

Review Article

Dance Therapy for Children and Adults with Autism Spectrum Disorder or other Developmental Disability: Literature Review of Present Research

Gruen J*

*Department of Internal Medicine, Yale University School of Medicine, USA****Corresponding author**

Jadry Gruen, Department of Internal Medicine, Yale University School of Medicine, 789 Howard Avenue, New Haven, CT 06510, USA, Tel: 203-764-0235; Email: Jadry.gruen@yale.edu

Submitted: 28 November 2018**Accepted:** 18 December 2018**Published:** 19 December 2018**Copyright** © 2018 Gruen**ISSN:** 2374-0124

OPEN ACCESS

Keywords

- Dance movement therapy
- Autistic
- Art therapy

Abstract

While Autism Spectrum Disorder (ASD) is generally characterized by social deficits, it is in fact a multifaceted condition that affects social, motor and neurologic function. Furthermore, it affects each individual and his/her social construct differently. As such, there is no single treatment for ASD, and multiple therapeutic modalities are often used simultaneously. Dance has emerged as a supplemental therapy for those with ASD, and it is beginning to appear in the autism literature. This article examines the available research pertaining to dance therapy for adults and children with ASD or other developmental disability. Though there is scant case-based research on the topic, the existing evidence shows reduction of stereotyped and repetitive behaviors and improvement in motor control, emotional and psychological wellbeing, and social and cognitive function.

ABBREVIATIONS

ASD: Autism Spectrum Disorder; DMT: Dance Movement Therapy

INTRODUCTION

The first diagnostic criterion for Autism Spectrum Disorder (ASD) is the presence of persistent deficits in social-emotional reciprocity, nonverbal communication, and relationship development [1]. The second criterion is characterized by restricted, repetitive patterns of behavior, such as stereotyped movements (echolalia, hand flapping, or hand wringing), insistence on sameness, and hyper- or hypo-reactivity to sensory input [1]. Given these criteria, it makes sense that current mainstay therapy for ASD focuses on teaching social skills and minimizing maladaptive behavior [2-4]. Some of the most common therapies – including Applied Behavior Analysis (ABA), Picture Exchange Communication Systems (PECS), and Teaching and Education of Autistic and related Communication Handicapped Children (TEACHH) – primarily use cognitive approaches to detect and correct social and behavioral deficits [5]. The incidence of ASD has been on the rise, and this growth has highlighted the true diversity of people living with developmental disability [6]. Concurrently, a growing abundance of therapeutic options

reflects the needs and wants of this heterogeneous population [4].

Some of these therapies focus not on primary social deficits of ASD and developmental disabilities, but instead on secondary deficiencies such as impaired motor skills and coordination [1]. Physical impairments, including difficulty with multi-limb coordination, postural control, gait, and imitation, are frequently present in people with ASD [7, 8]. Many children with ASD are enrolled in occupational and physical therapy, which provide sensory interventions (ie: applying headphones in noisy situations) and motor skills (ie: building strength and flexibility) that help them overcome physical barriers and over-stimulation [9]. It has been argued that movement-based therapies also help those with ASD overcome social challenges [10]. Studies in neuro-cognition suggest that the development of movement and communication occurs in tandem; if one is deficient early in life, it may have a direct effect on the other [10]. This shift away from a primarily cognitive approach to ASD and toward a social-movement perspective is gaining popularity in the autism community; through exploring the fundamental connection between movement and social learning, those in the ASD community are hopeful that they can discover new ways to address the variability seen in ASD [11].

Dance as Therapy: Defined

Dance therapy currently exists in many forms. Broadly speaking, it includes any type of activity that uses movement and rhythm as a means for therapy, and has been used in people with mental health disorders, Parkinson's disease, and other movement disorders. It is important to distinguish dance therapy and movement therapy from dance/movement therapy (DMT). DMT is a specific form of dance therapy that requires extensive training by organizations like the American Dance Therapy Association (ADTA). Dance therapy or movement therapy are more generalized terms that do not necessarily follow DMT guidelines. All three modes of therapy are included in this study, and the term "DMT" will be used to specifically refer to dance/movement therapy while "dance therapy" will pertain to dance or movement. As DMT requires formal training, it is the most standardized and studied form of dance therapy. As such, it will serve as a model to discuss the common components of dance therapy and why they may have therapeutic benefit in certain populations.

