented on Temple Grandin’s experience: “we would have lost so much had her mother not taken the time, had Temple Grandin not had the drive to communicate and to stand up for herself, and you know, had that kind of self-worth instilled in her... she was encouraged, and she had tons of talent, and obviously, raised...”

Suggestions for improvement and appeal to parents. When asked for suggestions for improvement or increasing appeal for parents, the parent commented that clearly knowing that parents would engage with their child virtually the whole session would be important. However, he mentioned that this knowledge might be “a selling point” or it would be a deterrent to some parents: “I was wondering if I had known coming into it that it was going to be like a lot more participatory from a parental perspective, if that would have made me more excited to be involved... or less excited. I think it probably depends on the parent.” For this parent, the level of participation was not a deterrent: “I don’t think it would have deterred me; I think I would have been happy to participate.” Other tentative suggestions included flexibility in scheduling the

sessions [although sessions were scheduled around parents' needs]; sessions once a week, instead of twice; sending therapists to the home (as other institutions and school districts do); and providing free parking to attend the program.

Discussion

The purpose of this study was to provide initial support to a conceptual framework of parent coaching for families with ASD (Chapter III), and, more specifically, to investigate the effect of music on parental responsiveness as an intermediate variable between the intervention and child outcomes. To answer the guiding research question, *Does music-based P-ESDM coaching increase parental responsiveness compared to non-music-based P-ESDM coaching?* parental verbal and non-verbal behaviors were measured, as well as parent fidelity to treatment. As secondary outcomes, child responsive joint attention (RJA), child initiation joint attention (IJA), and verbal behaviors were also measured.

Behavioral video analysis indicated that parental verbal responsiveness seemed to be lower during the music condition (see Figure 7). Such a result might be explained by the fact that the parent provided less verbal comments while singing. Discomfort with his own musical product, as noted in the parent's comments, might also be responsible for this result. On the other hand, non-verbal responsiveness increased noticeably in the music condition and was higher than the non-music condition (Figure 8). This result is consistent with previous research (Walworth, 2009) that shows music's ability to improve nonverbal communication of parents. Further, parent fidelity to treatment strategies, measured during free play, increased immediately and reached the desired level consistently by the 6th session (Figure 9). This result indicates that this parent coaching was effective in teaching the parent the strategies of the ESDM model. However, a significant decrease in both fidelity and parental behaviors was observed in the last two sessions.

The parent, a theatre professional, indicated that he had been involved in late night productions and was tired. The conceptual framework for this intervention considered parental fatigue as a moderator of intervention effectiveness (Chapter III). As noted in the conceptual framework, parents of children with ASD deal with significant levels of fatigue (Giallo et al., 2011). At the same time, engaging a child with limited social communication can be very demanding (Karst et al., 2012; Stewart et al., 2017). The result of this study (decrease in parental behaviors and fidelity due to fatigue) reinforces the need to consider parental wellbeing as a moderator of the intervention.

The child's RJA clearly increased during the music condition and was higher than the non-music condition (Figure 10), consistent with previous research (Kalas, 2012; Kim, Wigram, & Gold, 2008; Paul et al., 2015). The child's IJA was higher than the non-music condition and showed an upward trend after Session 5 except in the last two sessions, which showed a substantial decrease (Figure 11). Regarding verbal behaviors, and contrary to expectations, the child showed an overall decrease in verbal behaviors, except in the last two sessions, which showed an abrupt increase. It is important to note that the operational definition of verbal behaviors encompassed *any* vocalization or verbalization, including complaints, screams, and verbalizations without communicative intent. In that regard, a decrease in verbal behaviors might be encouraging since it might indicate fewer non-compliant or non-communicative expressions (i.e., echolalia). It is interesting to observe that the child had fewer JA responses (and *increased* verbal behaviors) when parental behaviors and fidelity also decreased (i.e., in the last two sessions). The latter supports the notion that parental responsiveness has a direct effect on child's outcomes, and, ultimately, that supporting parental learning yields better child outcomes.

However, since this is a single-case study, this mediating relationship is suspected but not demonstrated. Larger sample studies with control groups could investigate this relationship.

The final interview with the parent that completed the project supported these quantitative results and several assertions of the conceptual framework, namely:

- a) parents seemed capable and might find value in learning strategies from professionals that they can implement at home
- b) music seems to provide “freer engagement” and make the interaction more collaborative (as shown by parent’s comments and child’s RJA and IJA)
- c) use of familiar music seemed to be ideal and needed for parental comfort and efficacy
- d) making music—as opposed to responding to a recording source— and a structured, goal-oriented activity seemed to support child and parent learning better
- e) parents might need more support in learning music than brief introductions to the songs. Music sessions only with parents or take-home materials to practice the music could expedite learning the music-based strategies.
- f) providing clear expectations of parental level of involvement might act as “selling point” or a deterrent for the intervention, depending on parents’ preference. This model might not be appealing to parents who do not want “hands-on” involvement in their child’s treatment.

Finally, attrition in this study, although never ideal, supports the existence of the moderators presented in the conceptual framework (Chapter III). Specifically, other factors—such as resolution of diagnosis (in the case of D2), co-parenting relationship (in D3), and fatigue (in the last two sessions of D1)—seemed to interfere with coaching efficacy and treatment

adherence. Capacity and disposition to engage in playful activities with their child, while being observed and coached, are two other factors that could interfere with this type of intervention, as was observed in dyads D2 and D3, and as the parent in D1 commented. Parenting philosophy and relationship to treatment (i.e., willingness to engage in treatment, as opposed to defer all treatment to professionals) could also impact parent choices. Further studies could develop a parent assessment scale with these factors and investigate their impact on efficacy.

Intervention fidelity

The therapist consistently adhered to the treatment model, as measured by her self-report and independent observer's ratings (Figure 13). This result indicates that incorporating music to a well-researched model of parent coaching might be possible for a trained professional. It is important to note that the interventionist was a board-certified music therapist and also had certification and practice in the ESDM model, and training in the P-ESDM. Consistent with the systematic review in parent-mediated interventions (Chapter II), interventionist training seems essential to reach fidelity in this type of coaching intervention.

Implications for Clinical Practice

This project provides further support to parent coaching of music interventions to improve social communication in preschoolers with ASD (Hernandez-Ruiz, 2017). Individual sessions, as well as a clear parent coaching format, provided better results. Interested clinicians could incorporate the principles of the original ESDM with the music-based modifications as provided in the intervention manual (see Appendix H).

Limitations

The greatest limitation of this study is its small sample size (only one dyad completed the project), which limits its generalizability. Further research should strive to create a larger sample.

Also, the adaptation of the P-ESDM manual to music-based strategies supported treatment fidelity. However, it was observed that the small time assigned for discussion (5 minutes before each coaching period) in the original model was insufficient to ensure that the parent felt comfortable with the music. Including music-only sessions or providing materials for home practice could improve parent comfort and efficacy with the music. Further research should investigate such music coaching models.

A limitation was observed in the operationalization of parental responsiveness. Despite the improvement observed in parental responsiveness, both by the researcher and the trained observers, the quantitative data, particularly the verbal behaviors, do not show this clearly. It was observed that at the beginning of the study the parent was very directive (i.e., issuing directions and instructions; only asking questions). By the end, the parent was much more responsive to the child's interests and less directive. A better measure—such as a ratio of responsive vs. directive interactions—might show progress more clearly. Alternatively, it is possible that the short period of this program (5 weeks) was insufficient to establish a clear pattern. Although the number of sessions (10) was consistent with previous research projects (Rogers et al., 2012), the fact that they happened twice a week, instead of once a week, might have interfered with the parent's ability to practice the interventions at home, limiting their learning. On the other hand, it was previously observed that some parents did not sign up for the program when the length of the study was established at 12 weeks. Further research should strive to establish acceptable and functional lengths of parent coaching.

Future research

Future studies should investigate music training models that are complementary to the ESDM coaching. They should also determine better parental responsiveness and child outcome

measures, acceptable program duration, and factors—such as family dynamics, acceptance of diagnosis, hands-on participation—that impact program adherence and therapeutic allegiance. Further studies could also investigate different effects of familiar and preferred music compared to original music, as well as provision of services in community and home settings. Larger single-case studies could investigate other parental outcomes (e.g., satisfaction, implementation at home, parental stress, personality traits, etc.) and their impact on efficacy.

Conclusion

This study investigated the limited efficacy of parent coaching to teach music strategies, based on the P-ESDM (Rogers & Vismara, 2015), that promote social communication in preschoolers with ASD. The results are encouraging, given that a parent seemed to learn the strategies and achieve initial fidelity, and music seemed to enhance the child's communicative responses (RJA, IJA, and verbal behaviors). These results also provide initial support to the conceptual framework for parent coaching delineated in Chapter III. Future research should investigate better implementations of this model.

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CHAPTER V

CONCLUSIONS

Parent-mediated interventions are a specific intervention model where parents implement evidence-based strategies with their children with disabilities. Different from family therapy models, or parent participation models, parent-mediated interventions expect the parent to collaborate in goal setting and provide a significant part of the services. Such models have responded to the needs of early intervention services, especially in areas where professional services are scarce. In music therapy, parent participation studies have begun to appear in the research literature, particularly in the last 5 years (2012-2017). However, clear definitions of these interventions are missing, and parent-mediated interventions are very limited.

On the other hand, the present work indicated that parent-mediated music interventions seem feasible, both theoretically and empirically. Its potential to support parent and child outcomes, its alignment with best practices in ASD treatment, and high parental satisfaction indicate that music intervention can have significant value for all family members.

Sometimes used interchangeably, but clearly distinct, *parent coaching* is the professional service intended to train parents in the above-mentioned strategies. Parent coaching is currently researched as one of the most cost-effective and useful strategies within the ASD field. The present work developed a conceptual framework of a music-based parent coaching, grounded on the Parent-Early Start Denver Model (Rogers et al., 2012, 2014). Within this model, music was considered a mediator, enhancing the psychophysiological synchrony between the dyad, and increasing child motivation and attention, that could be easily incorporated into everyday family routines. Some of the relationships in this framework were then investigated by a single-case alternating treatments study. Initial results indicate that parents can indeed learn the strategies

and achieve initial fidelity, and that music might enhance the child's communicative responses, compared to the original P-ESDM.

Being a novel intervention, with few antecedents in the music therapy literature, this model still requires significant revision before an effectiveness study can be implemented. Further research should continue within Phase I (basic and feasibility research; Melnyk & Morrison-Beedy, 2012). Within this phase, research seeks to establish “the variables that may be amenable to intervention or in which the content, strength, and timing of the intervention are developed, along with the outcome measures of the study” (Melnyk & Morrison-Beedy, 2012, p. 41). More specifically, future research should study other feasibility measures such as acceptable program duration, better parental responsiveness measures, and factors—such as family dynamics, acceptance of diagnosis, hands-on participation—for program adherence and therapeutic allegiance. Larger single-case studies could also investigate other parental outcomes (e.g., satisfaction, implementation at home, etc.) and their impact on efficacy. This feasibility research would support and enhance the conceptual framework developed in this work.

Finally, a very important finding in this work indicated the need to investigate music training models that complement the P-ESDM coaching. Different approaches to music learning (video links, parent-only sessions to teach the music, recordings, etc.) could show better results in parental implementation. Further studies could also investigate different effects of familiar and preferred music compared to original music.

Having a young child with ASD can push parents to the limits of their resilience and resourcefulness. Although many parents are able to cope and thrive, professionals can support this resilience by sharing well-established, evidence-based strategies for their child's

development. As with any child, parental well-being, empowerment and resources will guarantee better outcomes for the child with ASD.

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Appendix A.

