Original Article

Validity of bodily-rhythmic coordination field test for obese people

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ABSTRACT

Monleón, C., Pablos, A., Carnide, F., Martín, M., Veloso, A., & Pablos, C. (2015). Validity of bodily-rhythmic coordination field test for obese people. *J. Hum. Sport Exerc., 10*(2), pp.629-637. Coordination is one of the most important skills in humans' relationship with the environment, alongside others such as endurance, strength, flexibility, and memory. However, despite there are many tools to measure these latter functional capabilities, the assessment of rhythmic coordination tests require sophisticated and expensive materials, or are specific to certain forms of dance. The purpose of this study is to show a new test for measuring rhythmic coordination in any person, in order to prove its validity and usefulness in the field of physical activity and health. Methods: Twenty women obese participants aged 50.63 ± 11.48 with body mass index (BMI) 38.61 ± 5.19 participated in this study. The test procedures were developed in a square circuit. The test was video recorded with a fixed camera for post-hoc observation purposes. A binary subdivision music track was chose (due to the simplicity beat) and the basic motor skill march was performed in which arms-legs-time musical coordination is important. Results: The results showed a moderate to good reliability and validity for the rhythmic-bodily coordination. These results show that observers had good accuracy in observing and evaluating the rhythmic-bodily coordination. Conclusion: The results obtained show that this test is presented as an objective, valid and reliable tool to assess the rhythmic-bodily coordination for people with obesity. **Keywords**: RHYTHMIC COORDINATION, TEST, OBSERVATIONAL, ASSESSMENT TOOL, OBESITY.

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INTRODUCTION

Coordination is a basic motor skill (Šebić, Sahat, Zukovic, & Lukić, 2012) decisive for the autonomy and quality of life of the general population. Regarding this, it is well known that overweight and/or obesity is associated with increased risk of limited mobility of both men and women of all ages compared to people of normal weight (Houston, Ding, Nicklas, Harris, Lee, & Nevitt, 2009), independently of lifestyle factors (Koster, Penninx, Newman, Visser, Gool, Harris, & Simonsick, 2007). Furthermore, the prevalence of overweight and obesity can result in low levels of physical activity and therefore of physical function and the onset of chronic diseases (Houston et al., 2009). Additionally, body movements are influenced by excess weight in obese people (Ranavolo, Donini, Mari, Serrao, Silvetti, Iavicoli, & Draicchio, 2013). In this sense, in the obese, low physical activity levels was associated with a significantly increased risk of mobility limitation (Koster et al., 2007).

Good dexterity and coordination has a huge impact on energy expenditure with improved kinetic chains in motion that would produce movements and gestures in a more economical and effective way. Thus, a high level of coordination is essential for the efficient performance of movements structures, their development and their successful use (Šebić et al., 2012). Besides, the rhythm has an important role in performance, as it considered as an important factor in the development, learning and performance of motor skills (Derri, Tsapakidou, Zachopoulou, & Gini, 2001). In this sense, are an increasing number of physical activity programs for obese people based on rhythmic activities (Monleón, Pablos, Carnide, Martín, & Pablos, 2014) or different types of dances (Eyigor, Karapolat, Durmaz, Ibisoglu, & Cakir, 2009; Federici, Bellagamba, & Rocchi, 2005) with the aim of combining activities with a musical basis for the work of the various capabilities who achieve to motivate participants and getting a high adherence to the program. Conversely, rhythmic ability becomes poor in elderly people due to decreased of perceptual and cognitive processes (Iannarilli, Pesce, Persichini, & Capranica, 2013). In this regard, we believe it is important to improve and maintain these processes during adulthood not only through programs which reproduce rhythmic patterns, but also incorporating rhythmic skill and body-rhythmic coordination into motor movement. In the literature, there is great diversity of tests for measuring rhythmic coordination. Most of these assessments are difficult to transfer to all fields of physical activity and sport since these tests are based on specialized populations of dancers (Šebić et al., 2012), computerized instruments (Iannarilli et al., 2013; Iannarilli, Vannozzi, Iosa, Pesce, & Capranica, 2013), or in children (Derri et al., 2001). In addition, the studies analyzed each separately (Pollatou, Karadimou, & Gerodimos, 2005). Hence, these types of measurements have limited a applicability for several reasons: (a) difficulty of access to the instrumentation, (b) high associated costs; (c) specificity of tests by dance specific and (d) do not imply movement synchronized with music. Besides, despite the importance of coordination in the quality of life of people, motor skills are less-explored (Šebić et al., 2012).