DMT, defined by the ADTA as the "psychotherapeutic use of movement to further the emotional, cognitive, physical and social integration of the individual," has existed since the mid-20th century [12]. DMT has been used as a form of therapy for somatic and psychiatric disorders, ranging from neurologic and psychosomatic illnesses to Parkinson's disease and trauma-related disorders [13]. Through dance classes that target the unique needs of specific populations, DMT helps to increase balance, flexibility, and spatial awareness, to integrate sensory and motor systems, and to foster the development of relationships [14]. As people with ASD tend to have limited perception of their body in relation to space, self, and others, DMT classes aim to increase body knowledge through the exploration of movement [14]. This is achieved using props, music, mirroring (following another's movement), grounding (locating the center of the body), rhythm, and eye contact [14, 15]. In general, for classes with participants on the autism spectrum, an instructor certified in DMT along with volunteers or trainees will instruct specific movements to recorded or live music. Students will often be placed in a large circle or in pairs, which allows dancers to face one another, mimic one another's movement, and physically work in tandem [12].

What separates dance from occupational therapy and physical therapy is an emphasis on "embodiment," which refers to the mind's perception of one's own body in space and in relation to the bodies and actions of others [16, 17]. In other words, DMT uses the experience of the body to make a connection to one's own mind and to form relationship with others. For instance, while a physical therapy program focuses on improving motor skills and removing negative stimuli, DMT uses such types of repetitive motions as a therapeutic starting point [18]. Janet Adler, one of the pioneers in DMT, writes that in a DMT session, her goal is not to suppress a client's repetitive movements, but instead to incorporate these movements into dance [19]. She writes that encouraging this "authentic movement" allows her to meet "the children in such an intimate way"; the therapeutic relationship is not founded on teacher and student, but instead on two dancers who can communicate through movement [19].

In other words, a structured dance class can help participants build social connections.

Literature Review

DMT as an embodiment approach to ASD is emerging as one of the alternatives to the traditional cognitive therapies. There is a growing body of theoretical reviews and anecdotal reports that demonstrate dance therapy's ability to foster social and physical skills for people with developmental disability [14]. However, there are very few studies that elucidate proven benefit from such programs for people with ASD [20]. The purpose of this review is to analyze existing case-based research on dance and movement for people with developmental disability, including those with ASD. The aim is to interpret and analyze significant findings that may promote future research in the area and perhaps foster the growing emphasis on a movement perspective of ASD.

METHODS

A systematic review of the literature was conducted with no limit to years of publication (up until February 2017 at the time of review) or geographic region. The databases searched included: PubMed, EMBASE, CINAHL, Scopus, and Web of Science. All articles in English language were included. The following keywords were used: autism, autistic, Asperger, developmental disability, developmental disorder, intellectual disability, dance, dance therapy, music, and melody. Search tools included use of Boolean terms AND/OR, and search phrases were modified according to the database in order to maximize search results (Appendix). Articles were then hand selected based on the inclusion and exclusion criteria that follow:

The primary intervention must be "dance" defined as movement to a rhythm. The purpose of the dance must be "therapy" for the subjects' developmental disability. The therapy must utilize interpersonal interactions, which may include imitation/mirroring, interpretive movement, and/or synchronous movement. The subjects can be all ages with a diagnosis of ASD or other developmental disability. Subjects with comorbid conditions are not excluded. Dependent variables of interest are psychosocial, behavioral, or neuromuscular outcomes. Quantitative, case-based research studies were included for review; qualitative, theoretical, and anecdotal papers were excluded. Articles that pertained to "music", "theater", "gaming", or other non-movement related therapies were excluded. Studies that included subjects without ASD or developmental disability were excluded.