Aggregated Results of Searches from the Systematic Review (Chapter II)

Date	Database	Strategy	Hits	Screened (Uploaded to Covidence)
03/31/2017	Academic Search Complete	APPLY filters: - Language: English and French (there were no Spanish). Exclude Russian) - Peer-reviewed - Scholarly Journals and dissertations/theses - From 2007-2016.	34	34
03/29/2017	ERIC	APPLY filters: - Language: English and French (there were no Spanish). Exclude German, Polish, Chinese, Italian) - Peer-reviewed - Scholarly Journals and dissertations/theses - From 2007-2016.	964	953 (excludes duplicates)
3/30/2017	Google Scholar	APPLY filters: - Language: English and French (there were no Spanish). EXCLUDED: German, Polish, Chinese, Italian. - From 2007-2016.	771	740 (excludes duplicates)
3/29/2017	JSTOR	(parent OR carer OR caregiver) AND (music) AND autis* OR...)	205	172 (excludes duplicates)
04/2/2017	Music Index	APPLY filters: - Language: English, Spanish and French - Peer-reviewed - Scholarly Journals and dissertations/Theses - From 2007-2016.	18	11 (excludes duplicates)
04/08/2017	ProQuest Dissertation and Theses Global	APPLY filters: - Language: English (there were no French or Spanish). - Only Doctoral dissertations - From 2007-2016.	18	18
03/29/2017	Proquest Research Library	APPLY filters: - Language: English and Spanish (there were no French). - Peer-reviewed - Doc type: Reports, articles, feature, review, interview. EXCLUDED: editorial, general information, news - From 2007-2016.	120	112 (excludes duplicates)
04/4/2017	Psychological and Behavioral Sciences Collection	APPLY filters: - Language: English, Spanish and French - Peer-reviewed - Scholarly Journals and dissertations/Theses - From 2007-2016.	6	0 (excludes duplicates)

03/26/2017	PsycINFO	APPLY filters: - Language: English and French (there were no Spanish). EXCLUDED: German, Polish, Chinese, Italian. - Peer-reviewed - Scholarly Journals and dissertations/Theses - From 2007-2016.	260	228 (excludes duplicates)
03/26/2017	PubMed	APPLY filters: - Language: English and French - Type of articles - From 2007-2016.	27	10 (excludes duplicates)
03/26/2017	Web of Science	APPLY filters: - Language: English and French - Peer-reviewed - Dissertation/theses - Journal Articles - From 2007-2016.	40	10 (excludes duplicates)
4/28/2017	Manual search	Nicholson et al., 2008	1	1
		TOTAL	2,464	2,289 (175 duplicates)

Appendix B.

Screening Tool used in the Systematic Review (Chapter II)

SCREENING TOOL: Parent-mediated music interventions for ASD: A systematic review

REVIEW QUESTION: What parent-mediated/parent-led music interventions have been researched within the ASD field?

Reviewer: _____ Date: _____
 Author Name: _____ Year: _____
 Title: _____ Journal: _____

Population	INCLUDE	EXCLUDE	Page:
Parents involved in sessions	Yes	No	
Children 12 years or younger	Yes	No	
Children formally diagnosed with ASD or Developmental Disabilities	Yes	No	
Intervention			
Intervention is music-based	Yes	No	
At least part of the intervention is provided by the parent/caregiver outside of sessions	Yes	No	
Study design			
Study Design	Data collection (either quantitative or qualitative) was performed directly with the families	Theoretical paper/position paper	

Overall decision:
 EXCLUDE

INCLUDE

NOTES:

Appendix C.

Data Extraction Tool Used in the Systematic Review (Chapter II)

⁴DATA-EXTRACTION TOOL for: Parent-mediated music interventions for ASD: A systematic review

REVIEW QUESTION: What parent-mediated/parent-led music interventions have been researched within the ASD field?

Reviewer: _____ Date: _____

Author Name: _____ Year: _____

Title: _____ Journal: _____

Study Information	CIRCLE	Page #:
Geographical area of implementation (continent and country)	Choose one (specify country): 1) Africa _____ 2) Asia _____ 3) Europe _____ 4) North America _____ 5) South America _____ 6) Oceania _____	
Discipline of PI:	Choose one: 1) music therapy 2) nursing 3) psychology/psychiatry 4) medicine 5) other _____	
Discipline of Co-authors:	Circle <u>all that apply</u> : 1) music therapy 2) nursing 3) psychology/psychiatry 4) medicine 5) other _____	

⁴ This tool is based on Robb, Burns, & Carpenter (2011), and Robb et al., (2018).

Participant description	LIST		Page #:
List all terms used to describe the child diagnosis being studied. <i>Examples:</i> Developmental delays Developmental disability Autism Spectrum Disorder Autism Asperger Neurodevelopmental disorder			
Age (years, months)			
Gender	F	M	Other
Definition of Parent-led/mediated	DESCRIBE/QUOTE		Page #
Definition of Coaching/Training	DESCRIBE/QUOTE		Page #
Parent Coaching	CIRCLE ONE		Page #
Was formal training for parents provided?	Yes	No	
Were follow-up sessions (monitoring) provided?	Yes	No	
Did the authors use a specific training/coaching model?	Yes	No	
What was the model? <i>Examples:</i> ESDM SCERT DRI	Describe: Give the name and citation if available:		
Who provided the training/coaching?	a) Music therapist b) Psychologist c) Social Worker d) Other _____		
Do these interventionists have specific certification/credentials in the models?	Yes	No	

Study Design	CHOOSE ONE		Page #
Study Design	<p><i>Experimental Designs (more than one group; randomization)</i></p> <ol style="list-style-type: none"> 1) 2 groups, randomized trial (randomization; control group; pre/post-test) 2) 2 groups, post-test only (randomization; control group; posttest only) 3) Randomized, Wait-list control Group 4) Factorial design 5) Cross over design 6) N-1 studies (Multiple-baseline design, etc.) 7) Other <p><i>Designs without Control Groups:</i></p> <ol style="list-style-type: none"> 1) One-group, posttest only 2) One-group pretest/posttest <p><i>Designs that Use a Control Group, but no Pretest</i></p> <ol style="list-style-type: none"> 1) Post-test only, non-equivalent groups 2) Case Control Design <p><i>Designs that use control groups & pretests</i></p> <ol style="list-style-type: none"> 1) Untreated control group design w/ dependent pre/posttest samples 2) Matching through cohort controls <p><i>Interrupted time-series designs</i></p> <ol style="list-style-type: none"> 1) Single group time series design 2) Nonequivalent control group time series design <p><i>Qualitative</i></p> <ol style="list-style-type: none"> 1) Case study 2) Grounded Theory 3) Phenomenological 4) Ethnography 5) Other. <p>Specify: _____</p>		
Outcomes	LIST		Page #
Outcome of Interest/Corresponding Measure <i>Example:</i> Outcome of Interest: Parental stress level Measure: PSI	Outcomes	Measures	
Contributions	DESCRIBE		Page #

Music Intervention Definition	CIRCLE/LIST		Page #:
Did the authors use any of the following terms?	Circle all that apply: 1) Music Therapy 2) Music Medicine 3) Music Intervention 4) Other (please specify)		
Did the authors define these terms? Indicate page number where term is defined	Yes	No	
Describe/Quote			
Music Intervention Reporting Criteria	CIRCLE/LIST		Page #:
A: Rationale for Music Selection/Intervention Theory Provided a rationale for the music selected; specified how qualities and delivery of the music are expected to impact targeted outcomes.	Yes	No	
B: Intervention Content Provided precise details of the music intervention and, when applicable, descriptions of procedures for tailoring interventions to individual participants. Please code the following 5 areas:			
B.1: Person Selecting the Music Specified who selected the music.	Yes	No	
	If yes, circle one: (1) pre-selected by investigator, (2) participant selected from limited set, (3) participant selected from own collection, (4) tailored based on patient assessment. (5) other		
B.2: Music			
When using <u>published music</u> , provided reference for sheet music or sound recording.	Yes	No	
When using <u>improvised or original music</u> , described the music's overall structure (i.e., form, elements, instruments, etc).	Yes	No	
B.3. Music Delivery Method (Live or Recorded)			
When using <u>live music</u> :			
(1) specified who delivered the music	Yes	No	

(2) specified the size of the performance group (e.g., interventionist only, interventionist and participant)	Yes	No	
When using recorded music:			
(1) specified placement of playback equipment and/or the use of headphones vs. speakers,	Yes	No	
(2) Specified decibel level of music delivered and/or use of volume controls to limit decibels.	Yes	No	
B.4: Intervention Materials			
Specified music material	Yes	No	
Specified non-music materials	Yes	No	
B.5: Intervention Strategies Described music intervention strategies under investigation.	Yes If yes, circle <u>all that apply</u> : 1) Breathing Entrainment 2) Imagery 3) Music-assisted relaxation 4) Songwriting 5) Lyric Analysis 6) Movement 7) Re-creating music by singing/playing instrument 8) Improvisation 9) Instrument/vocal play 10) Listening 11) Other (please specify)	No	
C: Intervention Delivery Schedule			
Reported number of sessions,	Yes	No	
Reported session duration,	Yes	No	
Reported session frequency	Yes	No	
D: Interventionist			
Specified qualifications (i.e., degree)	Yes Please list:	No	
Specified credentials (i.e., certifications)	Yes Please list:	No	
Specified how many interventionists delivered study conditions	Yes Specify #:	No	
E: Treatment Fidelity Describe any strategies used to ensure that treatment and/or control conditions were delivered as intended (e.g., interventionist training, manualized protocols, and intervention monitoring)	Yes	No	
F: Setting			
Specified where intervention was delivered (i.e., location)	Yes List location:	No	
Privacy level (e.g., private room, open treatment area)	Yes	No	

Ambient Sound (e.g., noise level in the environment)	Yes	No	
G: Unit of Delivery			
Specify whether interventions were delivered to individuals or groups of individuals.	Yes If yes, circle one: Individual Group	No	

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Appendix D.

Quality assessments of Studies Reviewed (Chapter II)

Citation	Reporting Score	External Validity Score	Internal Validity- Measurement Bias Score	Internal Validity- Selection Bias Score	Power	Total points	Total Items	Total Score
Ayson, 2011.	14%	33%	0%	0%	N/A	2	14	14%
Bakan et al., 2008.	44%	0%	0%	0%	N/A	4	17	24%
Blair, et al., 2011.	60%	33%	60%	75%	N/A	13	22	59%
DiRenzo et al., 2015.	75%	67%	43%	50%	Yes	15.5	25	62%
Jacquet, 2011.	25%	0%	25%	0%	N/A	3	17	18%
Nicholson et al., 2008	70%	67%	57%	17%	No	14	26	54%
Osei, 2009.	29%	0%	0%	0%	N/A	2	16	13%
Pasiali, 2012.	67%	33%	40%	20%	N/A	10	22	45%
Pitts, 2016	35%	100%	0%	0%	No	6.5	26	25%
Standley et al., 2009	75%	100%	57%	50%	N/A	17.5	27	65%
Thompson et al., 2014	80%	100%	67%	83%	Yes	21	26	81%
Thompson, 2012	30%	0%	60%	0%	N/A	6	18	33%
Thompson & McFerran., 2015	56%	33%	60%	33%	N/A	11	23	48%
Vaiouli, 2014	38%	0%	67%	0%	N/A	7	18	39%
Williams et al., 2012	70%	33%	67%	33%	No	14	26	54%
Woo et al., 2015	85%	33%	83%	67%	N/A	18.5	25	74%
Yang, 2013	80%	0%	67%	60%	Yes	16	25	64%
AVERAGE	55%	37%	44%	29%	3 Yes			45%

Note: Geretsegger et al., 2014, and McIntyre et al., 2013 excluded from this analysis because they are systematic reviews.

Appendix E.

PICOT Summary Report of the Systematic Review (Chapter II)

Population	Intervention	Comparison group	Outcome category		Time
<p>Children with ASD or children with disabilities (but 25-47% with developmental disorders)</p>	<p>Individual, group or family (parent-child) sessions with music-assisted relaxation, movement and music, re-creation of familiar music and improvisation. In all studies parents are present. In 9 studies, treatment has a formal parent training/coaching component.</p>	<p>16 studies- no comparison. 1 study—waitlist control group (Standley et al., 2009) 1 study—control group (standard care) (Nicholson et al., 2008) 1 study—control (standard care), and partial treatment (without music and olfactory stimulation) (Woo et al., 2015)</p>	<p>Parents</p>	1. Interactions with child	<p>Duration: Between 6 weeks and 4 years; Frequency: daily (Woo et al, 2015), weekly or biweekly. For 8 studies, frequency unspecified</p>
				2. Parental efficacy	
				3. Mental health	
				4. Benefits and satisfaction	
				5. Music	
			<p>Children</p>	1. Social interaction	
				2. Emotional regulation	
				3. Cognitive abilities	
				4. ASD symptoms	
				5. Language and communication	
				6. Self-help skills	
				7. Child development	
				8. Music Skills	
				9. Sensory behaviors	
			<p>Parent-child</p>	1. Parent-child interaction	
			<p>Therapist</p>	1. Role in relation to dyad	
2. Appropriateness and effectiveness of music interventions					
3. Social validity					
4. Professional interactions					

Appendix F.

