UNIVERSIDADE FEDERAL DE SERGIPE

CAMPUS UNIVERSITÁRIO PROF. ANTÔNIO GARCIA FILHO

DEPARTAMENTO DE FISIOTERAPIA

DANCE FOR NEGATIVE SYMPTOMS IN AUTISM SPECTRUM DISORDER (ASD): A SYSTEMATIC REVIEW

BEATRIZ MENEZES DE JESUS

ROMÁRIO COSTA OLIVEIRA

LAGARTO

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Beatriz Menezes de Jesus

Romário Costa Oliveira

Trabalho de Conclusão de Curso (TCC) apresentado ao Departamento de Fisioterapia da Universidade Federal de Sergipe (UFS) Campus Prof. Antônio Garcia Filho-Lagarto, como um dos requisitos para graduação em Fisioterapia, sob a orientação da Prof.ª Dr.ª Lavínia Teixeira-Machado e co-orientação da Prof.ª Msc. Fernanda Oliveira de Carvalho.

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Lagarto, 13 de Março de 2019

BANCA EXAMINADORA

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Prof.ª Dr.ª Lavínia Teixeira-Machado

_____

Prof.ª Dr.ª Josimari Melo de Santana

_____

Prof.ª Dr.ª Sheila Schneiberg de Valença Dias

DANCE FOR NEGATIVE SYMPTOMS IN AUTISM SPECTRUM DISORDER (ASD): A SYSTEMATIC REVIEW

Beatriz Menezes De Jesus, Romário Costa Oliveira, Fernanda Oliveira de Carvalho, Ricardo Mario Arida, Jair de Jesus Mari, Lavinia Teixeira-Machado

Highlights

- Negative symptoms, such as self expression, eye contact, empathy, socialization are personal obstacles faced by individuals with autism.

- Dance movement therapy (DMT) is a psychotherapeutic approach that fosters the emotional, cognitive, social, and physical integration of the individual with ASD.

- Dance practice may contribute to body awareness and social involvement by techniques that provide mirrorring, syncronization, rhythm, and reciprocity in adults with ASD normal to high functioning.

ABSTRACT

Background: Autism spectrum disorder (ASD) is characterized as a neurodevelopmental disorder with stereotyped and repetitive behaviors. Dance practice is able to surface esthesia to awake the communication process, by the notion of the phenomenal body that is recognized in an expressive and symbolic space. **Objective**: To conduct a systematic review to identify how dance influences negative symptoms in ASD. **Method**: We formulated the research question based on PICO: "What is the influence of dance on negative symptoms in individuals with autism spectrum disorder?". Included databases were PubMed, Science Direct, Scopus, PsycInfo and Web of Science and, which were searched in March 2019. **Results**: We identified 9.350 studies, and five were selected in our review (total of 266 individuals). All included studies showed dance influence on negative symptoms, including empathy, emotional expression, body awareness, behavior, and psychological wellbeing that

impact on social reciprocity, and consequently in communication process in ASD. Dance practice may contribute to body awareness and social involvement by techniques that provide mirrorring, syncronization, rhythm, and reciprocity in adults with ASD normal to high functioning.

Keywords: autism spectrum disorder**,** dance, negative symptoms.

RESUMO

Introdução: O transtorno do espectro do autismo (TEA) é caracterizado como um transtorno do neurodesenvolvimento com comportamentos estereotipados e repetitivos. A prática da dança é capaz de levantar a estese para despertar o processo de comunicação, pela noção do corpo fenomenal que é reconhecido em um espaço expressivo e simbólico. **Objetivo:** Realizar uma revisão sistemática para identificar como a dança influencia os sintomas negativos no TEA. **Método**: Nós formulamos a questão de pesquisa baseada no PICO: "Qual é a influência da dança nos sintomas negativos em indivíduos com transtorno do espectro do autismo?". As bases de dados incluídas foram PubMed, Science Direct, Scopus, PsycInfo e Web of Science e, que foram pesquisadas até março de 2019. **Resultados:** Nós identificamos 9.350 estudos, e cinco foram selecionados em nossa revisão (total de 266 indivíduos). Todos os estudos incluídos mostraram a influência da dança nos sintomas negativos, incluindo empatia, expressão emocional, consciência corporal, comportamento e bem-estar psicológico que impactam na reciprocidade social e, consequentemente, no processo de comunicação na ASD. A prática da dança pode contribuir para a consciência corporal e o envolvimento social por meio de técnicas que proporcionam correção, sincronização, ritmo e reciprocidade em adultos com TEA com funcionamento normal a alto.

Palavras-chave: transtorno do espectro do autismo, dança, sintomas negativos

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ADI-R	Autism Diagnostic Interview – Revised
ADOS	Autism Diagnostic Observation Schedule
ASD	Autism Spectrum Disorder
ASIM	Assessment of Spontaneous Interaction in Movement
BRA	Brazil
BSE	Body Self-Efficacy Scale
CARS	Childhood Autism Rating Scale
CEEQ	Cognitive and Emotional Empathy Questionnaire
CMI	Control Movement Intervention
DMT	Dance Movement Therapy
DSM-V	5th edition of the Diagnostic and Statistical Manual of Mental Disorders
EES	Emotional Empathy Scale
EIS	Embodied Inter-subjectivity Scale
FBT	*Fragebogen fuer Bewegungs Therapie*
FIM	Functional Independence Measure
GER	Germany
GO	Boundary Orientation between Self and Other Scale
HSI	Heidelberger State Inventory
IQ	Intelligence Quotient
IRI	Interpersonal Reactivity Index
MEDLINE	National Library of Medicine
MET	Multifaceted Empathy Test
PRESS	Peer Review of Electronic Search Strategies
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO	International Prospective Register of Systematic Reviews
SANS	Scale for the Assessment of Negative Symptoms
SI-DMI	Synchronization and Imitation Dance Movement
SOA	Self-other Awareness
WHODAS	World Health Organization Disability Assessment Schedule

SUMMARY

BACKGROUND

Autism spectrum disorder (ASD) is conceptualized as a neurodevelopmental disorder. Stereotyped and repetitive behaviors associated with communication impairments make it difficult to focus on environmental stimuli. These symptoms unbalance the emotional response, associated with impaired anxiety and emotional learning (Loke et al., 2015; Sanchack, Thomas, 2016).