Despite the scarcity of such tests, in this paper we refer to simple tools that can be used in the field, by allowing comparability of scores in an obese population. Thereby, the aim of this study was to construct, develop and validate a new bodily-rhythm coordination test that will allow quantitative and objective assessment of body-rhythmic coordination performance amongst obese adult women. This proposed test is intended to be an inexpensive tool, easily and safely applied in the field, to assist in assessing the rhythmic activities by a professional of sport, physical activity and health.

MATERIAL AND METHODS

Participants

The sample who carried out the test was composed of 20 women obese participants aged 50.63 ± 11.48 with body mass index (BMI) 38.61 ± 5.19. Each participant, after being informed of the purpose of the study, agreed to participate and signed an informed consent. The Ethics Committee of Catholic University of Valencia approved the study.

The group of expert observers (GE) for the validation of the test was composed of 3 professionals were experts in dance and physical activity and sport who were responsible for observing and evaluating the test twice with a time difference of one week. This time is considered optimal for the GE did not remember their previous scores. The purpose of the double observation was verified the validity and reliability of the test.

Study design

This study is based on observational methodology. The design of this study has been divided into 2 main phases. The first phase is the design of the test and the design of the assessment tool, along with the criteria, variables and response options for assessment. The second phase it served to study the psychometric properties of the test for obese people. In this phase, participants completed the test and it was filmed once. Thus, the GE assessed this execution at two times, with a time difference of one week between measurements, assessing each subject independently, on the same monitor and conditions.

Test design and Procedures

The test procedures were developed in a square circuit measuring six by six meters each side. Each vertex of the square was marked by a cone. The test was performed in pairs. Each participant originated in a different vertex (opposite) and the test was video recorded with a fixed camera for post-hoc observation purposes.

Regarding the music, we chose a binary subdivision since discrimination and reproduction is easier (Iannarilli et al., 2013). The mentioned music track (San Marcial Military March) was chosen both for its speed (124 bpm) and simplicity beat (2/4) and also for the similarity of movement performed in this test.

The movement that has been used is the basic motor skill march. This movement is very similar to that used in military parades, in which arms-legs-time musical coordination is important. The selection of this movement to assess the test coordination rhythm was mainly due to the fact that all body segments are encompassed in the movement while the difficulty increased. In addition, the continuous changes of steps and direction (always to the beat of the music) would entail shifts in balance and weights, becoming evident rhythmic-bodily control.

Each participant received the same instructions in order to avoid any misunderstanding:

"Let's put a song on for 90 seconds. You have seven seconds to get into a rhythm on the site and the voice of "go" (which will be heard inside the song), shall start making the march to the beat of the music as being military, with large amplitude of both arms and legs. The coordination of arms and legs should be opposite, which is right arm above and left leg performing step. The step must be well marked and you must be bordering the cones making a square. Try to keep this cycle with the rhythm from start to finish. You must try to follow the music making the march from the beginning until the music ends. Remember that you cannot look to other participants and you may only take a try."

At the start of the acoustic stimulus marking the tempo of the movement, participants had to start marching in place. On the command "go", participants had to march out, to set the pace as a military march coordinating arms and legs (i.e. right leg with left arm) to complete 90 seconds that were timed.

Classification and observation system

For classification purposes, a coding system was developed with a template including the assessment of 3 main dimensions: rhythm, foot-tapping and coordination. Each of these dimensions had 3 items that were related to the movement performance. Rating to each dimension and item was carried out through a Likert scale: very good (4 points), intermittently (2 points) or bad performance (0 points). The GE were observed at two different times with an interval of one week. These evaluators were experts in dance and physical activity and sport.

In this way, to evaluate the rhythm dimension of each participant, the observer should mark one of the following items for each dimension: keeps the pace (refers to the constancy of rhythm throughout the 90 seconds test. The item is marked when the participant has shown to keep the beat for 90 seconds); stops when misses a beat and recovers (regarding the alternation of the participant with the rhythm, when he/she is in and out of the beat intermittently); as unable to be on the beat (that is, the participant has never been on the beat during the 90 seconds).

The items that reflected in the coordination dimension were: always keeps feet-arms coordination (this item is selected when the participant has kept arms-legs coordination correctly over the whole 90 seconds); intermittently keeps the feet-arms coordination (this item is marked when the participant is not able to keep continuous coordination, with an alternating coordination-lack of coordination); does not keep arms-legs coordination (this option is chosen when the participant is unable to coordinate arms and legs during the 90 seconds).