The search strategy yielded 90 results for review. Hand selection yielded 27 papers that specifically targeted dance therapy for individuals with developmental disorder. Of these, 18 articles were qualitative; 9 were quantitative and met all the inclusion criteria for the present review. One of the included studies had a "rhythm" intervention group in which whole body movement was incorporated into improvisational music making, interpersonal synchrony, and song singing [5]. Another study used yoga as the primary intervention, employing the practice of breathing techniques, yoga postures, music and dance, and typical yoga relaxation [21]. Both these studies were included because the movements described had the qualities of "dance" as defined in the inclusion criteria. Of note, 3 case-based studies were excluded either because the primary subjects were educators or

therapists and not the individuals with developmental disability, or because the goal of the dance class was not therapy [22-24].

RESULTS

The 9 articles included in this review are listed in Table (1). Studies occurred in the USA, Greece, Spain, UK, and Germany in the years 2011-2016. A variety of dance class styles were utilized: 2 used traditional Greek dance programs [25, 26], 1 used yoga therapy combined with dance and music [21], 1 used a

rhythm-based movement intervention [5], 1 used music therapy combined with DMT [27], and 4 used DMT only [30, 31, 18, 28]. Collectively, the dance classes adopted techniques commonly used in dance therapy, including use of rhythm, balance, and coordination, free dance and exploration, animal imitation, incorporation of musical instruments, and combination of song and dance. 4 studies focused in particular on synchronous movement, mirroring, and imitation, which are fundamental concepts in DMT [5, 18, 21, 28].

Table 1: Reviewed studies including study design, included population, and results..

References	Study design and data collection	N	Population	Objectives and measures	Results
Arzoglou et al. (2013)	Case series with control group 8-wk Greek traditional dance program 2 time points	10 - 5 dance - 5 control	Clinically diagnosed ASD Greece Mean age 16.7 yrs	Korper koordination-test fur Kinder (KTK): neuromuscular coordination	Improved neuromuscular coordination: balance and walking backwards, jumping over an obstacle on one foot, lateral jumps, lateral movement and repositioning Compared to control
Barnet-Lopez et al. (2015)	Case series, no control group 26 DMT sessions 4 time points	30	Non-specific intellectual disability Spain Mean age 47.3 yrs	Koppitz human figure drawing test (HFD): body knowledge, cognitive development, maturity	Improved body knowledge and developmental maturity Compared to pre-intervention
Barnet-Lopez et al. (2016)	Case series with control group 26 DMT sessions 4 timepoints	44 - 22 dance - 20 control	Non-specific intellectual disability Spain Mean age 48.15 yrs	Koppitz human figure drawing test (HFD): emotional well-being	Improved emotional well-being Compared to control
References	Study design and data collection	N	Population	Objectives and measures	Results
Koch et al. (2015)	Case series with control group 7 DMT sessions 2 time points	31 -16 dance -15 control	Clinically diagnosed ASD Germany Mean age 22.0 yrs	Heidelberger State Inventory: psychological well being Questionnaire of Movement Therapy: body awareness Self constructed scale: self-other awareness EES (Caruso and Mayer): empathy FBT (Gunther and Koch): social skills	Increased psychological well-being, body awareness, self-other awareness, social skills No change in empathy Compared to control
Koehne et al. (2014)	Case series with controls 10 DMT sessions 2 time points	55 - 29 dance - 26 control	Clinically diagnosed ASD Germany Ages 18-55	Multifaceted Empathy Test: emotion inference and empathic feelings Interpersonal Reactivity Index: tendency to spontaneously adopt the psychological point of view of others The automatic imitation paradigm: imitation Finger-tapping task: synchronization	Improved emotion inference Increased quantity and quality of spontaneous imitation of synchronized movement No change in empathic feeling Compared to control
References	Study design and data collection	N	Population	Objectives and measures	Results