PROGRESS Summary Report of the Systematic Review (Chapter II)

Component	Quality of data	Description
Place of Residence	12 reported. 5 implied by researcher's residence. 2 reviews	6 USA, 5 Australia, 2 Canada, 1 New Zealand, 1 South Korea, 1 Italy, 1 UK, 2 N/A (reviews)
Race/Ethnicity (second language was used as proxy of diversity when no other information was available)	7 studies reported at least partial data 12 studies no report	<ul style="list-style-type: none"> • Italian (82), Eastern European (2), Asian (1) (DiRenzo, et al., 2014) • Indigenous 2% in disability group; 6.5% total; 16.4% language other than English (Nicholson, 2008)* • Ghana (international student?). Bilingual. (Osei, 2009) • 23% English as second language (Thompson et al., 2014) • 27% English as a second language (Thompson & McFerran, 2015) • 16% English as a second language (Williams et al., 2012) • White= 58%. Black= 23%; Hispanic= 7%; Mixed, other= 12% (Yang, 2013)
Occupation of Parents	5 studies reported partial data 14 studies no report	<ul style="list-style-type: none"> • Homemakers (mothers), and Teachers (Blair et al., 2011). • PhD student (and researcher) (Osei, 2009). • 50% Grad student (1 also employed). 50% not reported (Pasiali, 2012). • 68% not in paid employment (Williams et al., 2012). • 11 Stay-at home moms; 9 Full-time work; 6 Part-time work (Yang, 2013).
Gender of Child and Parent	Children: 16 studies reported, at least partial data. 3 studies no report Caregivers: 3 reported 16 not reported (female assumed through narrative)	<ul style="list-style-type: none"> • Children: M= 80-100% except when recruited for balanced groups (Standley et al, 2009), or disability/at risk groups (Williams et al., 2012). • Caregivers: Female (Blair et al., 2011; McIntyre, 2013; Thompson & McFerran, 2015; Yang, 2013), Male (Osei, 2009).
Religion	None reported	---
Education of parent	7 reported at least partial data 12 studies no report	<ul style="list-style-type: none"> • High school, and 2-yr college (2) (Blair, 2011) • Incomplete high school = 48% in disability group; 51% of all groups (Nicholson, 2008) • PhD student (Osei, 2009)

* Only 58% provided complete data

		<ul style="list-style-type: none"> • Graduate students (2 families), others not reported (Pasiali, 2012) • 45% = 11-12 yrs. of school; 45% professional certificate; 10%: university degree (Thompson & McFerran, 2015) • 34% did not complete high school (Williams et al., 2012) • Mothers: High school or less= 46%; Associate = 15%; Bachelor's = 31%; Graduate = 8%. Fathers: High school or less = 43%; Associate = 19%; Bachelor's = 19% Graduate = 19%. (Yang, 2013).
Socioeconomic status	7 studies reported at least partial data 12 studies no report	<ul style="list-style-type: none"> • 5% Low, 70% average, 24% high. SES includes quality of life, parental occupation and education (DiRenzo et al., 2015); • Not paid employment = 51% in disability subgroup; 70% in all 3 groups; main income from benefits: 22% in disability group; 43% in all groups (Nicholson, et al., 2008); • 1 mother in “economic hardship” (Pasiali, 2012); • “disadvantaged” (Pitts, 2016); • 27% considered themselves in economic hardship (Thompson & McFerran, 2015) • 17% income from benefits (Williams et al., 2012); • 12% poverty; 38% Lower Middle; 19% Middle; 12% Upper Middle; 19% High (Yang, 2013)
Social Capital	Data extracted from narrative. No study explicitly reported.	<ul style="list-style-type: none"> • 2 mothers diagnosed with depression (Blair et al., 2011) • 42.4% reported depression in last year (Nicholson et al., 2008) • Parent-teacher-therapist ambivalent relationships (Osei, 2009) • Mother divorced from abusive partner (1 family); depressed (2 families) or graduate students (2 families) (Pasiali, 2012). • Mentioned ethnic minority, severe economic disadvantage, traveler families, and English as added language as risk factors (Pitts, 2016) • Sibling participation in several studies • Children born prematurely (Standley et al., 2009) • 90% cohabiting/married; 16% reported one depressive event on the last year (Williams et al., 2012). • 2//3 of participants with severe ASD diagnosis; 1/3 with moderate (Thompson et al., 2014)

Appendix G.

Complete Table of Results and Findings (Chapter II)

Group	Outcome category	Positive results/findings	Null results	Negative results/findings
Parents	1. Interactions with child	Positive interactions increased from 30% to 60%; negative interactions decreased from 70 to 17% (Blair et al., 2011) Parents reported understanding their child in their own terms, engaging w/their child, perceiving child better as unique; more confident, creative, resourceful and fun; more hopeful and optimistic; seeing their child develop friendships with other children (Bakan et al., 2008) Parent-reported and therapist-observed significant improvement in irritable parenting (Nicholson et al, 2008) "Playing with", actively seeking engagement, not only music ideas, but applying experiences to daily interactions. (Thompson & McFerran, 2015) Therapist-observed significant improvement (73-77% reliable change) in parental behaviors; parents' positive physical and verbal behavior, significant increase, medium effect size (Yang, 2013).	null effect on parent-reported parental warmth (Nicholson et al, 2008) Parent-reported parental warmth and irritable parenting showed no difference (Williams et al., 2012);	none reported
	2. Parental efficacy	Improvement in educational activities in home (increase for Nicholson, 2008, as reported in McIntyre, 2013); Observed improvement in parent sensitivity, engagement and acceptance (as reported in McIntyre et al., 2013) Insights for child learning (Osei, 2009) Music therapist supported the parent to reinterpret the behaviors; mt accepted parent expertise; mt withdrew for parent to take the lead (Thompson, 2012) Self-efficacy increased (Vaiouli, 2014)	Null effect in educational activities at home for Williams, 2012, as reported in McIntyre, 2013 Null effect for parental self-efficacy (Nicholson, 2008, and Williams, 2012-- only 2 studies in McIntyre's review to report null effect). No effect on parent attitude towards parenting and child (Thompson & McFerran, 2015)	slight decrease in parent self-efficacy in disability group (Nicholson et al., 2008);
	3. Mental health	Significant improvement (Nicholson et al., and Williams et al., 2012). Two of 6 studies reporting this effect in McIntyre, 2013.	none reported	none reported

	4. Benefits and satisfaction	<p>Provided ideas to mother on how to use music (Ayson, 2011);</p> <p>Provided father researcher perspective (Osei, 2009);</p> <p>Music therapy can promote mutually responsive orientations (Pasiali, 2012); changes in parents' perceptions of the child: positive possibilities; seeing the child not the autism; seeing child's motivation; recognizing the power of music (Thompson & McFerran, 2015);</p> <p>Increased communication with other parents, reported high satisfaction; increased knowledge (Williams et al., 2012);</p> <p>Parental perception of improved social skills in children, improvement in parenting skills, and improvement in their interaction. Most effective teaching strategy: matching child's developmental level, interest, and behavioral style. Most beneficial activity: musical games. Effectively generalized to daily routines.</p> <p>Materials were used by other therapists. Parents used materials 2 to 6 times per week, 7 to 30 mins per session after program (Yang, 2013).</p>	none reported	none reported
	5. Music relevance	<p>Parent considers music as a fundamental tool for child learning: "The use of instructive songs for teaching students with autism social and personal care skills has not been adequately explored for their contribution to special education." (Osei, 2009, 108);</p> <p>92% of parents still used music materials 3 months later (Yang, 2013).</p>	Songsheets not useful if English is second language; parent involvement not as successful. (Pitts, 2016)	none reported
Children	1. Social interaction	<p>Greatest improvement in active learning and organization; least, in flexibility and resiliency (Ayson, 2011)</p> <p>Both child engagement in activities and social interaction increased from 20% to 60%, increase in engagement with peers and siblings (Blair et al, 2012)</p> <p>Social interaction outside of treatment had a moderate to large effect size (0.71, 95% CI = 0.29, 0.85) (Geretsegger et al, 2014)</p> <p>Socioemotional reciprocity had large effect size (2.25, 95% CI = 0.73,</p>	no effect on observed child responsiveness and engagement (Nicholson et al., 2008, and Williams et al., 2012 – 2 of 3 studies with null effects, as reported in McIntyre et al., 2014)	none reported

	<p>3.83), but high attrition and small sample size in one study (Kim, 2008, 2013) as reported in Geretsegger et al., 2014);</p> <p>Increase in social and communication skills (Nicholson et al., 2008)</p> <p>Music as a Vehicle for social skills (sitting, following instructions, Pitts, 2016)</p> <p>Significant improvement in engagement in mt sessions (Thompson et al., 2013); Children engaged when adult imitated their play, created structure (made up a story with music) and when there was low anxiety and positive affect (Thompson, 2012)</p> <p>Child learned music behaviors (loud, soft, fast, slow), and used them to initiate musical interactions (Thompson, 2012);</p> <p>Child was more responsive, interconnected (Thompson & McFerran, 2015);</p> <p>Increases in all measures of joint attention (Vaouli, 2014);</p> <p>Significant improvement in social play skills, responsiveness, interest, participation and social engagement (Williams et al., 2012);</p>	<p>(Thompson et al., 2013)</p> <p>No difference in child behaviors (Williams, et al., 2012)</p>
2. Emotional regulation	<p>Greatest improvement in active learning and organization; least, in flexibility and resiliency (Ayson, 2011)</p> <p>Child problem behavior decreased from 75% to 17% (Blair, et al., 2011)</p> <p>Significant improvement in therapist-observed child behavioral problems (Nicholson, et al., 2008)</p> <p>Significant and large effect size in social and emotional functioning (but still below age range, Thomas, et al., 2013)</p> <p>More able to wait and respond; increase in positive verbal behavior (Yang, 2013)</p>	<p>Null effect on parent-reported child behavioral problems (Nicholson, et al., 2008)</p> <p>No effect on positive physical behavior (Yang, 2013)</p>
3. Cognitive abilities	<p>Increase in IQ and FR, particularly at younger ages (2.5 - 5 years old), (DiRenzo et al., 2015).</p> <p>No difference between treatment groups (full and partial- without music). Significant difference with standard care: increase in IQ score.</p> <p>NOTE: High scores in Lieter-R and</p>	<p>none reported</p> <p>none reported</p>

		Reynell at pretest predicted beneficial outcomes (Woo et al., 2015)		
	4. ASD symptoms	Decrease in ADOS score (less severity) at posttest. Several students change diagnosis from autism to ASD (DiRenzo et al., 2015) 21% of children in treatment group moved out of classical autism but remained in ASD. None in the standard care group changed (Woo et al., 2015).	none reported	none reported
	5. Language and communication	Significant increase in receptive communication (Williams et al., 2012) Non-verbal communication outside of treatment improved with a moderate effect size (0.57, 95% CI= 0.18,1.25) and verbal communication improved with a small effect size (0.33, 95% CI = 0.16, 0.49) (Getsegger et al., 2014) Parent-reported improvement in child communication and play skills; (Nicholson et al., 2008); great percentage of children that improved above expectations (particularly in understanding) (Pitts, 2016) Significant improvement in receptive communication (Williams, et al., 2012) Significant improvement in both treatment groups for receptive and expressive (Woo et al., 2015).	No difference on vocabulary production and understanding (Nicholson et al., 2008). No difference between treatment groups (with and without music), (Woo et al., 2015)	none reported
	6. Self-help skills	Child toilet trained with "instructive song" that included a bird theme (his repetitive interest) (Osei, 2009)	none reported	none reported
	7. Child development	Significant increase (almost double) in overall developmental scores. Significant difference in number of children achieving music and cognitive skills. Low incidence of problem behaviors in music group (Standley et al., 2014)	Mentioned, but not reported (Pasiali, 2012). No difference in social and motor skills (Standley et al., 2014)	none reported
	8. Music Skills	Increase across settings (Pitts, 2016)	none reported	none reported
	9. Sensory behaviors	significant increase in sensory behaviors for treatment groups (Woo et al., 2015)	none reported	none reported
Parent-child	1. Parent-child interaction	Quality of parent-child relationships improved significantly with a large effect size (0.82, 95% CI=0.13,1.52) of music therapy. However, Kim (2008) had high attrition, and results	none reported	none reported

		were non-significant when excluded (Getsegger et al., 2014); positive change in perception of child, of the relationship, and own responses towards child (Thompson & McFerran, 2015).		
Therapist	1. Role in relation to dyad	Depends on "parent-child attitudes". Preserve the family from medical intrusions. Emphasize positive. Promote expression of needs. Solidify the "bulle familiale". Guest within the family for limited time. Create distance: try that parents learn the principles of MT so they interact musically but respect each family dynamics. Stages: first in trios to show musical techniques, then withdraw and encourage parent to be creative. "Guide the dyad through the difficulties to prepare them for the future." (Jacquet, 2011, p. 102) Collaboration where "at every moment of music-making, each person is impacting on what will happen next, and the role of the leader or follower can morph into the other in an instant... the music experiences allow for a natural opportunity for each person to gently share their expertise." (Thompson & McFerran, 2015, p. 22)	none reported	none reported
	2. Appropriateness and effectiveness of music interventions	1) songwriting: for emotional expression; (2) improvisation: parent-child communication; (3) familiar songs: family routines, intimacy, reminiscence, alliance and communication (Jacquet, 2011) Songsheets should be in preferred language; useful if English is second language (Pitts, 2016)	none reported	none reported
	3. Social validity	socially valid because "solidarity, responsibility and decision making are collective traits embedded in the Korean culture" (Blair et al., 2011); significant improvement in parent-reported educational activities at home (Nicholson et al., 2008); increase in parent and teacher confidence in use of music (Pitts, 2016); 79% parents were satisfied (Nicholson et al., 2008); minimal cost to implement (bundled sensory intervention), (Woo et al., 2015); Increase in daily musical playtime, and	none reported	High attrition (Nicholson et al., 2008; Woo et al., 2015). Minimum therapeutic dose (6 sessions) only achieved by 53.6% of families (Nicholson et al., 2008). Significant effort for parents (36 to

	overall playtime. Decrease in non-musical playtime. (Yang, 2013).		100% of compliance), (Woo et al., 2015).
4. Professional interactions	speech pathologist's opinion "another setting to practice and achieve goals" (Ayson, 2011);	none reported	none reported

Appendix H.

