Case report

Friedreich's Ataxia: dance and somatic education a case report

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Abstract — This research aims to determine the effects of a dance program in dialogue with somatic education in psychomotor aspects in a subject with Friedreich ataxia. We used the research method intra-subject BAB design, were phase "B" comprises the treatment phase through interventions with stimuli, and "A" the stimuli are removed. We performed a dance program with 24 interventions on a subject with Friedreich Ataxia, and assessed pre- and post-program through the Monitoring Instrument Learning in Educational Dance. The results showed that the dance program with somatic education can improve the analyzed skills: getting up, sitting, shifting feet, shifting the ground, sitting position, body image, movement rhythm, and fluency movement.

Keywords: Friedreich Ataxia, psychomotor performance, dancing.

Introduction

Studies on the interface between dance and disability were started in Brazil in the 1980s, and have intensified in the recent years[1]. Moreover, studies that emphasize physical disability have been frequently reported. Physical disabilities can be conceptualized as an impairment of the locomotor system, formed by the osteo-articular, muscular, and nervous systems. Diseases or injuries that affect any of these systems, either alone or in combination, can lead to a various physical limitations of gravity based on the affected body part and the lesion type[2].

Among the various factors that trigger physical disability, Ataxia Friedreichde, a autosomal recessive disease, characterized by progressive neurodegenerative, was first described by Nicholaus Friedreich in 1863[3,4]. Its clinical manifestations usually begin in childhood and adolescence, and 80% of cases occur before the age of 20 years[5].

Ataxia is related with weak coordination of movements, generating unsteady or ataxic gait, characterized by walking with broad steps6. In addition, with the advancement of the clinical picture, other muscular damages may arise, such as: Babinski's positive signal, muscular hypotrophy, lack of perception of the postural sense, scoliosis, dysarthria, lack of coordination of the movements and deformity of the feet, however, the cognitive is preserved [3,7]. Moreover, other comorbidities may also be associated with syndrome, such as: carbohydrate intolerance, diabetes mellitus, and heart disease[8,9].

An early process and continuous stimulation with the purpose of delaying is important from the progression of disability[10]. Psychomotor is an area that is involved in psychomotor foundations for integral development of the individual[11]. Eleven psychomotor functions can be identified: breathing, relaxation, balance, inhibitory brake, global coordination, fine motor coordination, body scheme, laterality, spatial orientation, time, and pace orientation[12].

Among the different motor activities that enable psychomotor development, dancing has been proven to be effective in improving the quality of life, enabling benefits in the physical, emotional, and social aspects[13]. In this sense, when you consider dance activities for a person with Friedreich ataxia, it ascertains that this may be a possible way to obtain a better psychomotor development, as the body work involved has artistic language.

The dance is a physical activity that promotes knowledge and various skills, and increase the cognitive development, affective and psychomotor of the people who practice it [14]. Therefore, dance can be one of the viable methods for people with Friedreich ataxia, which can enhance the aspects of development, resulting in a better quality of life.

Another theoretical and practical field for the study of the body and movement is somatic education. As demonstrated by Bolsanello[15], this method has been highlighted as a means to achieve a better body awareness.

Therefore, Somatic Education can be understood to contribute to the development of the individual with Friedreich ataxia, which will act as the main physical symptom of the disease. Moreover, the interaction between dance and Somatic Education can develop a therapeutic bias movement of the study, wherein the body is thought holistically and express the sensations and feelings, leading to greater self-knowledge and consequently, welfare in person[16].

The intervention with a dance program and Somatic Education in Cerebral Palsy patients, also characterized by a physical disability, was effective in relation to joint mobility, balance and dance elements – space, time, weight, fluency, and improvisation[17]. Thus, this program would be beneficial for a person with Friedreich ataxia, considering the similar symptoms between Cerebral Palsy and Friedreich ataxia patients.

Therefore, this study aimed to verify the effects of a dance program together with Somatic Education in psychomotor aspects in a subject with Friedreich ataxia.

Methods

This study was characterized as quasi-experimental research, using intra-subject BAB design. The design is done in stages: phase "B", which consists of a treatment phase, through stimulus alerts; the phase "A", also called baseline, in which there is a withdrawal of the stimuli and a reversal; and return to treatment (B). In the intra-subject delineation, the control is given by the subject itself, there being no groups for comparisons[18].

In this type of study, the researcher can infer about the effectiveness of the intervention, decide on the duration of the intervention and understand if there was any cause and effect relationship between the variables. It is important to point out that this type of design is indicated in cases of self-mutilation behavior and can be used with the intention of reversing unwanted preexisting behavior[19].