Mateos-Moreno et al. (2013)	Case series with control 36 dance and music therapy sessions 8 time points	16 - 8 dance - 8 control	Clinically diagnosed ASD Spain Mean age 25.62 yrs	Revised Clinical Scale for the Evaluation of Autistic Behavior: behavioral symptoms	Improved regulation of behavior variability, imitation disorder, instinct disorder, and emotional disorder Compared to control
Rosenblatt et al. (2011)	Case series, no control 8-wk multimodal yoga, dance, and music therapy program 2 time points	24	Clinically diagnosed ASD USA Mean age 8.9 yrs	Behavioral Assessment for Children: psychiatric functions Aberrant Behavioral Checklist: problem behaviors	Improved behavioral symptoms Compared to pre-intervention
Srinivisan et al. (2015)	Randomized controlled trial 32 sessions involving either rhythm, robot, or sedentary 3 time points	36 - 12 rhythm - 12 robot - 12 sedentary	Clinically diagnosed ASD USA Mean age 7.75 yrs	Unbiased coder: repetitive and maladaptive behaviors, affective states. (2 coders established intra- and inter-rater reliability of 90%)	Increased positive affect, task-appropriate behaviors, and improvement in motor imitation skills Rhythm group compared to pre-treatment measures and compared to robot and sedentary controls
Tsimaras et al. (2012)	Case series with control 16-wks traditional Greek dancing 2 time points	17 - 10 dance - 7 control	Non-specific intellectual disability Greece Median age 18 yrs	A balance deck was used to measure dynamic balance ability before and after intervention	Traditional Greek dance program increased dynamic balance compared to pre-treatment measurements

In all studies, the primary subjects were individuals with developmental disability. 6 of the studies included participants with a clinical diagnosis of ASD, and the remaining 3 included participants with an undefined intellectual disability. Only 2 studies focused specifically on children; the rest included either adults only or a range of adolescents and adults.

Although the types of dance classes varied, all programs had the same fundamental purpose of augmenting the physical and social functioning of people with intellectual disability. 6 of the studies focused on the primary improvement of physical and technical skills: Arzoglou et al. (2013) and Tsimaras et al. (2012) found that traditional Greek dance improved balance and neuromuscular coordination. Koehne et al. (2016), Mateos-Moreno et al. (2013), and Srinivasan et al. (2015) noted that dance class participants demonstrated improved imitation skills and the ability to move in synchrony with others. 3 authors found that dance class participants demonstrated improved social skills, including the ability to infer emotions of others and to better distinguish between the self and others [5, 18, 28]. The 2 studies that honed in on stereotyped and repetitive behaviors found that dance decreased maladaptive behaviors and improved task-appropriate social behavior [21, 29]. Finally, the 4 papers that studied the subjects' emotional outcomes found that dance therapy improved participants' emotional wellbeing, increased positive affect, and enhanced knowledge of their own bodies [5, 18, 30, 31].

DISCUSSION

Of the 27 papers on dance therapy and developmental disability reviewed in this literature search, only one third examined dance therapy using case-based research. These studies demonstrated that dance classes may have a positive impact for people with ASD or other developmental disability: participants exhibited improvements in emotional and psychological

wellbeing, physical and motor control, and social and cognitive functioning while demonstrating a decrease in stereotyped behaviors. While these very early studies yield promising results, more research needs to be done to test the validity, reliability, and generalizability of these outcomes.

Several key learning points can be gleaned from the present review of literature. Overall outcomes were geared toward demonstrating improved sociability and wellbeing of dance class participants. Even studies that focused on the physical benefits of dance implied that better motor control might improve social abilities. Furthermore, the diversity of studies demonstrates that dance and movement is a generalizable learning tool that can assist different types of populations. The dance programs took place in various geographic regions, including Greece, Germany, Spain, the UK, and the USA. This highlights that since dance is primarily non-verbal, its benefits are transferrable across borders and do not rely on specific language perception or skill. Additionally, the investigated dance programs included children, adults, or a mix of adolescents and adults. Traditionally, ASD interventions such as ABA, PECS, and TEACHH are most beneficial when started at a young age (APA, 2016). Yet Barnett-Lopez et al. (2015, 2016), Koch et al. (2015), Koehne et al. (2014), and Mateos-Moreno et al. (2013), all demonstrated that dance-centered therapies can benefit adults as well. This is particularly important as many programs for people with developmental disability stop at age 21 [32]. Dance classes may provide not only social opportunities, but also continued developmental therapy that benefits people from all backgrounds and of all ages.