According to the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V), ASD diagnosis involves two criteria axes: I) social-emotional reciprocity, non-verbal social communication, reciprocal relationships; and II) presence of repetitive movements and behaviors, rituals and routines, restricted interest, unusual sensory reactions and interests (Grzadzinski et al., 2013).

Scientific evidences suggest that growth factors modulate motor, emotional, and cognitive functions, which may explain mental disorders manifestation (Loke et al., 2015; Sanchack, Thomas, 2016). Although ASD etiology remains unclear, events can be triggered by the combination of genes, environment influence, or the interaction between gene combination and environment (Loke et al., 2015).

Based on the assumption of the substantial influence of the environment for the development of communication and relationships, it is critical focus on approaches that directly act on the ASD social barriers. In this line, this review focused on dance as an approach to arouse the capacity to emerge emotional states, fundamental for human relations, because it may configure itself as a mean of communication, fundamentally non-verbal.

Negative symptoms in ASD are characterized by difficulty in common social behaviors in typical individuals, such as eye contact, thinking flexibility, social involvement, name response, facial and verbal expression (Foss-Feig et al., 2016; Prata et al., 2017).

Due to these characteristics, several interventions can be used to favor social engagement and thus reduce negative symptoms (Foss-Feig et al., 2016). Among them, we highlight dance practice, which has the capacity to improve facial expression, social behavior, and recognition of emotions through movement synchronization (Amos, 2013; Koehne et al., 2016; Martin et al., 2016).

Dance - as a possibility of action, perception, understanding and interpretation of the gestural movement - allows the corporeity from the personification of the symbolic way as a tool for gestural expression. Aesthetic sensibility is awakened, and as a poetic and plastic reading of the body in motion, gesture is established in a peculiar dimension of the body in movement, with the aim of promoting emotional inference and empathy, that is, emotional reaction of the others feelings (Koehne et al., 2016; Malloch, Trevarthen, 2018).

Existe uma lacuna na ciência de como intervir de forma não-mendicamentosa em indivíduos com TEA. Dessa forma, foi incentivado a pesquisa sobre os efeitos da dança nos sintomas negativos nesse público, pois esta é uma atividade artística, não-farmacológica e que permite a socialização.

In this way, this systematic review aimed to conduct a systematic review to identify how dance influences negative symptoms in ASD, and secondary outcomes were dance influence on communication, body awareness, behavior and social reciprocity.

METHOD

Registration

The review protocol was registered with International Prospective Register of Systematic Reviews (PROSPERO) on June 25, 2018 (CRD42018099000).

Criteria for considering studies for this review

This systematic review formulated the research question based on PICO strategy, where: P: population, patient or problem; I: intervention; C: control or comparative

interventions; O: outcomes. This strategy was used in order to allow the resolution of the clinical research question and optimize the recovery of evidence in the databases. In this review, a research question was formulated: "What is the influence of dance on negative symptoms in individuals with autism spectrum disorder?", where, following the criteria above, P: Autism Spectrum Disorder; I: dance practice; C: controls, physical exercise, sports or other activities; and O: negative symptoms.

Types of studies

This review included randomized clinical trials that reported dance for people with ASD, without restriction of language and year of publication. Interventions that addressed dance, dance movement therapy (DMT), dance/movement based on imitation and synchronization were included. Primary outcome was negative symptoms and secondary outcomes were communication, body awareness, behavior and social reciprocity. Studies that not addressed dance in ASD, reviews, letters and cross-sectional studies were excluded.

Electronic searches

Five databases were used to search appropriate documents that fit the purpose of this study. The National Library of Medicine (MEDLINE-PubMed), Science Direct, Web of Science, Scopus and PsycINFO (APA – American Psychological Association) were included using different combinations of the following descriptors: "dance therapy", "dance", "autistic disorder", "autism" "autism spectrum disorder", and search terms and booleans operators (((("dance therapy"[MeSH Terms]) OR "dance") AND "autistic disorder"[MeSH Terms]) OR ("autism") OR ("autism spectrum disorder"[MeSH Terms])). Other resources searching, such as conference proceedings, journals and others non-bibliographic database sources (conference panel), unpublished and ongoing studies (registered with clinical trial), and free web searching were included in our systematic review.

We carried out search for articles in mentioned databases, executing the following protocol: analysis of title articles, later reading summary articles that had been included in the first stage. Then, we read entire article that was included in the second stage, and finally we analyzed articles references that were read in their entirety.

Databases were searched for studies conducted until March 2019. A research strategy was designed to identify studies that used dance in the treatment of individuals with ASD and to analyze their quality of life. Level of agreement of inclusion / exclusion among two researchers who examined the studies was obtained by Kappa test.

Kappa test analyzes concordance between articles that were included and excluded by researchers. Kappa values below 0 are classified as insignificant; from 0.01 to 0.20 are considered as fair consent; from 0.21 to 0.40 as moderate consent; from 0.61 to 0.80, as a strong agreement; and from 0.81 to 0.99, as near perfect agreement (Costa et al., 2015).

Searching other resources

Free handsearching, grey literature, reference lists, world wide web and personal collections of articles were done by the authors using search terms and booleans operators [(dance) AND (Autism Spectrum Disorder)] and studies that addressed behavioral and dance sciences, multidisciplinary psychology, rehabilitation, neuroscience, psychiatry, and integrative complementary medicine.