The foot-tapping dimension refers to whether participants marked the rhythm with vigour or not. In order to check this dimension we had the following items: cue the pulse (this item will be considered when the participant vehemently checks each step taken during the test); sets the pace intermittently (this item refers to the intermittent momentum step by participants throughout the test); the subject doesn't set the pace (those participants who do not mark the passage at any time during the development of the test).

The post-hoc evaluation was performed by three independent examiners. All examiners were instructed with an observation protocol for the test so that all of them were equipped with standards and guidelines. The Likert scale was maintained to evaluate all the dimensions. This approach allowed us to determine if the assessment form was objective, which was our main interested aim, or if, instead, the end result could be influenced by the subjectivity of the evaluators.

Data analysis

Descriptive statistics were calculated as mean values with standard deviation for normal interval data and medians or percentage for categorical data. Intraclass correlation coefficient (ICCs) was used to determine intra and interrater reliability of overall score and Kappa statistics for individual components of coordination test. The interrater reliability was determined by the comparison of three raters that performed two observations to 20 participants. This observational assessment to the specialized observer was considered as the "gold standard". The intrarater reliability was determined from within rater comparison from session 1 and 2, separated by one week.

The canonical coefficient concordance (CCC) was calculated between different expert observers in order to verify the validity of the test. These analyzes were conducted following the model of Anguera (1990), considering both the scores for each item as per dimension of the instrument.

All analysis were completed using IBM-SPSS, version 20.0 (IBM, NY, USA) except from the CCC than a data matrix was created in Microsoft Excel 2010 version of Windows software.

RESULTS

Intra-observer agreement
Table 1 presents the descriptive data in terms of percentage for the 2 observations of each observer. The data are shown for each of the three items in each dimension.

The 3 observers assessed the group with a score of "4", i.e., with good Rhythm (more than 52%). In the same way, for the Coordination dimension, all observers evaluated the group of obese people with good coordination (over 60%) among the two observations. Conversely, the Foot-Tapping dimension presented more controversy.

Table 1. Percentage of each observer for the first and the second observation items

		OBS 1		OBS 2		OBS 3	
		pre	post	pre	post	pre	post
Rhythm dimension	0	0	4	8	8	8	8
	2	32	24	28	44	24	24
	4	68	72	64	48	68	68
Foot-Tapping dimension	0	32	20	28	12	32	36
	2	32	36	32	44	28	24
	4	36	44	40	44	40	40
Coordination dimension	0	4	4	12	4	4	4
	2	32	4	16	20	24	20
	4	64	92	72	76	72	76

OBS 1: Observer 1; OBS 2: Observer 2; R OBS: Reference observer.

Agreement arrived at by consensus
Relative to content validity was calculated the CCC between 3 expert observers. A final test concordance 67.76% was obtained.

Intra-observer agreement
The results of the Kappa values show that there is an intra-observer agreement Substantial-Almost Perfect, especially for reference observer (more than .901) for all the dimensions. For the examiner 2 Moderate to Substantial agreement was obtained for three dimensions. However, the same was not observed for examiner 1, for which the agreements were Fair-Moderate for rhythm and coordination dimensions (Table 2).

Table 2. Analysis of variance for determining intra-observer reliability for 3 dimension and calculate percentage agreement using the Kappa index

	RHYTHM DIMENSION	FOOT-TAPPING DIMENSION	COORDINATION DIMENSION
Observer 1	.354	.697*	.294
Observer 2	.716*	.507*	.615*
Referent Observer	1.000***	.939*	.901**

*=range .41 to .80 (Moderate to Substantial agreement).

**=range .81 to .99 (Almost Perfect agreement).

***= 1 (Perfect agreement).

Inter-observer agreement

The analysis of the first observation regarding to the reference observer shows a Moderate agreement (.593) to the Rhythm dimension for the observer 2. A fair agreement was obtained by observer 1.

Regarding Foot-tapping dimension, observers were in the range of Moderate to Almost Perfect agreement (.455 to .819). Finally, for the coordination dimension, Substantial – Almost Perfect agreement were obtained for observers 1 and 2.

Therefore, all observers showed generally a good agreement with inter-observer with regard to reference observer (Table 3).

Table 3. Analysis of variance table for determining inter-observer reliability was performed relative to an observer reference, specializing in dance and physical activity, using the Kappa index for first observation

	RHYTHM DIMENSION	FOOT-TAPING DIMENSION	COORDINATION DIMENSION
Observer 1-R	.392	.819**	.826**
Observer 2-R	.593*	.455*	.635*

R = reference observer.