Forming Empathic Relationships through Dance

Another interesting feature of the review is the focus on mirroring, imitation, and synchronous movements, as seen in the papers by Koch et al. (2015), Koehne et al. (2014), and Srinivasan et al. (2015). Imitation and mirroring has been a

central part of DMT since its inception in the late 60s to early 70s [14]. Mirroring typically occurs in dyads, in which one therapist works with one patient. The patient mimics the therapist's movement until this traditional student-teacher role reverses, and the therapist follows the movement that the patient chooses to make. Mirroring may also involve larger groups, in which multiple dancers all follow one dancer. This mimicry creates a connection between dancers without using any spoken language; it involves preverbal structures of interactions that can facilitate understanding emotions before actually articulating them [33, 34]. As these types of interactions evolve, it is theorized that dancers glean the emotional quality, mood, and affect that comes with dance, thus forming a movement-based relationship [10]. This intrinsic sensation of movement and body posture is known as "kinesthesia." Kinesthesia refers to one's own bodily sensations in response to the body movements or posture of someone else [13].

This "kinesthesia," may in fact play a key role in empathy, an important relationship building tool that many with ASD lack [10, 35]. Interpersonal experiences through movement, especially when moving in synchrony with others, can be important for strengthening relationships as well as refining the distinction between the self and other, which are both necessary in empathic interactions [13]. Theoretical research demonstrates that this connection between movement and empathy may take root in the Mirror Neuron System (MNS). The MNS, though not yet fully understood in humans, is essentially a neuronal bridge between self and other that may be active in the process of being simultaneously the perceiver and the object of another's perception [13, 33, 34]. For instance, if a person is watching an emotive dancer, the same mirror neuron structures are activated in the observer as the dancer, which generates a shared body state that enables implicit understanding. In a sense, the person's own physiological response is used to detect another's emotions, and an empathic relationship is formed.

This largely theoretical framework is put into practice in dance therapy. Through using the mirroring modalities that are central to DMT, dancers may be using the MNS to build empathic relationships with other dancers. Referring back to the example of Janet Adler, we can employ the kinesthetic framework to understand why mirroring a repetitive or stereotyped movement may foster relationship building. Instead of finding ways to limit these behaviors, incorporating them into a shared dance acknowledges whatever emotion drives the unwanted movement. As the present literature review demonstrates, mirroring these movements does not to foster maladaptive behavior, but instead, limits them. Dance may create a comfortable space for the repetitive movements to be accepted, so that they are no longer associated with anxiety, fear, or overstimulation. Dance therapy may assume the role of physical and occupational therapy as a practical and approachable modality for learning how to cope with high-stimulation environments and reducing maladaptive behaviors.

LIMITATIONS

Despite these interesting findings, it must be noted that the research on dance therapy for the developmentally disabled is very limited. One problem that the present review confronts is that

the articles used various tools in attempt to quantify subjective outcomes. For instance, in their studies, Barnet-Lopez's group (2015, 2016) used Human Figure Drawing (HFD), a projective test in which subjects were asked to draw a human body, and the rendering was used to glean information about the subjects' cognitive development, maturity, attitudes, and experience. In order to measure emotional inference and empathy, Koehne et al. (2014) used the Multifaceted Empathy Test (MET), which utilized photographs of emotionally charged situations to cue subjects to discuss how the people photographed might be feeling and how much the subjects shared the feeling of the individuals. Koch et al. (2015) used a series of questionnaires to elucidate psychological wellbeing, body awareness, self-other awareness, empathy and social skills. Mateos-Moreno et al. (2013), Rosenblatt et al. (2011), and Srinivasan et al. (2015) used observational checklists to monitor changes in stereotyped behavior, the ability to imitate or move synchronously with others, and the affect of the participants. Although many of these studies arrived at similar conclusions, their measurements are vastly different and therefore may not reflect truly reliable outcomes.