Selection of studies

Our review was performed according to the guidelines for systematic reviews and meta-analyzes (PRISMA) and it followed the recommendations of the international guideline Peer Review of Electronic Search Strategies (PRESS). Electronic searches were carried out to identify the largest number of articles about dance for ASD. Specific search strategies were developed for each database.

Data extraction and management

A form was created to collect specific information to our review, containing: author; year of publication; study design; participants; age; objectives; ASD graduation scale; evaluation instrument; intervention; outcome; limitations; conclusions.

Analysis of the selected articles were performed according to the type of study selected, type of participants (age, sex, presence or absence of comorbidities), type of intervention used (dance, dance/movement therapy or other style of dance practice), as well as the type of control group (other intervention, exercise or no intervention), randomization and blinding of participants, period and frequency, measured time points, outcomes.

Assessment of risk of bias in included studies

Standard Quality Assessment criteria (Kmet checklist) was applied to assess the methodological quality of each study selected for inclusion. Scale and trend risk were reported, relative to the grade or level of quality. The 14-item Kmet checklist contains a three-point, ordinal scale (0 = no, 1= partial, 2 = yes), giving a systematic and quantifiable means for assessing the quality of studies of a variety of research designs. Checklist includes topics as known as: question and objective of the study description; study design; description of method of groups selections and source of information of variables, including sample size; randomization and blinding; outcomes and exposure measures; analytic methods; controlled for confounding; detailed results and conclusions in line. A score was used for the classification of methodological quality: >80% was considered strong quality, 70–79%, good quality, 50–69%, fair quality and<50% was considered poor methodological quality (Kmet et al., 2004; Teixeira-Machado et al., 2019). We used Review Manager (5.3 version RevMan) software to analyze risk of bias of selected studies.

RESULTS

Description of studies

Selection process included 9350 studies (PsycINFO=7.028, PubMed=1.379, Science Direct=720, SCOPUS=56, WOS=167). After excluding duplicates and screening abstracts, 105 studies were selected. A total of 5 studies fulfilled inclusion criteria. There was a high level of agreement on inclusion / exclusion among two researchers who examined the studies (Kappa>83%).
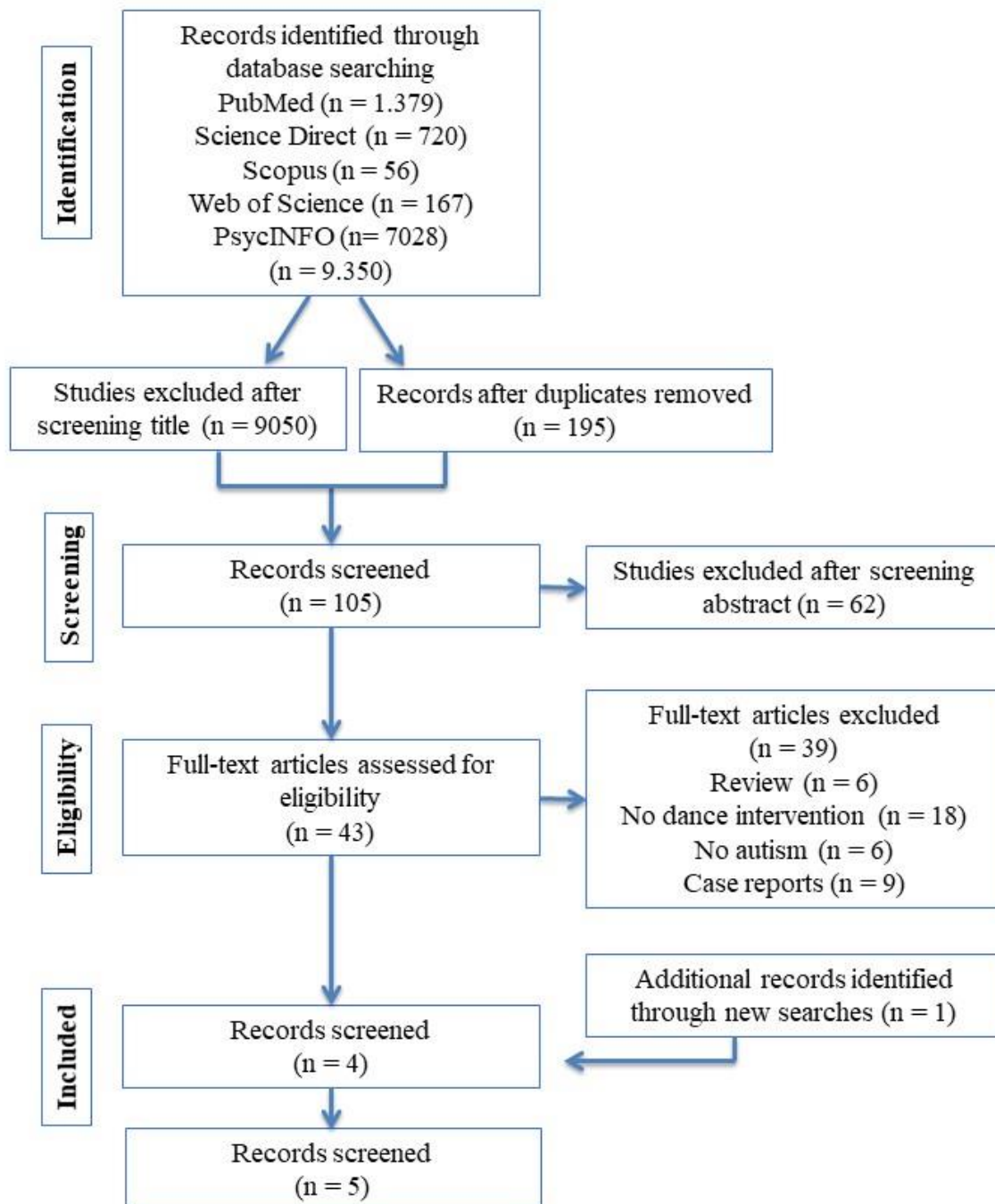
Figure 1. A flow diagram of the systematic review literature search.