Music-based P-ESDM Intervention Manual

Intervention Manual

Contents:

- I. General considerations
- II. P-ESDM Topics/Strategies addressed
- III. Coaching session structure
- IV. Introduction to the topic: Information to include in each strategy presentation.
- V. Materials

Table A1: Music-based interventions and procedures

Table A2: Non-music-based interventions and procedures

I. General Considerations

The interventions designed for this study follow the P-ESDM model that has been clearly delineated in a parent manual and a therapist’s coaching manual (Rogers & Vismara, 2012; Rogers & Vismara, 2015, respectively). Therefore, only the main components and modifications will be described here.

The interventionist will follow the coaching session structure of the Therapist Coaching Manual (Rogers & Vismara, 2015, see coaching structure below). For each coaching portion, the interventionist and parent will choose one of the proposed activities (either in Table A1 or Table A2) to teach the P-ESDM strategy. Parallel non-music/music-based activities were created to teach the strategies. Corresponding activities (i.e., Five Green and Speckled Frogs song *and* book) should be used within the same session.

Several P-ESDM strategies can be taught with *one* activity. An activity can, therefore, be repeated in two sessions, if the interventionist and parent consider it appropriate, but the focus of the coaching should change to the strategy taught in that session.

About the music: the parent will be asked which of the proposed songs s/he, and the child, are familiar with, and that song will be used. Previous research (Cirelli et al., 2015) has shown that prosocial behaviors are amplified in toddlers when familiar music is used. If none of the songs are familiar, the interventionist will teach the song to the parent, and will spend a few more minutes making sure the parent is comfortable with it.

About modeling: as suggested by Rogers, and Vismara (2015) modeling will be restricted to showing the parent the activities during the Introduction of the Topic, but not directly with the child. The reasons for this choice include a) the lack of time for creating a therapeutic relationship between therapist and child would interfere with appropriate delivery of the intervention; 2) modeling can inadvertently put the therapist in an “authority figure” compared to the parent and would interfere with the parent-child interaction. This is contrary to the philosophy of this approach, where the intention is to empower the parent to use his/her own resources to teach the child.

Optional sections: The Hello/Goodbye sections (either music or non-music-based activities) are suggested for the beginning/end of every session (during “Warm-up activity”, and at the end of the second coaching period, see session structure below), to support transitions in and out, but can be omitted if needed. The relaxation section is also optional, as it is not a specified part of the P-ESDM and is only intended to facilitate behavioral management when needed.

Order of the Strategies: The order of the P-ESDM strategies is suggested in the next section but can be altered depending on parent and child needs, and after consultation with the parent, as suggested by Rogers, and Vismara (2015).

II. P-ESDM Strategies addressed in each intervention session

1. Step into the Spotlight - Capturing Your Child's Attention
2. Find the Smile! - Having Fun with Sensory Social Routines
3. It Takes Two to Tango - Building Back-and-Forth Interactions
4. Talking Bodies - The Importance of Nonverbal Communication
5. Do What I Do! - Helping Your Child Learn by Imitating
6. Let's Get Technical - How Children Learn (principles of behavior modification)
7. The Joint Attention Triangle - Sharing Interests with Others
8. It's Playtime!
9. Let's Pretend!
10. Moving into Speech

III. Coaching session structure

Section	Description	Parent and Child behavior
Greeting and check-in (5 min)	MT greets parent and asks about the week's progress (successes, challenges, concerns)	Parent provides information about the week Child plays with available toys
“Warm Up” Activity (DATA COLLECTION —video recording) (10 min)	MT asks parent to play freely with child and observes. MT fills out ESDM Parent Fidelity Sheet. MT does not provide any guidance.	Parent and child engage in free play.
Introduction of the Topic/Song (5 min)	MT presents the topic of the day (intervention, see below) and explains procedures. She models with child if necessary. If it is a music portion, she will model the music.	Child plays with available toys
Coaching 1 (10 min) (DATA COLLECTION —video recording)	MT coaches in the moment and provides musical support if necessary	Parent performs the intervention engaging the child
Introduction of the Topic/Song 2 (5 min)	MT presents the same topic and explains procedures. She models with child if necessary. If it is a music portion, she will model the music.	Child plays with available toys
Coaching 2 (10 min) (DATA COLLECTION —video recording)	MT coaches in the moment and provides musical support if necessary	Parent performs the intervention engaging the child
Closing (summary and clarification) (5-10 min)	MT summarizes and provides opportunities for clarification. Gives “Refrigerator List” to parent	Parent expresses doubts, if needed, and receives a written summary (Refrigerator List).

IV. Introduction of the Topic: information to include in each strategy presentation

The following information should be given *briefly* to the parent during the introduction of the topic (P-ESDM strategy). After this information is provided, the interventionist should follow the procedures for the specific activity (either music or non-music) as delineated in Tables A1 and A2.

This information should be reviewed during the Closing section. The Refrigerator Lists (Roger & Vismara, 2012) are provided as summaries to the parent during Closing and are included here.

1. Step into the Spotlight - Capturing Your Child's Attention
 - a. Children at risk with ASD show different or restricted interests
 - b. Many times, they are more interested in objects than in people
 - c. We need to make ourselves very interesting!
 - d. These are the steps (REFRIGERATOR LIST):
 - i. Identify your child's interest
 - ii. Position yourself in the spotlight (where he is looking to)
 - iii. Eliminate competition
 - iv. Find your child's social comfort zone and stay there
 - v. Follow his/her lead: listen, narrate, help, imitate
2. Find the Smile! - Having Fun with Sensory Social Routines
 - a. Motivation might be a struggle for your child
 - b. We need to manage their attention and arousal
 - c. Make yourself very fun!
 - d. Use sensory social routines (songs, touch, roughhousing)
 - e. These are the steps (REFRIGERATOR LIST):
 - i. Stay in the spotlight
 - ii. Create fun routines
 - iii. Accompany them with lively faces, voices, and sounds
 - iv. Narrate as you go
 - v. Use stimulating objects
 - vi. Vary the routine if it gets repetitive
 - vii. Pause often and wait for his/her cue
3. It Takes Two to Tango - Building Back-and-Forth Interactions
 - a. Joint attention is our ability to share attention to an object
 - b. Joint activity is our ability to participate cooperatively in a shared activity, basically through taking turns
 - c. Children with ASD have difficulty with this, but can learn
 - d. These are the steps (REFRIGERATOR LIST):
 - i. Position materials between you and your child
 - ii. Stay in the spotlight! Make your child watch your turns
 - iii. Narrate and label
 - iv. Frame the activity in 4 sections: setup-them-variations-closing
 - v. Maintain turn-taking throughout
4. Talking Bodies - The Importance of Nonverbal Communication
 - a. Nonverbal communication is essential for speech and language
 - b. Children with ASD need structured and intentional teaching of this
 - c. These are the steps (REFRIGERATOR LIST):
 - i. Do less so your child will do more!
 - ii. Pause and wait—for a gesture, eye contact or vocalization
 - iii. Add gestures to play or caregiving routines
 - iv. Exaggerate!!
 - v. Divide up materials, and create barriers so s/he has to ask for help
 - vi. Point to objects and materials and wait for child to do it, too
 - vii. Add a simple word to the gesture
 - viii. Build gestures into *every* activity
5. Do What I Do! - Helping Your Child Learn by Imitating
 - a. Children learn through imitation
 - b. However, the lack of joint attention can limit imitation skills

- c. Again, it can be taught through structured and intentional activities
 - d. These are the steps (REFRIGERATOR LIST):
 - i. Imitate your child (in play and speech), and expect him/her to imitate back
 - ii. Add prompts but fade them fast!
 - iii. Use turn-taking for imitation
 - iv. Use SSRs for imitation
 - v. Use the 4-part joint activity for imitation
6. Let's Get Technical - How Children Learn (principles of behavior modification)
- a. Children (and adults!) learn through rewarding experiences
 - b. ABCs of behavior modification: what happens before cues the behavior, that is sustained with the reward that happens afterwards.
 - c. Children with ASD are not as rewarded by social interaction as other children, but can be taught
 - d. These are the steps (REFRIGERATOR LIST):
 - i. Everything happens for a reason: Identify your child's goal
 - ii. What is he doing to achieve his goal? Is that what you want?
 - iii. Use your child's goal to teach important skills (self-help skills, communication skills, etc.)
 - iv. Be aware of the rewards you provide, and which behavior you are rewarding
 - v. Replace the unwanted behavior with a more acceptable one
 - vi. These replacement behaviors need to be as easy and effective as the unacceptable ones
 - vii. The rewards after the desired behavior will make it stick
7. The Joint Attention Triangle - Sharing Interests with Others
- a. Children with ASD tend to "get stuck" in one focus of attention, instead of flexibly disengaging, and they tend to focus on objects and not on people.
 - b. Therefore, they miss out on important social cues
 - c. Joint attention skills, as mentioned, are essential for learning, and also for social interaction (understanding others and sharing one's interests).
 - d. These are the steps to teach them (REFRIGERATOR LIST):
 - i. Giving is a powerful request for help
 - ii. Teach your child to give and give it right back to him
 - iii. Make your child "look at you" before handing objects
 - iv. "Showing" begins as "giving" (without the adult "taking")
 - v. Pointing tells your child where to look
 - vi. Child pointing commands action and accomplishes goals. Give your child this powerful tool
 - vii. Add gaze!
8. It's Playtime!
- a. Flexible play is essential to practice mastered and new skills, and to develop social skills
 - b. Children with ASD have difficulty with flexibility, and tend to repeat sensory play
 - c. Flexible play can be taught
 - d. These are the steps (REFRIGERATOR LIST):
 - i. Teach your child to play with his toys: from easier to harder
 - ii. Model and then prompt. Fade prompts fast!
 - iii. Use the 4-part structure to teach more play skills
 - iv. Encourage independent play by organizing well, sitting behind, and easing out
 - v. Rotate toys to prevent boredom
9. Let's Pretend!

- a. Pretend play requires abstract thinking and imagination. It is based on “shared experiences”
 - b. Children with ASD might have difficulty with this, even if they are very adept at more concrete play (puzzles, building blocks, numbers, etc.)
 - c. Pretend play is correlated to language skills and social interactions
 - d. It can be taught
 - e. These are the steps (REFRIGERATOR LIST):
 - i. Use everyday objects during play
 - ii. Bring dolls/figures/animals to life
 - iii. Substitute objects for other things
 - iv. Combine multiple actions to make scenes from life
 - v. Everyday life events are the best
 - vi. Playing out social interactions helps your child understand them
 - vii. Playing out scenes from movies or books is also an excellent resource
10. Moving into Speech
- a. Speech builds on gestures, imitation, functional and pretend play, and shared interactions.
 - b. Children with ASD struggle with understanding and using speech, but it can be taught
 - c. Multiple, high-quality, structured opportunities facilitate learning.
 - d. A percentage of children with ASD do not develop speech, but even if they don’t use speech, they can learn to communicate
 - e. These are the steps (REFRIGERATOR LIST):
 - i. Raise your expectations!
 - ii. Continue initiating your child’s sounds and create vocal games
 - iii. Label EVERYTHING
 - iv. Use simple language: follow the one-up rule!
 - v. Put in your child’s ear the words you want to come out of his mouth
 - vi. Instruct less; follow through more

IV. Materials

Music selection. Since this is a follow-up study using the same music interventions, the music selection criteria were delineated in Hernandez-Ruiz (2017). They are reproduced here for clarity.