*= range .41 to .80 (Moderate to Substantial agreement).

**= range .81 to .99 (Almost Perfect agreement).

The analysis of the second observations regarding to the reference observer shows an agreement increase for all three dimensions (Table 4). In the same way as the first observation all observers showed generally a good agreement with regard to reference observer.

Table 4. Analysis of variance table for determining inter-observer reliability was performed to an observer reference, specializing in dance and physical activity, using the Kappa index for second observation

	RHYTHM DIMENSION	FOOT-TAPPING DIMENSION	COORDINATION DIMENSION
Observer 1-R	.466*	.700*	.451*
Observer 2-R	.501*	.467*	.790*

R = reference observer.

*= range .41 to .80 (Moderate to Substantial agreement).

**= range .81 to .99 (Almost Perfect agreement).

***= 1 (Perfect agreement).

Intraclass correlation coefficient

The results obtained for the ICC inter-observer among 3 observers for each evaluation, shows a very good agreement in both the first (.837) and the second observation (.861) between the 3 observers. These data suggest that, when the participant is globally evaluated and compared by the inter-observer, the agreement has great significance in the 2 observation times represented by the Cronbach alpha.

DISCUSION

To the present study is intended to provide a simple tool applied in the field which measures the bodily-rhythmic coordination in obese women. The relevance of the test here presented lies in the importance of coordination as a skill in human relationship with the environment. Besides, the influence of excess weight on the movements in people with obesity is highlighted (Ranavolo et al., 2013).

To our knowledge, this is the first study that aims to validate a bodily-rhythmic coordination test, specifically in obese population. Study results prove moderate to good reliability and validity for the rhythmic-bodily coordination. Results to all observers were similar regarding "gold standard" observer. Thereby, these results show that observers had good accuracy in observing and evaluating the rhythmic-bodily coordination.

Furthermore, measuring instruments should have features such as feasibility, reliability and validity (Nebot, Pablos, Elvira, Guzmán, Drehmer, & Pablos, 2015). These features have been analyzed for validation of this field test.

Thus, this study is presented as a useful test in the obese population evaluating their bodily-rhythmic coordination, highlighting their employability as it is done in the field without sophisticated instruments. In this sense, this instrument represents a new tool as well as an important step for the measurement of this ability to professionals in the field of physical activity and health. This is shown by the high concordance and agreement between the 3 observers following the Clinical significance by Viera & Garrett (2005) regarding Kappa statistics, in which a score of 1 represents Perfect agreement, .81-.99 is Almost Perfect agreement, .61 to .80 Substantial agreement, .41-.60 Moderate agreement, .21-.40 Fair agreement, .01 to .20 Slight agreement and 0 is less than chance agreement. Moreover, for ICC cut-off values it were used those defined by Szklo & Nieto (2000), being poor for an ICC bellow to 0.50, moderate for 0.50-0.75 and good for 0.75 or higher.

The importance of tests like the one presented here resides, on the need to encourage obese people to be physically active because (D'Hondt, Deforche, Vaeyens, Vandorpe, Vandendriessche, Pion, & Lenoir, 2011), as suggested by their data, those participants with overweight and obesity mainly, had worse gross motor coordination compared to their peers with healthy weight. Thus, high levels of skill coordination are essential for the efficient performance of the structures of movement (Šebić et al., 2012). Thus, Iannarilli et al. (2013) suggest that training can help counteract, at the same time, the trend of decrease in the rhythmic reproduction ability caused by dimensions such as aging.

Thereby, this test is an easy and safe tool to assess the rhythmic coordination in obese people. Nevertheless, an important issue to consider is the lack of generalization of testing for all individuals and not just for obese people. With this instrument, a score of rhythmic-bodily coordination is provided combining the 3 evaluated dimensions. More studies are needed in this direction with different populations to understand the role of the rhythmic-bodily coordination in functionality and mobility of people. Likewise, despite the high agreement and reliability of the test, there is great difficulty in comparing our results with similar studies. In contrast, the strength of this study was the participation of obese people in the test that implies physical movement.

CONCLUSIONS

Bodily-rhythmic coordination field test is presented as an objective, valid and reliable tool for adult people with obesity. This type of test may provide information about the mobility and functionality of obese people from an improved bodily-rhythmic coordination demonstrated by scores of validity, reliability and internal consistency of the instrument for this obese population. From the results it appears the usefulness in field studies. However, we believe that more research concerning this issue is needed to verify the impact on health and mobility.

CONFLICT OF INTEREST

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