Included studies

Hildebrandt et al. (2016), Mastrominico et al. (2018) and Souza-Santos et al. (2018) studies were randomized clinical trials. Study randomization is not clear in Koch et al. (2015) and Koehne et al. (2016) studies. A total of 266 participants were involved, aging between five and 55 years old, and 74,8% were boys and men. Autism Diagnostic Observation Schedule (ADOS), Autism Diagnostic Interview – Revised (ADI-R) (Koehne et al., 2016) and Childhood Autism Rating Scale (CARS) (Souza-Santos et al., 2018) were used to measure ASD. Koehne et al. (2016) investigated high functioning ASD participants (Intelligence quotient IQ>85) without severe physical conditions. Koch et al. (2015) did not address IQ, but participants were considered within intelligence normality, although the authors did not specify how the IQ analysis was done. Hildebrandt et al. (2016) and Mastrominico et al. (2018) considered IQ>70 (IQ<70 is considered intellectual deficit). Souza-Santos et al. (2018) did not address IQ.

Interventions

Hildebrandt et al. (2016), Koch et al. (2015) and Mastrominico et al. (2018) interventions were based on dance movement therapy (DMT). Koehne et al. (2016) study focused on synchronization and imitation dance movement (SI-DMI) lessons. Souza-Santos et al. (2018) applied a specific dance program for ASD called TALT (*Técnica Aplicada Lavinia Teixeira*). Regarding period and frequency of sessions see details in Table 2.

Outcome procedures

Studies used the following measurements to assess dance and DMT influences on ASD participants: negative symptoms were assessed by Scale for the Assessment of Negative Symptoms (SANS) (Hildebrandt et al., 2016). Body awareness and social skills were assessed by Embodied Inter-subjectivity Scale (EIS), Body Self-Efficacy Scale (BSE) (Mastrominico

et al., 2018), Questionnaire of Movement Therapy (*Fragebogen fuer Bewegungstherapie –* FBT) (Koch et al., 2015).

Koch et al. (2015) assessed psychological wellbeing by Heidelberger State Inventory (HSI). Empathy was assessed by Multifaceted Empathy Test (MET), Interpersonal Reactivity Index (IRI), Assessment of Spontaneous Interaction in Movement (ASIM) (Koehne et al., 2016), Emotional Empathy Scale (EES), Boundary Orientation between Self and Other Scale (GO), self-other awareness (SOA) (Koch et al., 2015) and Cognitive and Emotional Empathy Questionnaire (CEEQ) (Mastrominico et al., 2018).

Functional Independence Measure (FIM) assessed functional independence, and social participation was assessed by World Health Organization Disability Assessment Schedule, 2.0 version (WHODAS 2.0) (Souza-Santos et al., 2018).

Table 1: Summary of participants and assessments

1st Author (year)	Country	Participants						Tools
		N	Groups	Descriptions	Male	Female	Age	
Hildebrandt (2016)	GER	78	I: 55	Individuals with ASD	63	12	14-53 (22.5)	SANS
			C: 23					
Koch (2015)	GER	31	I: 16	Individuals with ASD	23	8	16-47 (22.0)	Self-report scales; HSI; FBT; EES; SOA
			C: 15					
Koehne (2016)	GER	55	I: 29	Individuals with ASD	33 in both groups	Not described	18-55	Imitation/synchronization paradigms; MET; IRI; ASIM
			C: 26					
Mastrominico (2018)	GER	57	I: 35	Individuals with ASD	44	12	14-52 (22.5)	CEEQ; IRI; EIS; BSE
			C: 22					
Souza-Santos (2018)	BRA	45	I: 15	Individuals with ASD	36	9	5-12 (7)	FIM; WHODAS 2.0
			C_1: 15 C_2: 15					

GER= Germany; I = Intervention Group; C= Control Group; SANS= Scale for the Assessment of Negative Symptoms; HSI= Heidelberger State Inventory; FBT= Questionnaire of Movement Therapy" Fragebogen fuer Bewegungstherapie; EES= Emotional Empathy Scale; SOA= Self-other awareness; MET= Multifaceted Empathy Test; IRI= Interpersonal Reactivity Index; ASIM= Assessment of Spontaneous Interaction in Movement (ASIM); CEEQ= Cognitive and Emotional Empathy Questionnaire; EIS= Embodied Inter-subjectivity Scale; BSE= Body Self-Efficacy Scale; FIM= Functional Independence Measure; WHODAS 2.0= World Health Organization Disability Assessment Schedule, 2.0 version.

Results reported

All studies found reported effects on ASD through dance intervention. Hildebrandt et al. (2016) highlighted dance practice on negative symptoms, including emotional expression, with interaction effect on the significance level of 0.1 indicating symptom reduction in dance group ($F(1.4) = 2.99$, $p = 0.09$). Koch et al. (2015) emphasized that DMT influenced body awareness, psychological wellbeing and social skills compared to the control group ($F(1.27) = 2.95$, $p = 0.04$, $d = 0.63$).

Koehne et al. (2016) showed that dance movement focused on interpersonal imitation and synchronization changed emotional inference when compared with control movement intervention group ($p = 0.04$, $\eta^2 = 0.09$). Furthermore, interaction effects related to social reciprocity also showed of imitation/synchronization ($p < 0.001$, $d = 1.27$) and reciprocity/dialogue ($p = 0.04$, $d = 1.25$), respectively (Koehne et al., 2016).

Mastrominico et al. (2018) pointed out that mirroring interventions interfered on empathy, relationship, and others feeling as well as psychological health. They reported the main effect of time compared to control group yield findings for emotional empathy ($F(1,55) = 12.55$, $p = 0.001$, $\eta^2 = 0.19$) and its subscales mirroring ($F(1,55) = 9.22$, $p = 0.004$, $\eta^2 = 0.14$) and empathic concern ($F(1,55) = 4.99$, $p = 0.030$, $\eta^2 = 0.08$). Souza-Santos et al. (2018) addressed changes in ASD severity (p=0.01), communication (p=0.01), psychosocial adjustments (p=0.02) and functional independence (p=0.03). Summary of studies design, procedures and outcomes are described in Table 2.

