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Validity and reliability of a test battery for assessment of functional capacity in adults Down syndrome

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ABSTRACT
Background: People with Down syndrome (DS) have reduced functional capacity (FC) due to physical and intellectual characteristics arising from the syndrome. The battery of tests proposed in this study will provide scholars in the area with a tool for evaluating and correctly prescribing training to improve the autonomy and independence of individuals with DS. **Objectifs**: This study aimed to verify the content validity and reliability of a battery of tests created to assess FC in adults with DS. **Methods:** The battery tests include walking 10 meters, Time up and go, unipodal support, sitting and rising from a chair, getting up from the ground, wearing a shirt and the breakfast test, in addition to the variables of body mass and height. Content validity was stipulated by the evaluation of six judges and reliability was verified intra-rater and inter-rater. Content validity index (CVI) and intraclass correlation index (ICC) were used to verify reliability. **Results:** Forty-one people with DS participated in the reliability stage, aged between 18 and 59 years (mean 30.41 and σ +-10.41), average body mass of 68.57 kg (σ +-17.18) and average height of 1.52m (σ +-0.09). A CVI of 0.95 was observed for the battery of tests. In relation to the intra-evaluator ICC, all values above 0.83 were found and inter-rater values were above 0.75, with the exception of the wearing a shirt test (ICC=0). **Conclusions:** The battery created is one of the first proposals to evaluate the FC of people with DS and presents content validity and reliability for the evaluation of people with DS.

Keywords: Validity; reliability; functionality; Down's syndrome; performance.

BACKGROUND

Down syndrome (DS) is the most prevalent chromosomal cause of intellectual disability (ID)(1). The characteristics of this population include heart problems, a high degree of obesity and musculoskeletal deficits that limit their ability to perform daily activities, in addition to an 80% increased risk of developing Alzheimer's disease at age 65(2).

In the current context, most of these conditions are treatable, a fact that contributed to the increase in life expectancy of people with DS, reaching 60 years of age(3). However, it is necessary that the aging process happens with quality of life. In this sense, a good functional capacity (FC) is essential for the individual with DS.

In general, FC is defined as the ability to perform basic and complex daily routine tasks necessary for an independent and autonomous life in society. FC is related to physical, cognitive and emotional aspects of the individual(4).

Few studies have evaluated FC in adult individuals with DS(5) and an even smaller number have evaluated the validity and reliability of tests used for this purpose, since most of the instruments used in this type of evaluation were developed for elderly populations and do not mention applicability in people with DS and other disabilities(6,7).

Thus, the lack of validated instruments for the motor assessment of FC in people with DS leads to a gap, especially for professionals and scholars in the field of physical education, occupational therapy and physical therapy(8,3).

The adequacy of a specific instrument for the assessment of people with DS becomes necessary, due to cognitive (different degrees of intellectual disability) and physical limitations, such as reduced balance patterns, muscle hypotonia, ligament laxity, changes in gait and obesity as which are not usually characteristic of people without SD(5,3).

The proper measurement of FC will optimize the prescription of physical exercises and occupational treatments aimed at improving FC and, consequently, will improve the quality of life and autonomy of this population. Given the above, the objective of this study is to verify the content validity and reliability of a battery of motor tests to assess the functional capacity of adults with DS.

METHODS

Sample

The study included 41 people with DS aged between 18 and 59 years (mean 30.41 (σ=10.41)) residents of the city of Pelotas-RS and six experts in physical education and disability who were invited to participate as volunteers in the research at the content validity stage.

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The selection of the main sample (people with DS) was carried out in an intentional non-probabilistic way, where all interested parties and guests who met the inclusion criteria and were accepted to be part of the study were included.

Based on population information, it is estimated that the number of participants in the sample is equivalent to 15.41% of the total number of people with DS in the city of Pelotas-RS9. A sample error margin of 12% is considered in this study with estimated confidence of 90% (calculation made on the Survey Monkey website - https://pt.surveymonkey.com/).

Individuals who: had a medical diagnosis of DS were included in the study; were 18 years of age or older; they wished to be part of the study; they had no restrictions on the practice of physical activity; and had no other disability besides DS.