The researcher selected the music considering the following elements:

1. Low level of difficulty and high level of familiarity for parents to feel comfortable singing and using the songs during the session and at home.
2. Developmentally appropriate: taken from available literature of young children’s music, with short vocal ranges, repetitive structures, short phrases and child-oriented, simple lyrics (e.g. “Five Green and Speckled Frogs”).
3. Easily supported by visual stimuli: it is common practice in the ASD field to use visual supports since most children with ASD are visual learners. Most of the songs used in this project were easily supported by visuals.
4. Action songs: as explained in Hernandez-Ruiz (2017), creating sensory-social routines (SSR) that promote joint attention and interaction is especially important for children with ASD (Dawson, Osterling, Rinaldi, Carver, & McPartland, 2001). Many action songs (those that are accompanied by gross or fine motor movements) lend themselves very well to this effect (Srinivasan & Bhat, 2013).
5. Evidence-based: some of the songs (see Music Resources, in the Reference section) were used as part of a research-based curriculum for early intervention (Walworth, 2013).

However, the procedures in this study were different and designed to incorporate the principles of the Early Start Denver Model.

Based on these principles, the music selections are included in the second column (Musical Activity) of Table A1.

Instruments. Small percussion instruments will be available for the dyad (chiquitas, maracas, jingle bells, sleigh bells, rhythm sticks, small hand drums, rainbow drums, castanets, wood blocks, triangles). The MT will use piano and/or guitar to present the music condition if required. Recorded music will be included using a MacBook Air and Bluetooth speaker.

Visuals and toys. Visuals or books of the songs will be used. When appropriate, toys suggested by the ESDM manual (Rogers & Dawson, 2010) will also be included.

Table A1.

Music-based intervention, Target behaviors, ESDM Principle and Procedures

Session Section	Musical Activity	Target behavior child	Target behavior adult	ESDM strategy (topic)	Procedure
Songs with Visuals (choose 1 or 2)	Five Little Ducks*	Follow instruction/Do action with visual	Make sure the child is attending and prompt his/her response	“Step into the Spotlight,” or “Find the smile”: managing child’s attention and motivation	During the introduction of the topic, the MT will present a visual with 5 ducklings and a “mommy” duck on a black cardboard to the dyad. The ducklings will be taken off the board as the song indicates. The music will be presented <i>a capella</i> . During the coaching section, the parent will do the intervention with the child. The child will take turns taking the ducklings off. The parent will encourage responses by singing, pointing to the board and helping to take the visual off.
	Itsy Bitsy Spider*				During the introduction of the topic, the MT will present pictures of a spider, a waterspout, a sun, and a cloud with rain on a black cardboard. These will be moved according to the lyrics. The music will be presented <i>a capella</i> . The parent will then present the activity to the child, who will take turns moving the visual. The parent will encourage responses by singing, making hand movements, and pointing to the board.
	5 Green & Speckled Frogs*				During the introduction of the topic, the MT will present pictures of 5 green & speckled frogs and a log on a black board. The frogs will be taken away according to the lyrics. The music will be presented <i>a capella</i> . The parent will then present the activity to the child. The child will take turns moving the visual. The parent will encourage responses by singing and pointing to the board. He/she will become independent in presenting the song to the child.
Songs with Visuals or Toys (choose 1 or 2)	Oh, Where Has My Little Dog Gone?*	Follow instruction/Do action with visual	Make sure the child is attending and prompt his/her response	“It takes two to Tango,” and “Let’s Pretend”: object play and pretend play	During the introduction of the topic, the MT will present pictures of a dog and a scarf to the parent, and will explain the procedures, and teach the song, if necessary. The parent will hide the picture of the dog under the scarf and ask the child to look for it with gestures and lyrics. The music will be presented <i>a capella</i> . If the child is successful, the parent will encourage the child to find new hiding spots with/without the scarf around the room.
	Five Little Monkeys*				During the introduction of the topic, the MT will present pictures of 5 little monkeys and a bed. These will be moved according to the lyrics. The music will be presented <i>a capella</i> . The parent will then present the activity to the child, who will take turns moving the visual.

					<p>The parent will encourage responses by singing and pointing to the board.</p> <p>During the introduction of the topic, the MT will provide a visual of a small bird to the parent. He/she will be asked to attract child's attention and then do the movements according to the chant.</p>
	Birdie Beat (Avirett, J. in Walworth, 2013)				
Movements and actions (choose 2 or 3)	The Ants Go Marching*	Do movement through imitating adult	Model behaviors and prompt movement	<p>“Talking bodies,” “Do what I do,” and “Let’s get Technical”: Nonverbal Communication, Imitation and Behavioral modification</p>	<p>Participants will be asked to sit down facing each other. The MT will sing the song and “march” around the dyad. The end of the verse will be modified to say: “and they all go marching down <i>to play with a friend</i>”. As she says that, she will invite the parent/child dyad to stand up and walk around the circle, and perform the movements depicted in the lyrics. The song will be continued until all verses are sung. The music will be presented <i>a capella</i>. The parent will gradually sing the song independently.</p>
	Funga Alafia*				<p>Child and parent will sit facing each other and will hold a colored stretch band. The MT will sing the song while providing directions regarding the movement of the band. The parent will help the child hold onto the band, and perform the movements. As the session progress, the parent will sing and direct the activity independently.</p>
	The body language (Sandler, S. in Walworth, 2013)				<p>This song asks for different movements in the verse. The participants will be invited to stand up and make the movements as indicated by the song. The lyrics will be modified to incorporate new movements. The music will be presented with guitar and singing, but the parent will interact with the child. Then the parent will sing <i>a capella</i>.</p>
	If you're happy and you know it*				<p>This song asks for different movements in the verse. The participants will be invited to sit down and make the movements as indicated by the song. The lyrics will be modified to incorporate new movements. If possible, the child will be asked to propose new movements. The parent will be asked to help if the child cannot make up a movement. The music will be presented with guitar and singing. Then the parent will sing <i>a capella</i>.</p>
	Make rainbows (Fulton, 2015)				<p>The dyad will receive a scarf for each person and will be told to find a spot in the room. The parent will sing and play the song with guitar. The parent will be asked to model the behaviors (moving the scarf, and then putting it in the floor to simulate a “puddle”, and jumping on it). The parent will sing <i>capella</i> as soon as possible.</p>
	1,2,3 Play				<p>This song asks for different playing patterns (fast, slow, high, low) in the verse. The</p>

	(Rushing, J. in Walworth, 2013)				participants will be invited to sit and play their small percussion instrument as indicated by the song. The lyrics will be modified to incorporate new patterns as needed. The music will be presented with guitar and singing, and then the parent will sing <i>a capella</i> (or with guitar support by the MT). This song will serve as the transition for the free improvisation (see next section)
Free improvisation (do in 2 sessions, use same song)	Bongo Jam (Guilmarin, 2014)	Imitate actions with instrument and propose others	Create and elaborate activity by imitating child and proposing playing patterns	“It’s Playtime,” and “The Joint Attention Triangle”: Elaboration of joint activity	During the introduction of the topic, the parents will be provided with a range of small percussion instruments (chiquitas, maracas, jingle bells, sleigh bells, rhythm sticks, small hand drums, rainbow drums, castanets, wood blocks, triangles). The parent will be encouraged to play. During coaching, the parent will be asked to involve their child in playing. The MT will walk around modeling or giving short verbal prompts to the parent on how to engage the child. The main strategy will be to instruct the <i>parent to imitate their child</i> , and then introduce slight changes to promote imitation from the child. The music will be presented through a Bluetooth speaker placed beside the dyad.
	Bongo Rock (Epps, 2008)				
Songs for Speech	Choose the child’s preferred activity above and embed strategies	Vocalize spontaneously or imitatively	Imitate child’s vocalization and expand (one-up rule)	“Moving into speech”: elaboration of vocalizations and verbalization	MT will teach the parent to treat all child’s vocalizations as intentional communication and provide context to make them meaningful (by pointing, responding to child’s intent, etc.). During coaching, the MT will ask the parent to sing the song and pause before the last word/sound for the child to fill in. Prompting should happen as needed. The MT will also teach the one-up rule (using one word more than the child is able to verbalize: e.g., if the child uses one-word sentences, the parent should use 2-word sentences; if the child does not use recognizable words, the parent will use one-word sentences, etc.). The parent will also be taught to narrate, name, expect responses, fade gestures, and withhold rewards.
OPTIONAL:					
Hello Song	When I meet a new friend (Batey, J. in Walworth, 2013)	Wave/say hello	Capture child’s attention and say hello	Orient, “Step into the spotlight”: becoming child’s focus of attention	Participants will sit facing the child. MT will sing the song with guitar including each participant’s name in the song one at a time. Adult participants will be encouraged to sing along, and children will be encouraged to wave to the person named. As sessions progress, the parent/caregiver will start the song independently.
Music-assisted	Hush Little Baby*	Calm down and orient to	Create a comfortable relaxing	Behavioral modification	The parent will be asked to “cuddle with his/her child” by sitting with his/her child on his/her lap. She/he will be encouraged to sing, and to

relaxation	Twinkle, Twinkle little star*	end of the session	environment for down regulation		have the child facing him/her to promote joint attention. The MT will provide the music through singing and guitar (finger-picking style), and the parent will sing a capella (or with a recording if s/he feels more comfortable).
	How will you grow? (Avirett, J. in Walworth, 2013)				
Goodbye Song	It's Time to Go*	Wave, say goodbye	Model waving goodbye	Closure	The song will be presented two or three times with sign language for "time" "to go", "wave goodbye" and "say". The parent will be encouraged to ask for child's participation through imitation.

Table A2.

No-Music Intervention, Activity, Target behaviors, ESDM Principle and Procedures

Session Section	Activity	Target behavior child	Target behavior adult	ESDM principle	Procedure
Activities with Visuals (choose 1 or 2)	Book: Five Little Ducks	Follow instruction/ Do action with visual	Make sure the child is attending and prompt his/her response	“Step into the Spotlight,” or “Find the smile”: managing child’s attention and motivation	During the introduction of the topic, the MT will present a book with 5 ducklings and a “mommy” duck to the dyad. During coaching, the book will be read, and the parent will point to the ducklings as they “disappear.” The child will take turns pointing to the ducklings. The parent will encourage responses by pointing to the book and helping the child touch/point.
	Book: Eensy Weensy Spider				During the introduction of the topic, the MT will present a book of Eensy Weensy Spider and will explain how to read it. Then, the parent will read the book pointing at the appropriate images. The child will take turns pointing at the visual. The parent will encourage responses by making hand movements, and pointing to the book.
	Book: Five Green & Speckled Frogs				During the introduction of the topic, the MT will present a book of the 5 Green and Speckled frogs and will explain how to read it. During coaching, the parent will read the book, pointing to the appropriate image. After the second session with this book, the child will take turns pointing at the visual. The parent will encourage responses by pointing to the book. He/she will become independent in presenting the book to the child.
Activities with Visuals or Toys (choose 1 or 2)	Visual/Toy: Oh, Where Has My Little Dog Gone?	Follow instruction/ Do action with visual	Make sure the child is attending and prompt his/her response	“It takes two to Tango,” and “Let’s Pretend”: object play and pretend play	The MT will present a picture of a dog and a scarf, and will explain the activity. The parent will hide the picture of the dog under the scarf and ask the child to look for it with gestures and words. If the child is successful, the parent will encourage the child to find new hiding spots with/without the scarf around the room.
	Book: Five Little Monkeys				The MT will present a book of 5 little monkeys. The parent will read it while pointing to the images. The child will take turns pointing to the visual. The parent will encourage responses by pointing to the book. Gradually, the parent will present the activity independently.
	Visual/Toy: Birds				The MT will provide a toy of a small bird to the parent. He/she will be asked to attract child’s attention and then do the movements according to the instructions.