Table 2: Summary of study design, procedures and results

1st Author (year)	Study Design	Comparison condition	Period and Frequency	Time points measured	Outcome	Conclusions
Hildebrandt (2016)	RCT	I: DMT	One session of 60 min per week for 10 weeks	Pre and post intervention	The mean symptom reduction in the treatment group was 15.27%, while symptom severity worsened by 6.99% in the control group.	The findings showed potentially influential factors on the decrease of negative affect, and thus the improvement of emotion expression.
		C: No intervention or alternative treatment				
Koch (2015)	RCT	I: DMT	One session of 60 min per week for 7 weeks	Pre and post intervention	DMT can be effective and viable for the treatment of ASD, in improving body awareness, self-awareness, psychological well-being and social skills.	DMT can be effective for treating people with ASD, with improvement in psychological well-being and social skills.
		C: No intervention or alternative treatment				
Koehne (2016)	RCT	I: SI-DMI	Ten sessions of 90 min for 3 months	Pre and post intervention	Patients treated with SI-DMI showed a significantly greater improvement in inference of emotions, but not empathic feelings, than those treated with IMC.	SI-DMI intervention increased the inference of emotion and improved imitation and synchronization functions.
		C: CMI				
Mastrominico (2018)	RCT	I: DMT C: No intervention or alternative treatment	One session of 1h per week for 10 weeks	Pre and post intervention	The results suggest that there are no significant changes in overall empathy between groups.	The results can not report conclusive effects on the effect of DMT on empathy for people with ASD.
Souza-Santos (2018)	RCT	I: DG	24 sessions of 60 min, twice a week for 36 weeks	Pre and post intervention	Dance improved functional independence, communication, and psychosocial adjustments.	Interventions were crucial in disorders of the ASD, especially in social aspects, including communication and functional independence for daily living tasks.
		C: EG; DEG				

Abbreviations: RCT=Randomized Clinical Trial; I= Experimental Group; C= Control Group; DMT= Dance/Movement Therapy; SI-DMI= Imitation- and Synchronization-based Dance/Movement Intervention; CMI= Control Movement Intervention; DG= Dance Group; EG= Equine-assisted therapy Group; DEG: Dance and Equine-assisted therapy Group.

Risk of bias in included studies

Methodological quality and Risk of Bias

Methodological quality of the studies was according to an appropriate description and selection of 14 items from the Kmet checklist, namely: 1. objective, 2 - design of the study, 3 - method of group selection, 4 - control group description, 5 - random allocation, 6 – blinding of personnel, 7 - blinding of participants, 8 - means of evaluation, result and robustness been reported to the classification measurement bias, 9 - sample size; 10 - analytical methods, 11 - any estimates of variance reported for the main results, 12 - controlled confounding, 13 - results in sufficient detail, 14 - conclusions supported by results.

The percentage of the obtained results was performed, and thus, the quality of the studies was classified through the score: 80-100: strong quality; 60-80: good quality; 50-60: adequate quality; and <50: fair quality. Hildebrandt et al. (2016), Koch et al. (2015), Koehne et al. (2016) and Souza-Santos et al. (2018) had strong quality, and Mastrominico et al. (2018) study had good quality.

Risk of bias (high, unclear and low risk) was reported about selection, performance, detection, attrition, reporting and other bias. Blinding of participants was difficult in all included studies was noted, since interventions are a practical activity with humans. In other bias item, lack of use internationally validated scale was considered, as well as the use of self-report scales, or half of other scales, besides creation of own group assessment, and publication bias. See details in Figure 2.

Figure 2. Quality assessment of selected studies.

DISCUSSION

This systematic review focused on the influence of dance for negative symptoms in ASD. This neurodevelopmental disorder is characterized by impairments in social and communication skills that make it difficult daily activities, especially in quality of personal life and family members. Included studies in our review reported substantial effects on negative symptoms, as also on communication, body awareness, behavior and social reciprocity when compared to others interventions, as known as physiotherapy, occupational therapy, equine-assisted therapy, social skills training, and psychotherapy (Hildebrandt et al., 2016; Koch et al., 2015; Koehne et al., 2016; Mastrominico et al., 2018; Santos-Souza et al., 2018; Siniscalco et al., 2018).

Dance and negative symptoms

Negative symptoms are difficulties faced by individuals with ASD, which involve social-emotional behavior that includes communication, attention, empathy, expression, eye contact, social interaction, and behavioral abilities (Barton et al., 2012; Bremer et al. 2016). These challenges can generate aggressive attitudes (Bremer et al., 2016).

Hildebrandt et al. (2016) study emphasized DMT practice for empathy and emotional expression, and that minimal changes in negative symptoms were extremely valuable to the social life of the individual with ASD. Koch et al. (2015) did not use specific instruments for negative symptoms such as Hildebrandt et al. (2016), but obtained directly related findings such as improvement of empathy, body awareness and social skills. As Koehne et al. (2016) that addressed the influence of DMT on the inference of emotions by imitation and synchronization. Mastrominico et al. (2018) and Souza-Santos et al. (2018) did not investigate negative symptoms directly but involved empathy and social participation as their study outcomes.

Dance provides expressive ability to connect with the world, with the goal of improving body awareness, social participation, communication, self-esteem, physical and emotional wellbeing (Berrol, 2006; Teixeira-Machado, 2015).

Dance and communication

Communication is the most impaired condition in ASD due to deficits on communicative, social and reciprocal attitudes. These behaviors interfere in social relations in several ways, including: absence of eye contact, joint attention and empathy difficulties (Llaneza et al., 2010; Williams, Cameron, 2017).