However, in this study, the BAB design was not adopted with the intention of eliminating a behavior, but of verifying and efficiency of a Dance and Somatic Education program in the improvement of psychomotor aspects in a student with Friedreich's Ataxia. That is, to investigate possible influences of the Dance and Somatic Education program in the evaluated aspects, comparing periods with and without intervention.

Location description

The survey was conducted in the psychomotor stimulation laboratory located in the Department of Physical Education, Universidade Federal de Viçosa (UFV) [Federal University of Viçosa]. The environment consists of a large room, lit, without noise, and has availability of materials for interventions, such as ethylene-vinyl acetate (EVA) mat, stability ball, wooden stick, elastic band, balance disc, massage /physiotherapy balls, mats, and stereo. Such materials were used during the sessions of the dance program.

Participant

The study sample consisted of a female participant who received a diagnosis of Friedreich's ataxia at age 17. Currently, she has been attending in the Psychomotor Stimulation Laboratory (LEP) of the Department of Physical Education, located at the Federal University of Viçosa (UFV), Minas Gerais. The participant uses a wheelchair for mobility, has motor experiences through swimming lessons and dance, as well as attending a physical therapist once a week at LEP. The inclusion criterion was having a diagnosis of Friedreich ataxia.

Before the beginning of the interventions, a bioimpedance test was performed to record basic information about the participant's body composition (weight: 48.5kg, height: 1.54m, age: 29 years, body mass index: 20.5 kg/m2), in addition, a medical certificate of aptitude was requested for the accomplishment of physical activities.

Procedures

LEP has been approved to conduct research by UFV 's Ethics Committee under number 094/2007; therefore, data collection began after the participant signed the informed consent.

The questionnaire – Monitoring Instrument Learning in Educational Dance (IAADE), developed and validated by Rossi19, was used for data collection. This questionnaire consists of four stages: knowing one's own body; contact with each other; the body in space; the body in motion, containing 21 questions. Each question has a score of one to five, being described as Understaffed, Regular, Good, Very Good, and Great, to represent 1, 2, 3, 4, and 5 points, respectively. The instrument was completed at the end of each class by the researcher.

Intervention procedures

The dance program, in terms of Somatic Education, comprised 24 interventions for 8 months. The sessions were held once a week, lasting 50 min each, starting on March 18 and ending on November 18, 2015. The first 11 sessions were conducted with interventions with stimuli, characterizing the treatment phase or phase B. In sessions 12, 13, and 14 the treatments were removed, characterizing the step A to experimental design. Thus, these sessions were established as baseline this study. Subsequently, the treatment phase was resumed (step B) in session 15, remaining until the end of study session 24.

Each intervention consisted of an average of three different activities, which sought to assess the issues contained in the questionnaire. These activities were prepared based on the following contents: Contemporary Dance, Belly Dance, and Techniques of Somatic Education.

The dance is characterized by intensive use of the ground, working with different forms of support and displacement, enabling the participant to experience different methods of getting around and characterizing the spatial orientation[20]. To main strengthening of muscle groups of the abdominal region, posterior region of the trunk, chest and upper limbs were used contemporary dance as twists, trunk rotation, contraction and relaxation[21], these approaches may lead to the providing greater stability and balanced trunk. During the interventions were applicate variation between slow and fast movements allows working with the pace since the introduction of different time intervals becomes possible to realize successive time[12].

The main characteristic of Belly dance is joint mobility, making it possible to achieve greater range of motion. The Belly dance is composed of dissociation movements of various body parts, such as the head, arms, torso, and hip, requiring movement control and increased body awareness[22]. This practice consists of variations of broad movements encompassing the entire body and minimalist movements involving isolated body parts, recruiting global and fine motor coordination, and body image. Similar to Contemporary Dance, the variation between fast and slow movements enables work with the rhythm and reach a better sense of body image.

Alexander technique and breathing techniques and massage were selected among the methods of Somatic Education. The

Alexander technique aims to eliminate tension and blockages caused by harmful body habits by manipulating and mobilizing the joints[23]. Hence, this technique helps in expanding joint movement and relaxation.

Because the activity consisted of deep inhaling and exhaling with the same variations of time, eg, deep inspiration for 3 s and subsequently expiration for 3 s. Another proposal was to take a deep breath and wait 3 to 5 s before exhaling. These exercises were divided in small series, varying between four and eight repetitions. To enhance muscle relaxation during these activities, the researcher asked the participants whether they feel lighter and relaxed with each exhalation, "[...] the expiration facilitates relaxation by stretching the muscles involved in the chest lock in inspiratory position", as demonstrated by Campignion[24].