Movements and actions (choose 2 or 3)	Duck, duck, goose (modified)	Do movement through imitating adult	Model behaviors and prompt movement	<p>“Talking bodies,” “Do what I do,” and “Let’s get Technical” :</p> <p>Nonverbal Communication, Imitation and Behavioral modification</p>	Participants will be asked to sit down facing each other. The MT will walk around the dyad. She will walk around saying “duck, duck, goose” until she <i>invites a friend to play</i> . She will invite the parent or child to stand up and walk around the circle, and perform the movements depicted by the MT. Then the MT will sit the down, and the parent will stand up. The game will be continued until several movements are done.
	Stretch Band				Child and parent will sit facing each other and will hold a colored stretch band. The MT will provide directions regarding the movement of the band. The parent will help the child hold onto the band, and perform the movements. As the session progress, the parent will do this independently, creating a <u>roughhouse game with the stretch band</u> .
	Simon says (modified)				This activity asks for different movements. The child will be invited to stand up and make the movements as indicated by the parent. The lyrics will be modified to incorporate new movements.
	Sensory-Social Routines				The participants will be invited to sit down. The parent will be asked to make movements imitating the child. The game will be modified to incorporate new movements by either the parent or the child. After the second time, the child will be asked to propose new movements. The parent will be asked to help if the child cannot make up a movement.
	Jumping puddles and making rainbows				During the introduction of the topic, the MT will explain the procedures. Then, each person will receive a scarf and will find a spot in the room. The parent will be asked to model the behaviors (moving the scarf, and then putting it in the floor to simulate a “puddle”, and jumping on it).
	Pat-a-cake				During the introduction of the topic, the MT will introduce the movements, and then the parent will lead the activity. This activity asks for different playing patterns (fast, slow, high, low) in the verse. The participants will be invited to sit and do the movements as indicated. The lyrics will be modified to incorporate new patterns as needed.
Free play (do in 2 sessions)	Different toys (stacking rings, banging toys, trains and cars,	Imitate actions with instruments and propose others	Create and elaborate activity by imitating child and proposing	“It’s Playtime,” and “The Joint Attention Triangle”: Elaboration	Participants will be provided with a range of toys (stacking rings, banging toys, construction toys, drawing utensils, etc.). The parent will be asked to involve their child in playing. The MT will walk around modeling or giving short verbal prompts to the parent on how to engage the child. The

	drawing utensils, etc.)		playing patterns	of joint activity	main strategy will be to instruct the <i>parent to imitate their child</i> , and then introduce slight changes to promote imitation from the child.
Activities for Speech	Choose the child's preferred activity above and embed strategies.	Vocalize spontaneously or imitatively	Imitate child's vocalization and expand (one-up rule)	"Moving into speech": elaboration of vocalizations and verbalizations	MT will teach the parent to treat all child's vocalizations as intentional communication, and provide context to make them meaningful (by pointing, responding to child's intent, etc.). The MT will ask the parent to pause before the last word/sound (of a phrase) for the child to fill in. Prompting should happen as needed. The MT will also teach the one-up rule (using one word more than the child is able to verbalize: e.g., if the child uses one-word sentences, the parent should use 2-word sentences; if the child does not use recognizable words, the parent will use one-word sentences, etc.). The parent will also be taught to narrate, name, expect responses, fade gestures, and withhold rewards.
OPTIONAL					
Opening Activity	Parent and Therapist saying hello to child	Wave/say hello	Capture child's attention and say hello	Orient, "Step into the spotlight": becoming child's focus of attention	Participants will sit facing the child. Therapist will model a greeting for each person. Adult participants will be encouraged to imitate, and children will be encouraged to wave to the person named. As sessions progress, the parent/caregiver will start the greeting independently.
Relaxation	Script with simple words (calm down, sit with me, etc.)	Calm down and orient to end of the session	Create a comfortable relaxing environment for down regulation	Behavioral modification	The parent will be asked to "cuddle with his/her child" by sitting with his/her child on his/her lap. As the sessions progress, she/he will be encouraged to talk softly to them, and to have the child facing him/her to promote joint attention. The MT will provide the script the first 2 sessions, and then the parent will do it.
Goodbye Song	Parent and MT saying goodbye	Wave, say goodbye	Model waving goodbye	Behavioral modification	The MT will model a goodbye wave and say goodbye with sign language two or three times. The parent will be encouraged to ask for child's participation through imitation.

Appendix I.

Demographic Survey

ID _____

ABOUT YOU:

What is your age? _____

What is your gender? _____

What is your race/ethnicity/nationality? _____

What is your marital status? _____

What is your highest educational degree? _____

Are you currently employed? _____

ABOUT YOUR CHILD:

What is his/her exact age? _____

What is his/her gender? _____

How many siblings does s/he have? _____

Is s/he the first, second, third... child? _____

Who is the main caregiver for your child? _____

What other therapies does s/he have? _____

Will s/he start any new therapies/educational programs in the next 8 weeks? _____

If yes, which? _____

Does s/he take any medication related to his/her condition? _____

Any other information that you think I should know? _____

Appendix J.

Final Interview Guide

Interview Guide⁵

Music-based P-ESDM Parent Coaching
Eugenia Hernandez-Ruiz, MME, MT-BC

Welcome Participant(s)

- Thank them for their participation in the group
- Ask participants to complete name tags with any desired name (if in group)

Provide a summary of the intervention

P-ESDM is an evidence-based intervention to help parents learn strategies to support their children's development. My intention with this project was to add a music component, and see how well it works for you, as parents, and for your children.

Explain Interview Purpose

- Gather information about the appropriateness and effectiveness of our work together
- Identify ways to make the intervention better for you and your children

Explain Interview Process

- I will ask questions to the group, clarify terms, and summarize
- I will audio record all interactions, which will be erased after the data are compiled. No information that directly identifies any of the participants will be reported

Establish Ground Rules (if interviewing group of participants)

- Allow/encourage everyone to participate
- Remember that disagreement is OK
- Please turn cell phone ringers off or to vibrate
- Speak one at a time
- Speak loudly and clearly
- There are no right or wrong answers
- Please be respectful of the other participants, and respect confidentiality

⁵ Guide based on: Center for Disease Control and Prevention. Focus on Youth + ImPact. Postintervention Focus Group Guide. Retrieved from: https://effectiveinterventions.cdc.gov/docs/default-source/foy-docs/FOY_Focus_Group_Guide.doc

Opening Question (Round Robin) (if in group)

Tell us the name that you would like to be called, and a fun fact about yourself

Key Questions

The P-ESDM emphasizes parental strengths and involvement in their child's development. The music-based P-ESDM intervention that you experience is a variation of that model.

1. What did you like about the intervention you experienced?
2. What did you *not* like about it?
3. What are some of the challenges that you faced either in the sessions or outside when trying to implement the strategies?
4. How did the music modify your and your child's experience, if at all?
5. What were some of the things that helped you learn the strategies?
6. What are some of the things that might have interfered with your learning?
7. What are your thoughts on participating in a facilitated session with your child?
8. If there is something, or some things, that are cause for concern, is there a way to make the sessions more comfortable for you?
9. What type of setting would you prefer for this session (e.g., at home, private room in community center, clinic)?
10. Do you believe that parents can implement strategies that support their children's development? If yes, why? If no, why not?
11. What do you think are the beliefs, attitudes, and/or social norms that influence a parent to be willing (or not) to implement these strategies?

Closing Question

12. What else might make this intervention more appealing to the parents and/or guardians of young children with ASD?

Appendix K.

Video analysis data sheet

Video Analysis Data Sheet

Rater: _____

Date: _____

Participant ID: _____

Video ID: _____

Instructions: Please use this form to record the behaviors as you watch the video. Refer to the training and coding list below to decide which behaviors qualify. Choose ONE behavior category to tally in each view (in each pass). Make a tally for each observed behavior *immediately* after you observe it. Pause the video as necessary. View the video again to tally another behavior category until all categories are tallied.

Parental behaviors. Parental verbal or nonverbal responses that happens no later than 2 seconds after the child’s communication bid or attention behavior (looking at a toy, reaching, etc.), that supports the child’s goal (e.g., if a child reaches for a toy, the parent gives it to him, or verbally acknowledges his desire), and that shows positive affect (devoid of behavioral manifestations of anger, frustration, or indifference). All three elements (timing, goal-oriented, and positive affect) need to be present to count the behavior.

Child behaviors

Child response to joint attention (RJA): orienting body towards parent, taking a toy that is offered, responding with eye contact, approaching parent when called, and looking at object when pointed at.

Child initiation of joint attention (IJA): showing a toy, initiating eye contact, reaching gestures, touching the parent, and approaching the parent. Vocal and verbal gestures will not be included since they will be counted in a separate category (see below).

Child verbalizations and vocalizations: all vocal behaviors (groans, screams, babbling, etc.) will be counted

Behavior category	Tallies	Total (in number)
Parent Verbal		
Parent Non-verbal		
Child RJA		
Child IJA		
Child Vocalizations/verbalizations		

Appendix L.

Verbatim Transcription of Final Interview with D1 parent.

E: As you know this conversation is part of the research project you participated in.

A: Mhm.

E: So, I'm going to explain a little bit what I did, and then I'm going to ask you a number of questions. Please feel free to answer as much or as little as you feel comfortable.

So, as you know, what we did, this intervention that I am trying to develop, is based on previous interventions, that's called the Early Start Denver Model... and I was trying to adapt it...

A: yeah, I even have a copy of that book.

E: You do?

A: Yep!

E: Great, awesome! That's awesome. Which one did you get... the one... An Early Start for Your Child with autism, or... the one geared for professionals?

A: I think it is the one geared for professionals, I am not sure. I bought it online, it is one that was recommended at KUMed...

E: Ah, ok.

A: ...whenever they went over his diagnosis with us... or whatever, I'm not sure, I'm sure they recommended that.

E: OK! I didn't know they were doing that.

A: I got... 10 or 15 books on autism...

E: I bet.

A: Some of it is more, you know, like personal recollections written by people with autism, or some are: "this is this professional's take on what's going on with autism." Things like that.

E: OK!

So, I think that one of the things about this model is that it's pretty down-to-earth and concrete strategies. It is evidence-based, it is based on research, and my intention with this project was to add a music component to it, and see how well it works for you, as parents, and, obviously, for your children, which in this case, is not children (plural), but A. of course. So, the purpose of this interview is to gather more information as to how appropriate and effective this work was for you, and to identify ways to make this even better, hopefully. Mmm, so I will ask questions, let me know if I need to clarify or something. I will audio record, as you know, but I will erase everything that we talked about once I have all my information.

A: OK.

E: What I will do is that I am going to summarize our discussion, and I am going to extract the most important points. I am going to write the paper. No identification to you personally, no information that will let anyone identify you. OK?

A: OK.

E: So, let's get to work here... So, what did you like about the work... the intervention that you experienced?

A: well, mmm, on a strictly personal enjoyment level, it was fun to watch A. be excited to come, and to have something that he was looking forward to...

E: OK.

A: that I felt that it was also towards his benefit, rather than just recreation.

E: OK.

A: I liked that it wasn't passive. I wasn't necessarily coming into it expecting to be as much as the focal point for it as I was...

E: mmhm (assenting).

A: but, I also felt that that helped in getting more out of it by participating rather than trying to observe and take mental or physical notes of what techniques were being used or how they were being used and so forth.

E: So, actually experiencing them...

A: Yeah, so I think... I think... I don't know if my expectations were... were realistic coming into it...

E: OK.

A: but I thought that was good... that was a nice surprise... that rather than me trying to glean what kind of goals and techniques we were using or being used...

E: Mmm.

A: from observation or discussion, it was put into practice by me as well.

E: OK, mmm. Being in the... ok, I think I'll get to that in a little bit...so, what did you *not* like about the intervention... or the process... or anything?

A: Mmm, I'm not sure that there is anything specifically that bothered me. There were certainly times where there were frustrations with... you know... trying to get A. to respond...

E: mmhm.

A: in ways that we wanted him, to participate in ways we wanted him to, but then I think there are normal frustrations for any parents of any children, not only parents with children in the spectrum.

E: right... children can have their own mind, can't they (giggles)?

A: Right!

E: and so...

A: and I mean, I didn't really... there weren't any times when I walked out of here going "why did we do that? That was completely ineffective" or "I didn't like doing that" you know... I... I felt like, maybe there were things, like, more enjoyable for me, but there was nothing necessarily that I disliked... at least, as far as I remember.

E: Of those things that were not terribly enjoyable, do you remember any example? that you would say "eh, that wasn't great"?

A: ... nothing pops up.

E: that's totally fine

A: yeah, ah... like I say, I think... the things that weren't enjoyable were more things that I found frustrating as opposed things that I found were either ineffectual or difficult

E: ok...

A: Cause I didn't feel like... the things we were doing were... you know, some things worked better than others but I think that if anything got to the point where... this is, this just isn't working, it never got to the point where it was so frustrating that *you* didn't suggest a change of course before, you know, I threw up my hands or whatever (laughs).

E: right, right...ok. Do you remember an example of something that was very, very enjoyable?