The studies included in this review took place between 2011 and 2016, which highlights how recent this area of research is and how much is yet to be developed. Since the majority of these studies were considered to be preliminary or feasibility studies, the N value was very small, ranging from 3 to 55 participants. While 7 of these studies contained control groups with either a non-movement or movement-based intervention, only 1 had randomized subjects; this may introduce a component of selection bias. Additionally, all studies took place during a relatively short period of time, with the longest program running for 4 months. While the majority of the studies had at least 2 measurement time points, a longitudinal study would be beneficial to measure a long-term effect of dance therapy.

CONCLUSION

Despite these shortcomings, there are still some key findings in the research that are worth clinical and investigative attention. Although there is an increasing amount of research in DMT, qualitative analyses are more common than quantitative research; narrative designs that deal with natural human experiences are in fact often the preferred choice of research in the arts, psychology, and humanities [36]. Currently, very few individuals with ASD are participating in dance therapy. One internet survey found that only 2.4% of children with ASD are partaking in DMT [14]. It is possible that health care practitioners seek more quantitative, scientific evidence before recommending dance therapy for their patients with ASD. It is also possible that insurance will not cover the cost of dance classes as they may be deemed recreational and not therapeutic. Quantitative measurements that are deeply rooted in DMT research, such as Laban Movement Analysis and Kestenberg Movement Analysis, may serve as foundational tools with which to analyze dance therapy for people on the spectrum [14, 34]. The commonality of these base measurements can serve as springboards from which more nuanced, qualitative measurements may be validated. While the struggle to find meaningful ways to quantify emotional elements is ongoing, strong scientific evidence may expand dance therapy availability for people with developmental disability, which in turn, would help to further substantiate future research.