Communication in ASD is limited, probably by the difficult to understand social signals complexity, appreciating atypical self desires and neglecting others perspective, constituting an obstacle to recognize the feelings of others (Llaneza et al., 2010). Moreover,

social interaction is also affected because a person with ASD has difficulty in recognizing facial emotions (Black et al., 2018), and impairments in emotional skills (Hu et al., 2018).

People with ASD who present high functioning have higher IQ and smaller deficits in communication and socialization. On the other hand, the individuals with low functioning manifest difficulties to communicate and socialize even their basic needs, as selfcare. However, both conditions have gaps in the execution of complex activities, such as comprehension, expression, and language (Black et al., 2018; Hu et al., 2018; Koehne et al., 2016).

In this regard, selected studies in our systematic review highlighted the influence of dance to improve the above conditions. For instance, Koch et al. (2015) mention that the expressive functions of the body through DMT act directly in the communication, which can benefit the development of its clinical condition. Hildebrandt et al. (2016) also use the DMT that has the affinity of transmitting their inner feelings to the external environment through the improvement of communicative ability.

Koehne et al. (2016) elucidate that dance provokes a feeling of proximity and pro-social behavior. Mastrominico et al. (2018) also corroborate with the other studies about the influence of dance on communication in relation to emotion, empathy, perception and body expression. Souza-Santos et al. (2018) highlighted dance can change social participation, including relationship and communication, in ASD participants when compared dance and equine-assisted therapy.

Other studies also presented similar results. For instance, in a randomized controlled trial conducted by our group (Teixeira-Machado et al., 2017) highlighted dance influence in twenty-six adolescents with cerebral palsy on functionality and socialization in the participants. According to Farias and Teixeira-Machado (2016), dance for individuals with Down syndrome provides learning through bodily actions that instigates communication and

body expression. In this line, it seems that dance interventions can stimulate behavioral development in individuals with ASD (Amos, 2013; Llaneza et al., 2010).

Dance and body awareness

Body awareness is represented by corporal scheme characterized as the global representation that individuals have of their own body in relation to the external environment. In addition, body awareness has relevance in the social aspect and in emotional discernment. DMT includes methods of self-awareness, verbal and non-verbal expression of feelings, as well as improvisation and communication on the move (Michels et al., 2018; Sharon, Goodill, 2018). Individuals with ASD usually present changes in body awareness and facial expression, which directly affect communication (Llaneza et al., 2010).

In Koch et al. (2015) and Hildebrandt et al. (2016) studies, self-awareness and body awareness were extensively explored in interactive abilities proposed by DMT in ASD. In accordance, Mastrominico et al. (2018) mentioned that this psychotherapeutic approach used verbal processing and feedback in order to increase body awareness, self-recognition, self-distinction, social interaction and communication. On the other hand Koehne et al. (2016) and Souza-Santos et al. (2018) did not report evaluation and results directly related to body awareness, once the proposal of their study focused on improving socio-cognitive and socio-affective processes.

Dance and behavior

Behavior of individuals with ASD is determined by difficulties of social interaction, and decrease of cognitive empathy, emotion and communication (Vyas et al., 2017). Thus, individuals with ASD present behavioral stress, as well as anxiety, schizophrenia and affective disorder, a fact that can influence aggressiveness and antisocial behavior (Baglioni et al., 2016).

All studies included in this review demonstrated that dance is capable of motivating empathy and mutual behavior, building a social relationship and encouraging expressive and nonverbal behavior, as well as improving emotional understanding between therapist and individual with ASD (Hildebrandt et al., 2016; Koch et al., 2015; Koehne et al., 2016; Mastrominico et al., 2018; Souza-Santos et al., 2018).

Dance favors behavioral changes that are important to occur self-knowledge, communication and socialization (Souza-Santos et al., 2018). A study conducted by Mateos-Moreno and Atencia-Doña (2013) recommended DMT as a positive advantage in treatment of ASD behavior, because its acts directly on emotional and interaction disturbances.

Dance and social reciprocity

Resistance to social interaction is seen as one of the main challenges associated with ASD, which affects relationships between family members, friends and community, greatly impacting self-esteem and social independence. In this view, approaches focused on social reciprocity for people with ASD are needed (LaGasse, 2017).

All included studies highlighted that the largest impairment associated to ASD is the difficulty of social interaction (Hildebrandt et al., 2016; Koch et al., 2015; Koehne et al., 2016; Mastrominico et al., 2018; Souza-Santos et al., 2018). Authors also reported that social interaction competence was a direct and / or indirect aim of the dance interventions, as well as well-being, empathy, nonverbal skills, autonomy and self confidence.

Centelles et al. (2012) elucidates that body movement foments social performance in children with ASD, and emotional and social benefits can be proposed by the intervention of dance movement (Ho et al., 2015). Most of all, dance encourages social connection through playfull space, promoting expression and creativity that allows focus on the art not on the disorder (Rocha et al., 2017). It occurs because dance influences social reciprocity in interpersonal interaction through the integration of the individual with the external

environment. In addition, dance provides several benefits for self expression and functional, cognitive and social improvement (Teixeira-Machado, 2015; Texeira-Machado, DeSantana, 2015).

Included studies in our review are in line with other investigations that reported the effects of DMT on improving self-perception and social symptoms, especially affection (Scharoun et al., 2014). It seems that dance intervention can promote cognitive, emotional, auditory, visual, sensory, physical and social abilities (Sharp, Hewitt, 2014).

AUTHORS' CONCLUSIONS

Findings of the included studies showed dance for negative symptoms in ASD, and its influence on communication, body awareness, behavior, psychological wellbeing and social skills.

Implications for practice

A number of studies have demonstrated that dance influences ASD management, whether in the individual or collective sphere, as it interferes in physical, emotional, cognitive and social capacity. Dance contributes to express feelings through bodily movement and promotion of social participation, avoiding feelings of loneliness, isolation and frustration (communication difficulties often faced).