With regard to the massage, the techniques used were massage therapy, self-massage, and massage with physiotherapy balls. The massage was performed in all body tracking, but each session prioritized greater accumulation of the tension region. Thus, this was a good time to release tension and self-knowledge because the student became more aware of their bones as they massaged their body, muscles, and skin by raising awareness and contact. The tone plays a fundamental role in our postural habits and is present in all movements or tasks performed. Thus, we can observe that the methods of Somatic Education can help in the psychomotor functions of breathing, relaxation, and body scheme[12].

In these contents, activities have also been inserted with the Swiss ball, widely used in the methods of Somatic Education[25], to develop balance, global coordination, laterality, spatial–temporal direction, and speed.

The sessions were referenced in studies by Barker, Campignion, Bolsanello, São José, Rossi[23, 24, 25, 21, 19]. The organization of the sessions consisted as follows: stretching and mobility exercises of the joint together with breathing followed by activities performed with the Swiss ball; then sequences of dance movements were practiced/studied, alternating between contemporary dance and belly dancing. At the end of each session, breathing exercises or massage was performed.

The relationship between the contents worked during sessions and their goals is shown in Table 1.

Table 1. Data relating to the contents worked during the dance program with their respective.

Content	Purposes
Techniques of Somatic Education: Massage, Breathing Swiss Ball, Alexander Technique	• Relaxation •Body Scheme •Tonicity •Breathing •Balance • Gross motor coordination •Laterality •Spatial orientation •Time orientation •Rhythm
Contemporary dance	•Balance •Gross motor coordination •Laterality •Spatial orientation •Time orientation •Rhythm
Belly dance	•Balance •Gross motor coordination •Fine motor coordination •Laterality •Time orientation •Rhythm

Subtitle: research data

Importantly, the LEP is located within a university environment because it follows the calendar of UFV; hence, no contact between researcher and participant occurred during the month of July, corresponding to the vacation of the school year. The period without interventions extended to August 25 due to return adjustments to activities in the LEP, with a total of 49 days.

Data analysis

When considering the objectives of this research, using only 12 of 21 IAADE issues relating to balance, joint mobility, body schema notion of laterality, rhythm, displacement in space, space levels, improvizational process and understanding term fluency was understood to be appropriate. Thus, questions related to time "contact with the other" were excluded because the questionnaire emphasizes contact with the researcher and another participant, but the classes individually happened. Questions related to space levels were excluded, considering that most of the classes were happening on the ground. In addition, when the standing participant moved, assessing the directions of the standing explored space was impossible.

Thus, the total points that could be achieved by participating in a session was 60 because the maximum score to be obtained in each issue of IAADE is 5 points, multiplied by 12, referring to the total number of questions ($5 \times 12 = 60$). The results from the IAADE were quantitatively analyzed based on descriptive statistics and presented in graphs to facilitate viewing and comparing the variation of these throughout the research.

Results

The results collected by IAADE showed changes in psychomotor aspects and dance elements analyzed (Figure 1).

A gradual increase of 43% passing score of 63% was observed during the initial phase B. After the stimuli (phase A) was removed, the scores were still noted to remain without change for two sessions, and subsequently undergoes a decrease of 5%. This change in score after withdrawal of treatment is related to the decrease in score on the elements in the sitting position, joint mobility, and displacement on the ground.

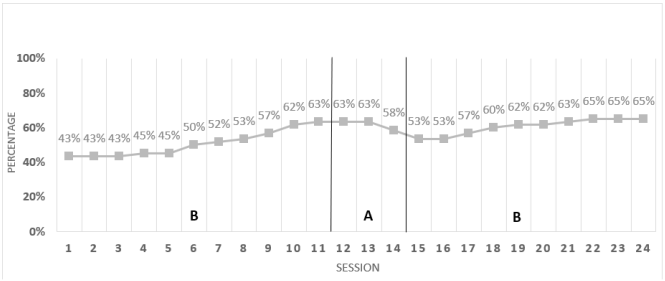

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Figure 1. Graph regarding the evolution of the second score of the participant achieved in IAADE.

In the second intervention phase (B), during sessions 15 and 16, the initial score decreased by 5% compared with session 14 (last session of phase A) and more than 10% session 11 (last session of first phase B). From session 16, gradual increases were observed in the overall score, which returns to 63% on session 21. During sessions 22, 23, and 24, the participant reaches 65% of the total score, with positive changes in all analyzed fundamentals.