REFERENCES

1. APA, Diagnostic and Statistical Manual of Mental Disorders, in DSM-5, A.P. Association, Editor. American Psychiatric Association: Washington. 2013; 50-59.
2. Ganz JB, Davis JL, Lund EM, Goodwyn FD, Simpson RL. Meta-analysis of PECS with individuals with ASD: investigation of targeted versus non-targeted outcomes, participant characteristics, and implementation phase. *Res Dev Disabil.* 2012; 33: 406-418.
3. Virues-Ortega J, Julio FM, Pastor-Barriuso R. The TEACCH program for children and adults with autism: a meta-analysis of intervention studies. *Clin Psychol Rev.* 2013; 33: 940-953.
4. Roane HS, Fisher WW, Carr JE. Applied Behavior Analysis as Treatment for Autism Spectrum Disorder. *J Pediatr.* 2016; 175: 27-32.
5. Srinivasan SM. A comparison of the effects of rhythm and robotic interventions on repetitive behaviors and affective states of children with Autism Spectrum Disorder (ASD). *Res Autism Spectr Disord.* 2015; 18: 51-63.
6. CDC. Autism Spectrum Disorder: Data & Statistics. 2016; 11.
7. Srinivasan SM, Bhat AN. A review of "music and movement" therapies for children with autism: embodied interventions for multisystem development. *Front Integr Neurosci.* 2013; 7: 22.
8. Colombo-Dougovito AM, Reeve RE. Exploring the Interaction of Motor and Social Skills With Autism Severity Using the SFARI Dataset. *Percept Mot Skills.* 2017; 124: 413-424.
9. Elder JH. Clinical impact of early diagnosis of autism on the prognosis and parent-child relationships. *Psychol Res Behav Manag.* 2017; 10: 283-292.
10. Martin M. Moving on the spectrum: Dance/movement therapy as a potential early intervention tool for children with Autism Spectrum Disorders. *Arts in Psychotherapy.* 2014; 41: 545-553.
11. Amos P. Rhythm and timing in autism: learning to dance. *Front Integr Neurosci.* 2013; 7: 27.
12. ADTA. What is Dance Movement Therapy? 2016.
13. Behrends AS, Müller S, Dziobek I. Moving in and out of synchrony: A concept for a new intervention fostering empathy through interactional movement and dance. *Arts in Psychotherapy.* 2012; 39: 107-116.
14. Scharoun SM. Dance/Movement Therapy as an Intervention for Children with Autism Spectrum Disorders. *Am J Dance Ther.* 2014; 36: 209-228.
15. De Tord, Brauning I. Grounding: Theoretical application and practice in dance movement therapy. *Arts in Psychotherapy.* 2015; 43: 16-22.
16. Niedenthal PM, Barsalou LW, Winkielman P, Krauth-Gruber S, Ric F. Embodiment in attitudes, social perception, and emotion. *Pers Soc Psychol Rev.* 2005; 9: 184-211.
17. Winters, A.F., Emotion, Embodiment, and Mirror Neurons in Dance/Movement Therapy: A Connection across Disciplines. *Am J Dance Ther.* 2008; 30: p. 84.
18. Koch SC, Mehl L, Sobanski E, Sieber M, Fuchs T. Fixing the mirrors: a feasibility study of the effects of dance movement therapy on young adults with autism spectrum disorder. *Autism.* 2015; 19: 338-350.
19. Adler J. American Dance Therapy Association 37th Annual Conference Keynote Address: From autism to the discipline of authentic movement. *Am J Dance Ther.* 2003; 25: 5-16.
20. Cruz, R.F., Dance/Movement Therapy and Developments in Empirical Research: The First 50 Years. *Am J Dance Ther.* 2016; 38: 297-302.
21. Rosenblatt LE, Gorantla S, Torres JA, Yarmush RS, Rao S, Park ER, et al. Relaxation response-based yoga improves functioning in young children with autism: a pilot study. *J Altern Complement Med.* 2011; 17: 1029-1035.
22. Hunter KGS, Piner Sk, Rosenberg AE. Pediatric physical therapists' consultation with a community dance instructor: A case report. *Pediatric Physic Ther.* 2004; 16: 222-229.
23. Lagomarcino A, Reid DH, Ivancic MT, Faw GD. Leisure-dance instruction for severely and profoundly retarded persons: teaching an intermediate community-living skill. *J Appl Behav Anal.* 1984; 17: 71-84.
24. Surujlal J. Music and dance as learning interventions for children with intellectual disabilities. *Mediterranean J Soc Sci.* 2013; 4: 68-75.
25. Arzoglou, D., et al., The effect of a traditional dance training program on neuromuscular coordination of individuals with autism. *J Physic Educ Sprt.* 2013; 13: 563-569.
26. Tsimaras VK, Giamouridou GA, Kokaridas DG, Sidiropoulou MP, Patsiaouras AI. The effect of a traditional dance training program on dynamic balance of individuals with mental retardation. *J Strength Cond Res.* 2012; 26: 192-198.
27. Mateos-Moreno, D. and L. Atencia-Dona, Effect of a combined dance/movement and music therapy on young adults diagnosed with severe autism. *Arts in Psychotherapy.* 2013; 40: 465-472.
28. Koehne S, Behrends A, Fairhurst MT, Dziobek I. Fostering Social Cognition through an Imitation- and Synchronization-Based Dance/Movement Intervention in Adults with Autism Spectrum Disorder: A Controlled Proof-of-Concept Study. *Psychother Psychosom.* 2016; 85: 27-35.
29. Mateos-Moreno D, Atencia-Doña L. Effect of a combined dance/movement and music therapy on young adults diagnosed with severe autism. *Arts Psychotherapy.* 2013; 40: 465-472.
30. Barnet-López S. Developmental Items of Human Figure Drawing: Dance/Movement Therapy for Adults with Intellectual Disabilities. *Am J Dance Ther.* 2015; 37: 135-149.
31. Barnet-Lopez S. Dance/Movement Therapy and emotional well-being for adults with Intellectual Disabilities. *Arts Psychotherapy.* 2016; 51: 10-16.
32. Autism Speaks: Adult Services. 2014; 3.
33. Homann KB. Embodied Concepts of Neurobiology in Dance/Movement Therapy Practice. *Am J Dance Ther.* 2010; 32: 80-99.
34. Samaritter R, Payne H. Kinaesthetic intersubjectivity: A dance informed contribution to self-other relatedness and shared experience in non-verbal psychotherapy with an example from autism. *Arts in Psychotherapy.* 2013; 40: 143-150.
35. Jones AP. Feeling, caring, knowing: different types of empathy deficit in boys with psychopathic tendencies and autism spectrum disorder. *J Child Psychol Psychiatry.* 2010; 51: 1188-1197.
36. Berrol C. Reflections on Dance/Movement Therapy and Interpersonal Neurobiology: The First 50 Years. *Am J Dance Ther.* 2016.