A: One of my favorite things was definitely when... when we were playing with the animals, having them walk to the wall, and then...

E: mmhm (assents).

A: back, and stuff, and having A. imitate back.

E: that was a good session...

A: That was something I had never really seen him do before... something that I have seen him do with animals and toys since.

E: mmhm, great! So...

A: All that kind of animating and personifying objects.

E: Is he still doing that?

A: Yeah! to some extent... I mean, he still wants to put his cars in a row, and stuff like that, but there are times when he makes his toys dance, and stuff like that... and... he initiates that a lot of times, so it is not me doing it.

E: Great, so he did learn that skill. He learned there is another type... way of playing.

A: Yeah!

E: Great, that's awesome! So, what are some of the challenges that you faced either in the session or outside when trying to implement those strategies? And that can be during the intervention, or during the weeks that we haven't seen each other.

A: Well, of course, he's got his routine and, we talked a little bit about that, about how he likes to have his own agenda, do things in his own time, wants to do what he wants to do, and sometimes you will give him two choices, one that you know he will not want to do, and the other is the one that you want to [him] to do...

E: mmhm.

A: things like that, ah, I'm sorry I lost track, what was the question...

E: no, you're fine.... The challenges that you have faced: that he has his own agenda...

A: yeah, ah mm, oftentimes and I think that was kind of the case here, too: it can be difficult to get him to, whether it's time to go, or whether it's time to do something else, or whatever, to interrupt the task, to interrupt what he is doing.

E: OK.

A: It could be that he is watching a YouTube video, or it could be that he's putting together a puzzle, or it could that he's, you know, playing with his cars, or something.

E: OK.

A: And you know, if you start to do something, or, you know, try to interrupt that in order to do something else, sometimes it is more effective... and maybe this is something that I learned through other readings, not just through here, but “Ok, you got one more minute, or 2 minutes, or 5 minutes to do that”...

E: mmhm.

A: before we are going to move on to something else.

E: Right!

A: but... so yeah, just saying “OK we are done with that, we are going to do this now” ah, that’s what creates more resistance.

E: Right...transitions are hard, yep.

OK, so how did the music modify your and your child’s experience, if at all?

A: well...I would say the biggest difference... because you know, we have... we always have music in the house, and he has always been interested in music, and that was one of the reasons why I was so interested in this study, because, you know, you hear that with kids, and with kids in the spectrum... teach to their strengths, and engage them on... in those aspects that they’re interested and enjoy. So, I’d say the most... probably the most... the biggest difference was engaging in making the music as opposed to playing it on a stereo or playing it on the TV and participating with a recorded source.

E: OK, so being able to *make* music...was the difference?

A: mmhm (assenting).

E: OK, what difference did you see in him? How did his behavior change when you made music here?

A: Well, I oftentimes, I think the instruments was something. We have instruments at home, and certainly I’ll get to play instruments with me sometimes.

E: mmhm (assenting).

A: ah... but I felt that incorporating the instruments with the singing, and making the music was something you know, I suppose it’s different when I’m at home... previously, it was more about “ok, here’s our xylophone. Let’s bang on this for a while.” And this was more goal-oriented, it was more... about a structure, as opposed, to free play. And even though sometimes I’ll play songs with him on, like, the xylophone or something, and even like do hand-over-hand, have him play songs, and so forth, I felt like this was more of a 50-50 with him, in terms of creating and helping him do some of the initiation whether it be picking what instruments he wants to play and going towards a circle as opposed to a more chaotic or less structured activity.

E: OK, wow! Did you see a difference..., remember that every session we had an activity that we would do with music and then without music, or vice versa, but we had both music and no music..., did you see a difference between those... conditions?

A: I haven’t really thought about it, but I would say that... excuse me... I felt like when we are doing the activities with music that engagement might have been a little freer...

E: mmhm.

A: it might have been... as I say, more collaborative with him, as opposed to me trying to insert myself or insert him into an activity we would do together... it felt more like “this is something that we would do together.”

E: OK..., ok, excellent.

So, from the things that I did, and how I set it up for you, the things that I said, what are some things that might have helped you to learn the strategies?

A: mmm, well, I thought the back-and-forth between discussion and interacting with A. sometimes it felt a little rushed, but at the same time it felt like it was appropriate, you know?

E: mmm.

A: to take those moments out and step back and go: “Ok, what just happened there?” you know. Sometimes it felt like it was only a couple of minutes, but I’m sure it was more like 5 or 15

E: mmm.

A: but I think it was nice to... even though sometimes it felt like: “oh, we were just starting to get going, and now we have to stop” you know, how did that happen, you know, what strategies worked and what didn’t.

E: mmhm (assenting)

A: you know, I found it challenging to think analytically like that, be challenged to... instead of more being with the kid, and going with what the kids do, and you know, trying to engage with him, on a more you know visceral level

E: mmhm.

A: to actually go: “OK, this is how you are interacting with him, now take a step back, and try to observe what is happening while you are also trying to be on the same plane with him and playing.” And this separation between observation and interaction, which I thought is maybe not how I usually function around him. I’m more in the moment.

E: right!

A: And in this case I think it helped me think about like ok, what happened in that moment. To reflect on it a little bit more.

E: OK, alright! Now, what are some of the things that might have interfered with your learning? That got in the way?

A: (pause)

E: and don’t feel bad. I can take it (giggles).

A: Not knowing who is behind that mirror (pointing to the one-way window).

E: Oh, nobody! Nobody else, literally! Oh, my gosh, didn’t I ever say that?

A: No.

E: Oh, I’m so sorry!

A: No, I figured that your ... your...

E: advisor?

A: Yeah, that your advisor was probably there sitting in some of those sessions...

E: No, he was not here; nobody!

A: (laughs) it made me feel like a monkey in a zoo

E: actually... sure! You should have said something!! (laughing with him). No, there’s a curtain. It’s blocked. Nobody is seeing anything. They are working on something else in there. It’s an office.

A: Well, I remembered you said that, you know, it would be all right for two parents to come... but one of them would be sitting there.

E: And we would have that... we would have opened it if that were the case.

A: That's why assumed... at least, I didn't think there was somebody there every time, but some sessions...

E: aha.

A: So, I was: "who is watching us? And why are they watching us?" (laughs)

E: (laughs with him)

A: "so, I'm doing alright?"

E: I'm so sorry that I didn't clarify that.

A: No, that's alright. I knew you had video and stuff.

E: Yeah, exactly and the video is there.

A: It was more like, there's a person I have never met, who might be or might not be watching... (laughs)

E: Oh, that would be weird... that would be so weird! No, in the case we do something like that, we introduce you to the people, and we would let you know that someone is watching...

A: Got you!

E: No, gosh, no, we don't do that, that's not *fair*!

A: (laughs)

E: I would be freaking out myself!

A: Maybe I've watched too many cop shows.

E: (laughs) right!

A: (with a fake voice) "Oh, you see what he did right there?"

E: (laughs)...

A: "we got him!" (laughing)

E: (laughing) No, we didn't have anybody in there. No, it was just the video. And the videos are not going to be watched by my committee, maybe only snippets, just to show *my* work, more than anything else.

A: yeah.

E: and, as I told you, they are being observed by two coders that I am training, and we are just counting behaviors. And that's it, there is no judgment involved here, not at all.

A: ok.

E: And more than anything else, they are going to see what I did, what I did wrong... evaluating *my* treatment.

A: (pauses to think) And I did... I did feel like, mmm, and maybe this is on the opposite end, that... although I wasn't expecting so much of the responsibility be put on me, I did feel like you had a very good, ah, manner with A. that you connected with him, and that he certainly enjoyed playing with you and interacting with you, too.

E: Mmhm, yeah, I liked it. I really enjoyed working with him. And yes, I do connect with kids really easily, but he is a *wonderful* little child, he is amazing, so, it is really easy to connect with him.

A: And obviously, I mean, that's part of it. But yeah, probably being a researcher, or someone who is going to work with kids, you need to have an aspect of that, if not, you know, have that at the forefront. But I certainly felt that if I walked into a colder more kind of clinical, kind of, you in a white lab coat, and spoke directly to me, and said (faking a stern voice) "Ok, this is what we are going to do..." I don't think I would have been as comfortable or as bold taking the leads that you wanted me to take, if you didn't have that kind of connection with the kid, too.

E: right! Ok, great, that is really important to know, thank you.

So, you kind of answered this already, but I am going to ask anyway, what are your thoughts on participating in a facilitation with your child? Something like this, how do you feel about this setting, me watching, you facilitating, all that?

A: like I say, I felt pretty comfortable with it once I figured out that's how it was going to be.

E: mmhm, ok.

A: Once I figured out that it was going to be me more than you doing, ah, playing with him directly, then it didn't...oh, what was the question? (laughing)

E: participating in a facilitated session with your child?

A: yeah, I thought it was great! I did touch on that. Yeah, I thought it was great, and, like I say...I want him, you know, from the time he was little, I want him to be able to be comfortable alone, and entertain himself, and that kind of thing, but I also don't want him to isolate himself, to feel that he can't approach others, that he can't engage with others. I certainly want him to be able to communicate. So, I think as parent sometimes, especially of a child who's happy to sit there, and you know, line up his cars, and then knock them apart, and then line them again, and you know, do that for 10 minutes or 20 minutes, or whatever, sometimes it's a lot easier. You are like, "oh, well, he's entertaining himself, I'm gonna go, you know, clean the bathroom counter, or make dinner" or whatever, and sometimes, you need that time...

E: Absolutely!

A: so, it's like, "kid, go play by yourself, I need to do this thing."

E: Right!

A: but, certainly, when you want him to learn to engage socially, when you want him to be able to communicate with others, and be able to play with others, and to interact with others, mm... that can also be detrimental. When you know, like, "oh, he's fine." And you know, I've got this thing that I want to read, or this thing that I wanna play, or this thing that I wanna watch, and he's fine, 'cause he's totally entertained, because he is doing his own thing...

E: mmhm.

A: I think there are times when I'm "wait a minute, what is he even doing? I haven't even looked at him for 10 minutes, or 10 or 20 minutes, or whatever" because I was doing this other thing. I think in that regard, it made me a little bit more conscious, mm, I don't know if it has changed or not, but certainly it, like, there are times when I'm making dinner, or something, and he is playing by himself and he'll say "Daddy", you know, like "help me, please" or he'll come and show me something or whatever.

E: ok!

A: well, that's cool, if those instances do happen and I am doing something that I can drop what I'm doing, usually I will go and engage with him when he wants to engage with me

E: Awesome!

A: And certainly be conscious of those times when I'm not engaging with him, and he is just playing by himself doing whatever...

E: which is fine too...

A: yeah!

E: Of course, but then you have options, right? You have options to engage.

A: mmhm.

E: So, he is starting to engage more and show you things?

A: Yeah!

E: That's awesome!

A: You know, he will go through the different colors of his cars and want me to repeat them after him. And sometimes, if he's in a room, and I'm in the other, he'll bring them up to me, and say "Blue!" And wait for me to say "blue!" and then go get another car and say "Yellow!" (giggles). I say "yellow!"

E: That's awesome!

A: and I don't know if he was doing this when we were doing sessions, but he also wants to look all the planets on my phone (laughs).

E: He was very interested in that, for sure.

A: He'll type them in, and hit go, and then hit images, and then find the image that he wants to look at... and he does that with all the planets and the dwarf planets, and then the solar system at the end, too,

E: Oh, wow, he's becoming very knowledgeable... I wouldn't be able to name any of those!

A: The dwarf planet Maki-Maki sometimes becomes Maki.

E: Ok.

A: So, I say "no, you have to say it twice". So, sometimes it's Maki-Maki, and sometimes it's Maki, and sometimes it's Maki-Maki-Maki-Maki.

E: (laughs)

A: (laughs) He knew Maki-Maki like a year ago, but now it's Maki, or Maki-Maki-Maki-Maki (laughs).

E: Well, you know, he's getting flexible about it, that's good!

A: One thing he is not flexible about is, no rings on Uranus... but "Uranus has rings," and he's "no rings! No rings on Uranus!" (laughs).

E: (laughing) ok!

A: "ok, we'll talk about that another time."

E: Maybe in a year (giggles). So..., is there anything that would have made these sessions more comfortable for you? Other than getting rid of that [one-way] mirror?

A: I don't know at what point I realized "oh, I am going to be doing a lot of the interacting and so forth"... maybe knowing that coming into it. And with my theater background, you know, I guess, you know, I have some experience with going to a rehearsal "OK, we are going to do this theatre game" that you've never done before with these people, you know, maybe you've been in a couple of rehearsals so far or whatever...