For better understanding of the evolution of participant score, Table 2 shows the scores obtained in each session based on the eight abilities analyzed in the study.

Table 2. Score achieved by participating in eight skills evaluated by IAADE during each session.

Session	Variables							
	G	S	DS	DG	SP	BI	RM	FM
1	20%	20%	20%	80%	60%	80%	40%	20%
2	20%	20%	20%	80%	60%	80%	40%	20%
3	20%	20%	20%	80%	60%	80%	40%	20%
4	20%	20%	20%	80%	60%	100%	40%	20%
5	20%	20%	20%	80%	60%	100%	40%	40%
6	20%	20%	20%	80%	80%	100%	40%	40%
7	20%	20%	20%	80%	80%	100%	60%	60%
8	20%	20%	20%	80%	80%	100%	60%	60%
9	20%	20%	20%	100%	80%	100%	60%	60%
10	20%	20%	20%	100%	80%	100%	80%	80%
11	20%	20%	20%	100%	80%	100%	80%	80%
12	20%	20%	20%	100%	80%	100%	80%	80%
13	20%	20%	20%	100%	80%	100%	80%	80%
14	20%	20%	20%	80%	60%	100%	80%	80%
15	20%	20%	20%	80%	60%	100%	60%	80%
16	20%	20%	20%	80%	60%	100%	60%	80%
17	20%	20%	20%	80%	60%	100%	60%	80%
18	20%	20%	40%	80%	60%	100%	60%	80%
19	40%	40%	40%	80%	80%	100%	60%	80%
20	40%	40%	40%	80%	80%	100%	80%	80%
21	40%	40%	40%	80%	80%	100%	80%	80%
22	40%	40%	40%	80%	80%	100%	80%	80%
23	40%	40%	40%	100%	80%	100%	80%	80%
24	40%	40%	40%	100%	80%	100%	80%	80%

Subtitle. G: get up; S: sit down; DS: displacement standing; DG: displacement on the ground; SP: sitting position; BI: body image ; RM: rhythm of movement; FM: flow of movement.

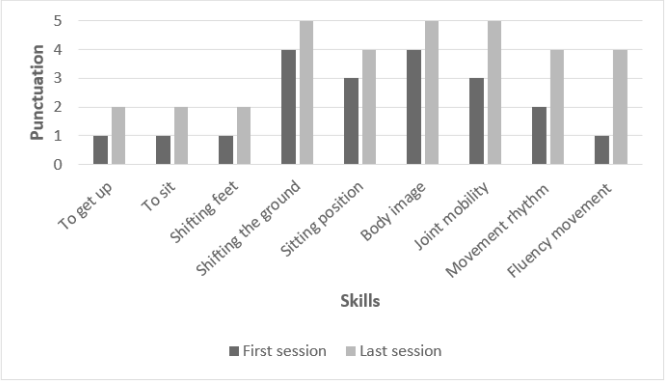
The shift ability on the floor is the first to receive an increase in the score after the start of the interventions, followed by the flow of movement as observed in Table 2. Throughout the sessions in the initial phase B, the participant gradually increases your score in all the analyzed abilities, except for three things: get up, to sit, and to scroll feet.

The displacement skills down, seated position, body structure, rate of movement, and flow of movement increased between 20% and 40% of the score during initial phase B. Between these five elements, only schematic and body movement creep maintained a constant score after the withdrawal of interventions. The other skills had a 20% decrease in the score.

After the return of interventions, the following skills increased the score: to get up, while sitting, standing displacement, displacement on the floor, sitting position, and movement rhythm. The body structure and movement creep skills were constant until session 24, at 100% and 80% of the score, respectively.

In session 24, the participant was observed to have achieved the most significant result in the ability fluency of movement, increasing from 20% to 80% of the total score. It achieves the highest score in the shifting ground skills and body schema, reaching 100% of the score. The skills had a smaller increase in rising, while sitting, and standing displacement, with a 20% increase compared with the initial score.

Although the participant has demonstrated a wobble in the evaluated elements, it is observed when compared to the initial score and end of each skill, an increase in all the fundamentals (Figure 2).



Subtitle: research data

Figure 2. Graph on the progress of the participant by pre- and post-intervention skills.

These results support the existence of positive changes in relation to psychomotor aspects and dance elements worked through Contemporary Dance, Belly Dance, and techniques of Somatic Education in a participant with Friedreich ataxia.