Cite this article

Gruen J (2018) Dance Therapy for Children and Adults with Autism Spectrum Disorder or other Developmental Disability: Literature Review of Present Research. *Ann Psychiatry Ment Health* 6(3): 1137.

APPENDIX

Search protocol according to each database:

- **PubMed – MEDLINE:** (music therapy[mh] OR music[mh] OR Singing[mh] OR Dancing[mh] OR Dance Therapy[mh] OR music[tw] OR music*[tw] OR melod*[tw] OR sing[tw] OR singing[tw] OR song[tw] OR dance[tw] OR dancing[tw] OR dancer[tw]) AND (Asperger Syndrome[mh] OR “Autism Spectrum Disorder”[mh] OR Autistic Disorder[mh] OR Developmental Disabilities[mh] OR Intellectual Disability[mh] OR Autism[tw] OR Autistic[tw] OR Asperger[tw] OR “developmental disability”[tw] OR “developmental disorder”[tw] OR “intellectual disability”[tw]) AND English[la]

- **Embase:**

- #1 ‘music’/exp OR ‘music therapy’/exp OR ‘musician’/exp OR ‘singing’/exp OR ‘dancing’/exp OR ‘dance therapy’/exp OR music:ti,ab OR music*:ti,ab OR melod*:ti,ab OR sing:ti,ab OR singing:ti,ab OR song:ti,ab OR dance:ti,ab OR dancing:ti,ab OR dancer:ti,ab
- #2 ‘autism’/exp OR ‘developmental disorder’/exp OR ‘mental deficiency’/exp OR Autism:ti,ab OR Autistic:ti,ab OR Asperger:ti,ab OR “developmental disability”:ti,ab OR “developmental disorder”:ti,ab OR “intellectual disability”:ti,ab
- #3 #1 AND #2

- **CINAHL:** (MH “Music”) OR (MH “Music Therapy”) OR (MH “Singing”) Or (MH “Dance Therapy”) OR (MH “Dancing+”) OR music OR music* OR melod* OR sing OR singing OR song OR dance OR dancing OR dancer

AND

(MH “Autistic Disorder”) OR (MH “Developmental Disabilities”) OR (MH “Asperger Syndrome”) OR (MH “Intellectual Disability+”) OR Autism OR Autistic OR Asperger OR “developmental disability” OR “developmental disorder” OR “intellectual disability”

- **SCOPUS:** music OR music* OR melod* OR sing OR singing OR song OR dance OR dancing OR dancer

AND

Autism OR Autistic OR Asperger OR “developmental disability” OR “developmental disorder” OR “intellectual disability”

- **Web of Science Core Collection:** (music OR music* OR melod* OR sing OR singing OR song OR dance OR dancing OR dancer) AND (Autism OR Autistic OR Asperger OR “developmental disability” OR “developmental disorder” OR “intellectual disability”)