In this line, all selected studies in this systematic review revealed dance benefits in ASD in communication, body awareness, behavior, psychological well-being and social skills, considering the relevant influence of dance on negative symptoms, as empathy, interpersonal relation, cognition, interaction, emotion and consequently, quality of life.

A key factor to be considered is a good adherence of the dance sessions for neurological conditions (Keogh et al., 2009; Patterson et al., 2018). It is pertinent to highlight that in a study included our review (Mastrominico et al., 2018) there was no dropout during the intervention, as most participants emphasized the dance proficiency and claimed the desire

to remain in therapy. Besides, dance intervention is an inexpensive approach in terms of cost-effectiveness that can be a good strategy to ASD treatment.

Although dance has been the unique intervention, some differences were noted between the studies' protocols such as dance imitation (Koehne et al., 2016), DMT (Hildebrandt et al., 2016; Koch et al., 2015; Mastrominico et al., 2018), and specific dance protocol (Souza-Santos et al., 2018), and no homogeneity between time, period and frequency for protocols application, which may interfere the findings.

Other factor to be considered is a suitable place or environment which ASD participants are exposed to conduct dance programs. Different conditions such as noises, sounds, mirrors, or the presence of other participants during dance session may interfere outcomes. Disqualification of some therapists that conduced research protocols; disparity in the number of participants per group; no standardization in the application of DMT (therapists, different places and therapeutic environments) are limitations reported by Mastrominico et al. (2018) that have to be considered in the conduction of future studies on this topic.

Our systematic review reveals that dance for people with ASD can be used in several age groups and in some ASD degrees, with important influence on both A and B ASD diagnostic criteria recommended by the Diagnostic and Statistical Manual of Mental Disorders (DSM- 5), with substantial effects on social reciprocity and stereotypies.

Implications for research

The lack of standardization of the evaluation measures in all included studies in this review affected the interpretation and comparison of the results between the studies, which did not allow a meta-analysis accomplishment.

From this review, it may be noted that despite the heterogeneity of the studies, dance approaches showed to be beneficial in ASD. However, it is not clear what are the duration and

frequency of dance application that are appropriate to obtain positive findings. Besides that, there were only ASD individuals with high functioning. More than this, studies with moderate and severe ASD are needed to verify the influence of dance in negative symptoms and how dance may contribute to communication, body awareness, behavior and social reciprocity in all ASD conditions.

Our review shows the role of dance practice can foster in the daily life in individuals with ASD on negative symptoms, and its influence on biopsychosocial aspects. While we reported the positive influence of dance in this specific population, further investigations are needed to determine this effect in all levels of ASD severity.

It was also observed that two out of the five studies in our review compared dance with other types of interventions, being equine assisted therapy (Souza-Santos et al., 2018) and exercise for movement control (Koehne et al., 2016). Although better outcomes in the above cited aspects were noted, more studies with different interventions are necessary to obtain consistent information about dance and ASD negative symptoms, as well as provide more information on how dance practice or DMT can be used in different circumstances in autism spectrum.

REFERENCES

Amos P. (2013) Rhythm and timing in autism: learning to dance. Frontiers in Integrative Neuroscience 7: 27.

Baglioni C, Nanovska S, Regen W, Spiegelhalder K, Feige B, Nisse C. (2016) Sleep and Mental Disorders: A Meta-Analysis of Polysomnographic Research. Psychological Bulletin 142(9): 969-990.

Barton ML, Dumont-Mathieu T, Fein D. (2012) Screening Young Children for Autism Spectrum Disorders in Primary Practice. J Autism Dev Disord 42:1165–1174.

Berrol CF. (2006) Neuroscience meets dance/movement therapy: Mirror neurons, the therapeutic process and empathy. The Arts in Psychotherapy 33: 302–315.

Black MH, Almabruk T, Albrecht MA, Chen NT, Lipp OV, Tan T, Bolte S, Girdler S. (2018) Altered connectivity in autistic adults during complex facial emocional recognition: a study of EEG imaginary coherence. Conf Proc IEEE Eng Med Biol Soc. 2752-2755.

Bremer E, Crozier M, Lloyd M. (2016) A systematic review of the behavioural outcomes following exercise interventions for children and youth with autismo spectrum disorder. Autism 20(8): 899-915.

Costa AB, Zoltowski, APC, Koller SH, Teixeira MAP. (2015) Construction of a scale to assess the methodological quality of systematic reviews. Rev. Ciência & Saúde Coletiva, 20(8):2441-2452.

Centelles L, Assaiante C, Etchegoyhen K, Bouvard M, Schmitz C. (2012) Understanding social interaction in children with autism spectrum disorders: does whole-body motion mean anything to them? Encephale 38(3): 232-240.

Farias LHS, Teixeira-Machado L. (2016) Behind the Dance: Educational, Emotional and Social Contexts in Down syndrome. International Journal of Humanities Social Sciences and Education 3(1): 20-23.

Foss-Feig JH, McPartland JC, Anticevic A, Wolf J. (2016) Re-conceptualizing ASD Within a Dimensional Framework: Positive, Negative, and Cognitive Feature Clusters. J Autism Dev Disord. 46(1): 342–351.

Grzadzinski R, Huerta M, Lord C. (2013) DSM-5 and autism spectrum disorders (ASDs): an opportunity for identifying ASD subtypes. Molecular autism 4(1): 12.

Hildebrandt MK, Koch SC, Fuchs T. (2016) "We Dance and Find Each Other"1: Effects of Dance/Movement Therapy on Negative Symptoms in Autism Spectrum Disorder. Behavioral Sciences 6(4): 24.

Ho RT, Cheung JK, Chan WC, Cheung IK, Lam LC. (2015) A 3-arm randomized controlled trial on the effects of dance movement intervention and exercises on elderly with early dementia. BMC Geriatrics 15: 127.