E: mmhm.

A: so, I think, despite the fact that I can be introverted, I was able to adapt to that kind of thing, but you might have/had some parents who aren't comfortable being demonstrative in that way, and so for me, I

certainly felt like “OK, I’m going to try to roll with it, whatever Miss Eugenia asks me to try to do” you know

E: mmhm.

A: but there were times when I was, “Ok, this is... this is a little bit out of my element, or... this is a bit out of... ah... my... ah...my...”

E: comfort?

A: Yeah, comfortability, but that doesn’t mean that I, you know, didn’t just try to push that aside and do the... you know, take care of the task at hand. But I did feel like “I wonder if she’s got other parents who she has to, kinda...like, to kick in the ass a little bit to get to...rise to that level of engagement...”

E: mmhm.

A: Especially, when you are observed and studied.

E: Right, right... and it’s definitely something that happens. I’m not going to lie, there are people who are more or less comfortable with that kind of situation.

A: And I don’t know if knowing that expectation coming in would have been helpful for me or not... but, it did occur to me that that was something that I was like “oh, that was...” ok, so, obviously you are here to learn, but you’re also a lot more of an expert than I am, so, yeah, I was wondering if I had known coming into it that it was going to be like a lot more participatory from a parental perspective, if that would have made, like, me more excited to be involved... or less excited. And, ah, I think it probably depends on the parent. I think that if some parents knew like “you are going to be engaging with your child the whole session,” or you know, virtually the whole session...

E: mmhm.

A: If that would be a selling point or it would be something that some parents would be like [fake voice] “wait a minute, this is a study about my kid, not about me”

E: Right!

A: I don’t know...

E: Right! If you had to guess, obviously you don’t know because it didn’t happen, but if you had to guess, would you have been more or less excited?

A: I don’t think it would have deterred me; I think I would have been... happy to...ah... to...ah participate.

E: Alright!

A: but I did have this thought coming into “oh, I’m going to have... I’m going to take notes, and I’m going to see..., you know, I’m going to have this...this observational perspective where I’m going to be able to see “oh, he responded to that...and he didn’t respond to this” whereas, like, that was more of your job!

E: (giggles)

A: “Oh, that worked and that didn’t work,” you know?

E: mmhm... right. Alrighty! That’s great input, thank you so much for those reflections!

A: Sure.

E: So, what type of setting would you prefer for these sessions? We did it here obviously, but do you think doing it at home, or, I don’t know, in a community center, or... would that change anything?

A: Well... that's an interesting thought. This room doesn't necessarily excite a kid, walking into it. Obviously, he was interested in... the outlets (laughs)

E: (laughs)

A: ...and the toys...and I don't know, it might be interesting to do it in, like, a children's playroom, and it might be interesting to see how it differed depending on the setting. 'cause this room is...like I said, this room is kind of boring, it's white... it's... I think the most interesting thing in it were the toys. And maybe that... is good because it allows for more focus... but of course, kids don't live in rooms like this, and they don't, ah, generally don't spend most of their time in environments like this. So yeah, having that kind of focus, I think, was good, but it... I would be interested to know if it would change if a child was in their home environment, or their home element, or... if it was a room full of bright colors and toys everywhere and... you know?

E: mmhm.

A: ...other things going on.

E: mmhm, and how that would change, right?

A: I felt this... I felt like, yeah, this was very effective, in terms of focusing on the task at hand, like this environment, whereas at home, he'll have toys thrown around the floor, and sometimes I'll ask him to help me pick 'em up, and...

E: mmhm.

A: ...and he wants to do something else, so I'm "ok, we have to do this first" but there are other times when he's playing with... his cars, and I'll start picking up his playdoh, and he'll stop playing with his cars and come over and say "noooo! No, leave the playdoh where it is." And I'm like, "no-o, you're not even playing with the playdoh, I'm putting this away..." you know?

E: mmhm.

A: and then he'll be like "no, I want to play with it." And he'll start playing with it. So "alright! Then I'll go put up the cars." And he will be "noooo!" (laughs)... "Wait a minute (laughs) you got toys all over the living room. I just want to pick up just one type of toys that you are not playing with..."

E: OK.

A: So, having that focus here lends itself to a focused activity...

E: mmhm.

A: but it's obviously, different when child is at home and has access to...to...

E: lots of things.

A: yeah!

E: mmhm... you are touching on things that are really important.

Ok, do you believe that parents can support strategies that support children's development?

A: oh, absolutely!

E: mmhm? Why?

A: I think that's what parenting is, right?

E: ok!

A: I mean, there's so many strategies, and I think some... sometimes it's easier as a parent to take the path of least resistance. And as a parent of a child in the spectrum that is especially true.

E: mmhm.

A: like “Oh, you don’t want to put on your shoes, fine, I’ll put them on for you.” You know?

E: mmhm.

A: And that’s with any kid, but especially if the kid is set against it, then... sometimes it’s easier to do things for them. Ah, yeah, so with, you know, with... all parents are going to employ strategies to help with their children’s development and their child’s development and independence and responsibility, and all those things.

E: ok, and do you think that we, as professionals, can share those... or should we share those strategies with you so that you can put them to use at home?

A: for me, I feel, like, yes. I mean, for me, I feel like one of the things that...that is helpful to me is when somebody says like... “ok, this is not just how we do things, but this is *why* we do things,” explaining the strategies, and saying “ok, this is the way we get from point A to point C, and point B is in the middle.” Instead of just saying “do this, and this, and this, and then you’ll be in point C,” you know?

E: mmhm.

A: I feel like, ah, and I also give you a chance to analyze like, “oh, is that working? Is that something that... this strategy *isn’t* working, so why don’t we try a different strategy...” I don’t know, I feel like having those strategies explained and...and...explicated, which is probably...those are pretty much synonyms... I feel like, at least for me, that in that kind of scenario, it is extremely helpful... it’s extremely helpful to know that...there’s a method, there’s a... thought behind it, and it’s not just “oh, well... you know... kid’s banging his head against the wall, oh... why don’t we try... putting rubbers on the walls” you know? (laughs)

E: (giggles)

A: like “wait a minute, that’s not... that’s not exactly a strategy...” but obviously, a kid’s banging his head against the wall... well, let’s see if we can try this... because... it’s not just a band-aid, and it’s also not just like “well, let’s just pull this out of thin air... here’s an idea... and... it’s never been tried before, I just made it up, but, you know?” To know that... and that’s the thing with autism, it’s that...we might have talked about this before or not, but, I mean, from what I’ve learned, there really hasn’t been a lot of money or research or so forth, ah, until about *RainMan*, you know, *RainMan* was kind of when it came into public consciousness, that you know, oh, here are people who really have... rich intellects, rich emotional life, you know...

E: mmhm.

A: but have basically been alienated or otherized because they’re... square pegs on round holes, you know? At least that is for neurotypical people. And because these others...you know, like Temple Grandin, she was... a doctor or pediatrician told her mom that she should be institutionalized, for the rest of her life... and that probably would have been easier on her mother, it would have been easier for a neurotypical society, but... you know, we would have lost so much had her mother not taken the time, had Temple Grandin not had the drive to communicate and to stand up for herself, and you know, had that kind of self-worth instilled in her that she was like “You know what? I have different difficulties, and obstacles than other people have, than neurotypical people have,” you know, many of her peers at college and in school, but at the same time she was... she was encouraged, and she had tons of talent, and obviously, raised...and even... in my mind, you know, even before I was a father, I thought she was pretty...ah... someone that I looked up to, somebody that I found a whole lot of inspiration from.

E: Absolutely... She is quite amazing... ah... I guess I have a couple of questions [left]. Regarding the music, how comfortable did you feel with the songs, and how comfortable did you feel making the music?

A: I felt it was difficult at times trying to lead and sing songs that I didn't know the words to. You know, once in a while we had a song that I was like... "wait, wait" trying to pay attention to him, and lead, and also try to find the words. So, you must have noticed, that most of the time when you gave me the option to pick a song, I would pick one that I was already more familiar with. Ah, so, yeah, I felt that in that regard, it was easier for me to... to initiate with A., to engage with A., when I did not have to think like... "what's the next line?"

E: Absolutely, oh, that makes total sense! Would it... is there another way, say, if I wanted you to use different music, not the one that you are familiar with, is there a way that I could teach it to you that would make it better once you are in front of [your child]?

A: Sure, well, I mean, whether it would be sending links to... videos of it, or sending recordings of it, with parents, you know, having, like, "why don't you take some time and work on this song at home with the kid?" or, I don't know, whatever... I don't know, because that might change how... how the sessions went, if parents felt like they were preparing to come in and *perform* a song...

E: mmhm.

A: but at the same time, I feel like, ah, those songs that I didn't know coming into it, ah... if I had a recording that we could have listened to at home, ah, it would've probably been a lot easier to... and they were relatively simple songs... I mean, that it's... I guess it is like the actor's nightmare, when you are supposed to go perform and you know...ah...

E: You don't know the lines!

A: You never learned the lines, and you never learned the choreography, or whatever.

E: Right, I totally get it...

A: You know... it feels like being put on the spot. And maybe that's the performer that feels being put in the spot... to sing a song, and do these other things, but at the same time, "what's the next word? What's the next line?"

E: Exactly!

A: It kind of derails of... instead of thinking about the kid, instead of thinking about engaging with... you're thinking about "I don't know what comes next" (laughs)

E: (giggles) totally. I get it.

I think that's about it... all my questions. I guess the only one, and more generally speaking, is there anything that might make this intervention more appealing to the parents, or even the children, that you can think of?

A: Hmm, obviously it is a really subjective question...

E: totally.

A: ...like I say, maybe knowing that it's a lot more participatory on the parents' part going into it, would be a turn-on for some and a turn-off for others. I'm not sure that... just depending on who the parent was, whether they were extroverted or introverted, or whether they are, like, [fake voice] "no, no, therapist is going to know my child like I know my child, of course I want to be in charge" or you know, leading in a directed study, you know...

E: mmhm!

A: but... I don't know, how to make it more appealing? From the outside looking in, from the inside, or all of the above?

E: all of the above, whatever you think can make it better... I mean, you already told me some things, but...

A: yeah, ah, I don't know, that's not something I've thought about before. I mean, it was always kind of thrilling to me when I would go "Ok, A., it's time to go see Miss Eugenia" and he would know what buttons to press in the elevator, and he would come tearing down the hallway, very, very excited. I told you about the time we got on the wrong floor, 'cause I wasn't paying attention, and somebody else was riding the elevator with us. We were on the fourth floor, he was so upset (giggles)

E: (giggles)

A: "this isn't the right hallway!!"

E: Ok.

A: I don't know, maybe... the only things I'm thinking, and this is totally subjective, you know...

Oh, (faking voice) "maybe a different schedule would work" for a different parent, or maybe, you know, all the sessions were grouped close together, maybe if it was only once a week...

E: Ok!

A: you know, I don't know, maybe flexibility in terms of... but I don't know how that would affect research.

E: yeah, research is sometimes not that flexible, but yeah, I hear you... if they were "real" sessions, well, they are real, but not within a research setting, would you be more comfortable with one session per week?

A: yeah... I know that A. works with Tiny K, and then he's got teachers that come from the school district to help him, and then he's going to age out of that because he is going to be eligible to go to Kindergarten roundup this year. And he's birthday is August 31st, so we'll probably won't put him in Kindergarten this year; we'll probably hold him back one year, so he wouldn't be the youngest kid in his class, you know, a little more time to catch up on some of those aspects where he is behind. Of course, he is ahead of his class in a lot of things, too, but... ah...his teachers are going to be with him for Kindergarten roundup, and go with him and give us some advice on, whether or not he is would benefit from going to Kindergarten in the Fall,

E: Ok.

A: but, what I was going to say, is that both Tiny K and the school district send their teachers to him, and... myself personally, if he goes to Kindergarten, he'll still be eligible for services but I will have to take him to the school... and I have no problem with that, I will be happy to do that and happy to see him receive services through them, and teaching, but I thought, that was amazing, like "they send the teachers to you?" like I was, that is just, like there is basically... you know, you can't be, like, "oh, I'm too busy to take my kid to this all the time..."

E: but for real services, having the services at home would be definitely something you need?

A: or like I say, you can send the teachers to the school. (pause) And getting your participants free parking! (laughs).

E: (laughs) yeah, I needed to get some funding for that, right? Ok, we're done.

[After the recording was stopped, the MT explained the general motivation for this study—supporting families with ASD, particularly parents—when other services are not available; the MT also thanked the parent for his participation and wished him luck. The father seemed very grateful. They said goodbye warmly, and MT accompanied him to the door]