Discussion

Increased score in all the skills analyzed shows that dance activities are in agreement with the techniques of Somatic Education, which were effective for better development of

psychomotor functions, as well as in dance elements.

The improvement in the skills to get up, to sit, and move on foot can be related to increased self-confidence during the intervention. This can be observed before the conduct of the participant, which initially required the mother's presence at the beginning and end of the session to assist in its transfer from the floor to the wheelchair and vice versa. However, the participant asked regarding the possibility of using the fixed bar to get up from the chair and sit on the floor in recent sessions, claiming that he was safe for this experience, requiring only partial assistance of the researcher. One of the benefits provided by the dance is related to improvement on rehabilitation and self-confidence[13].

With regard to the displacement on the ground, the dance provides experimental moments and discovery where students create new physical possibilities for shifting, such as rolling and crawling, exploring different forms of support, and contacting with the ground[19]. The dance is an opportunity for improvement in displacement on the ground through the fluidity of movement, muscle control, and greater mobility through its bearings and other possibilities offered. Therefore, these studies contribute to affirm the potential of Contemporary Dance in acquiring greater ease when moving on the groun[26,27].

The Belly Dance works extensively with the abdominal muscles, particularly the oblique muscles, strengthening the muscles of the region[28]. The pre-activation of the transversus abdominis muscles and internal oblique multifidus lumbar assists in spine stability.[29] In this sense, the muscle strength of the participant can be inferred to be influenced by the dance together with the Somatic Education because greater trunk stability/balance and better posture in the sitting position were observed throughout the program dance.

With regard to postural habits, a greater understanding and awareness of anatomical aspects involves good posture, which could be observed when the participant is rearranged in a wheelchair or on the floor, correcting your posture without needing of previous instruction. Although positive points have been shown in postural habits, the participant still has a slight scoliosis, which are the characteristic symptoms of Friedreich ataxia[6].

In the body schema, the participant initially had a good understanding of the body and through the activities developed by the Dance and Somatic Education techniques, the participants acquired a better understanding of the anatomy of their body. In this sense, Bolsanello[30] said that "[...] the somatic education is a practical theoretical field that is concerned with the awareness of the body and its movement". To understand the bone structure, the center of balance, the muscles have the perception of tone in every action, which are the basic attributes for Somatic Education. The participant acquires a greater sense of body image and improved muscle tone when developing themselves, recruiting only the tone needed to perform each movement[31].

The practice of Somatic Education together with dance contributes to the achievement of greater body awareness, providing a better sense of body image. In addition, studies show improvements in body awareness, influencing self-knowledge of their possibilities and muscular functionality[19, 26,32].

With regard to the improvement in the pace of movement, the dance can promote not only a better sense of rhythm, but also a better sense of spatial organization and body scheme.[33] Some studies show that the rate can be achieved together with a greater fluidity of movement.[19, 26, 34] In this sense, the Alexander technique also presents as an effective means to acquire improvements in pace because this technique aims the release muscle and joint tension, enabling larger movements and fluidity[23].

Furthermore, significant results in relation to joint mobility and fluency are also linked to the practice of activities in the Alexander technique since a good performance in both skills are necessary to perform large joint movements, which are fluid and controlled, directly related in controlling the tone[20]. In this sense, breathing and massage activities also contributed to greater fluidity because they are primarily intended to eliminate tension.

However, despite the positive results, the following limitations were identified in the study: the long holiday period wherein the participant has been submitted due to the fact the LEP follows the calendar of the institution where it was located, the UFV; the participant simultaneously attended physiotherapy sessions in this study, making this a quasi- experimental research.

Conclusion

The Contemporary Dance activities and Belly Dance together with techniques of Somatic Education proposed in the program were effective for better development of psychomotor aspects and dance elements in a subject with Friedreich ataxia.

The participant was observed to achieve significant results evaluated in the following flow of movement skills (80%), shift on the ground (100%), and body structure (100%). However, the program has had less influence on the ability to get up, to sit, and to scroll feet, getting a 20% increase compared with the initial score. However, an increase in participant scores in all analyzed skills was noted.

Thus, these data corroborate the assumption that dance together with Somatic Education can promote benefits for an individual with Friedreich ataxia, considering that these activities seek greater knowledge of the body and its movement possibilities, respecting their specificities.

However, it is the question of the effectiveness from program to individuals with other types of disability, opening the door to new research involving the theme dance, Somatic Education, and people with disabilities.

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