Hu X, Yin L, Situ M, Guo K, Yang P, Zhang M, Huang Y. (2018) Parent's impaired emotion recognition abilities are related to children's autistic symptoms in autism spectrum disorder. Neuropsychiatric Diesease and Treatment 14: 2973-2980.

Keogh JW, Kilding A, Pidgeon P, Ashley L, Gillis D. (2009) Physical benefits of dancing for healthy older adults: a review. J Aging Phys Act 17(4):479-500.

Koch SC, Mehl L, Sobanski E, Sieber M, Fuchs T. (2015) Fixing the mirrors: A feasibility study of the effects of dance movement therapy on young adults with autism spectrum disorder. Autism 19(3): 338-350.

Koehne S, Behrends A, Fairhurst MT, Dziobeck I. (2016) Fostering social cognition through an imitation-and synchronization-basead Dance/Movement Intervention in Adults with Autism Spectrum Disorder: a controlled proof-of-concept study. Psychotherapy and Psychosomatics 85(1): 27-35.

LaGasse AB. (2017) Social outcomes in children with autism spectrum disorder: a review of music therapy outcomes. Patient Related Outcome Measures 8: 23-32.

Llaneza DC, DeKule SV, Batista M, Crawley JN, Christodulu KV, Frye CA. (2010) Communication, Interventions, and Scientific Advances in Autism: A Commentary. Physiol Behav. 100(3): 268-276.

Loke YJ, Hannan AJ, Craig JM. (2015) The Role of Epigenetic Change in Autism Spectrum Disorders. Fronetiers in neurology 26(6): 107.

Malloch S, Trevarthen C. (2018) The human nature of music. Front Psychol 9:1680.

Martin LAL, Koch SC, Hirjak D, Fuchs T. (2016) Overcoming Disembodiment: The Effect of Movement Therapy on Negative Symptoms in Schizophrenia—A Multicenter Randomized Controlled Trial. Front. Psychol. 7: 483.

Mastrominico A, Fuchs T, Manders E, Steffinger L, Hirjak D, Sieber M, Thomas E, Holzinger A, Konrad A, Bopp N, Koch SC. (2018) Effects of Dance Movement Therapy on Adult Patients with Autism Spectrum Disorder: A Randomized Controlled Trial. Behavioral sciences 8(61).

Mateos-Moreno D, Atencia-Doña L. (2013) Effect of a Combined Dance/Movement and Music Therapy on Young Adults Diagnosed with Severe Autism. The Arts in Psychotherapy 465-472.

Michels K, Dubaz O, Hornthal E, Bega D. (2018) "Dance Therapy" as a psychotherapeutic movement intervention in Parkinson's disease. Complement Ther Med 40: 248-252.

Patterson KK, Wong JS, Prout EC, Brooks D. (2018) Dance for the rehabilitation of balance and gait in adults with neurological conditions other than Parkinson's disease: a systematic review. Heliyon 4(3):e00584.

Prata J, Santos SG, Almeida MI, Coelho R, Barbosa MA. (2017) Bridging Autism Spectrum Disorders and Schizophrenia through inflammation and biomarkers - pre-clinical and clinical investigations. J Neuroinflammation. 14: 179.

Rocha PA, Slade SC, Mcclelland J, Morris ME. (2017) Dance is more than therapy: Qualitative analysis on therapeutic dancing classes for Parkinson's. Complementary therapies in medicine 34: 1-9.

Rosenblatt LE, Gorantla S, Torres JA, et al. (2011) Relaxation response–based yoga improves functioning in young children with autism: a pilot study. The Journal of Alternative and Complementary Medicine 17(11): 1029–1035.

Sanchack KE, Thomas CA. (2016) Autism Spectrum Disorder: primary care principles. Am Fam Physician 94(12):972-979.

Scharoun SM, Reinders NJ, Bryden PJ, Fletcher PC. (2014) Dance/movement therapy as an intervention for children with autism spectrum disorders. Am. J. Dance Ther. 36: 209–228.

Sharon W, Goodill SW. (2018) Accumulating Evidence for Dance/Movement Therapy in Cancer Care. Frontiers in Psychology 9: 1778.

Sharp K, Hewitt J. (2014) Dance as an intervention for people with Parkinson's disease: A systematic review and meta-analysis. Neuroscience and Biobehavioral Reviews 47: 445–456.

Siniscalco D, Kannan S, Semprún-Hernández N, Eshraghi AA, Brigida AL, Antonucci N. (2018) Stem cell therapy in autism: recente insights. Dove Medical Press 11: 55-67.

Souza-Santos C, Santos JF, Azevedo-Santos I, Teixeira-Machado L. (2018) Dance and Equine-assisted therapy in autismo spectrum disorder: crossover randomized clinical trial. Clinical Neuropsychiatry 15(5): 284-290.

Teixeira-Machado L. (2015) Dance therapy in autismo: a case report. Revista Fisioterapia e Pesquisa 22(2): 205-211.

Teixeira-Machado L, Arida RM, de Jesus Mari J. (2019) Dance for neuroplasticity: A descriptive systematic review. Neurosci Biobehav Rev. 96: 232-240.

Teixeira-Machado L, Azevedo-Santos I, DeSantana JM. (2017) Dance improves functionality and psychosocial adjustment in cerebral palsy: a randomized controlled clinical trial. Am J Phys Med Rehabi. 96(6): 424-429.

Teixeira-Machado L, DeSantana JM. (2015) Dance Therapy Improves Quality of Life in Individuals with Neuromotor Disorders: Randomized Controlled Trial. International Journal of Humanities Social Sciences and Education 2(4): 84–92.

Vyas K, Jameel L, Bellesi G, Crawford S, Channon S. (2017) Derailing the trolley: everyday utilitarian judgments in groups high versus low in psychopathic traits or autistic traits. Psychiatry Research 250: 84-91.

Williams JHG, Cameron IM. (2017) The Actions and Feelings Questionnaire in Autism and Tropically Developed Adults. Journal of Autism and Developmental Disorders 47(11): 3428-3430.

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