The subjects were recruited from special schools, associations, and inclusive projects aimed at caring for people with disabilities and/or DS. In addition, online dissemination was carried out on social networks with the use of inviting and explanatory images and videos about the research. Invitations, contacts, and authorizations for inclusion and participation in the study were made through the legal guardians, via proxy. No participant was excluded from the sample

Procedures for preparing the battery of tests

The elaboration of the battery of tests was carried out in three phases: proposal of the battery (choice of tests); content validation; and verification of test reliability. The choice of tests was made based on a literature review conducted by the author. Thus, the most evaluated and verified functional capacity items in people with DS were listed. Tests considered easy to understand, easy to apply, and with little need for materials were selected. It is important to emphasize that most of the tests selected have their originality in the elderly population due to their high use and scarcity of tests created for people with DS. Thus, these tests are selected, adapted, and standardized for better applicability in the population studied.

Battery test

The battery consists of the seven tests described below:

• Test walking 10 meters (TW10m); selected to evaluate gait speed10. The test consists of walking a distance of 10 meters in the shortest possible time without running. It is measured by the time in seconds to perform the task. Walk analysis is important in verifying simple detachment tasks including short runs.

• Timed up and go (TUG) with adaptations; this test assesses mobility and functional agility11, consisting of getting up from a chair, walking to a cone placed three meters ahead, going around the cone, returning to the chair, and sitting down again in the shortest possible time. The result is measured in seconds. In its original version, this test uses a chair with a 46 cm high seat with armrests; in this study, a 40 cm chair (school type) without arms was used. Seat size was reduced due to the average height of people with DS being smaller than that of the general population12. Tests such as the TUG are important because they identify difficulties in performing activities with sudden changes in direction and/or performing combined daily tasks.

• Test unimodal support (TAU); the purpose of this test is to assess static balance on one leg6. The test consists of staying on the leg preferably for as long as possible, the maximum time being 10 seconds. Balance tests are important for preventing falls.

• Chair sit-up tests (CST); are intended to assess the strength of the lower limbs13. The test consists of getting up from the chair, with arms crossed in front of the chest, as many times as possible in 30 seconds. The same chair used in the Time Up end Go is used for the application of this test. The importance of evaluating the strength of the lower limbs is related to the daily activities of sitting and standing, standing, squatting, and moving, among others.

• Ground lift test (GLT); selected to verify the individual's ability to go from a lying position (ventral decubitus) to a standing position14. The test consists of acting like getting up in the shortest possible time. The result is measured in seconds. The importance of this test is linked to the performance of a basic daily task and, in addition, it is influenced by abdominal strength, lower limb strength, and the mobility itself to perform the task.

• Test wearing a t-shirt (TWS) with adaptation; evaluate the functionality of the upper limbs15. The execution of the test consists of putting on and taking off a shirt in the shortest possible time and its measurement is done in seconds. The original test uses only one large T-shirt size; in this study, the T-shirt size was used according to the appropriate size for the individual.

Sleeveless t-shirts of sizes S, M, L, and XL were used. The CVT is important because it measures the ability to put on a piece of clothing since getting dressed is one of the most complex daily activities necessary for functional independence.

• Test breakfast (TB); was created to verify the manual dexterity and control of objects related to the preparation of a meal. The test consists of uncapping a glass (with thread), serving a cup with three teaspoons of sand, and serving glass with 200ml of water. Like TVC, this test is important because it is related to an important daily task for functional independence. In addition, it relates to different ways of handling and controlling objects.

To obtain a final result for the battery, a total FC score (sCF) was created. The sCF is a measure created specifically for this study as a way to obtain a single variable that reflects the general CF of each subject. The sCF calculation consists of the sum of the results of all tests, converting the TSLC into time (instead of the number of repetitions) and the TAU into an inversely proportional measure (the shorter the time, the better the test result). Therefore, the sCF is calculated from the formula below, where 10 is the maximum time for executing the TAU and 30 is the time constant for performing the repetitions in the TSLC: sCF= TC10m + TUG + (10-TAU) + (30/TSLC) + TLS + TVC + TCM

Content validity

Content validity was determined through the assessment of the tests by six specialists in the field of disability and physical education, according to the suggestions of Polit and Beck16. The judges analyzed the battery of tests by filling out a form to assess the items of understanding, feasibility, the relationship with FC (effectiveness), and the applicability of the tests in people with DS. For each item, a rating from one (highest rating) to four (lowest rating) was assigned.

The CVI values were calculated from the sum of the number of relevant answers (values 1 and 2) divided by the total number of judges. The total IVCi of each test was calculated from the average of the IVCi values of understanding, feasibility, effectiveness, and applicability. The CVI calculation corresponds to the sum of the CVI divided by the number of items in the battery, that is, seven.

In addition to the IVC assessment, the battery of tests was adapted and revised according to the guidelines and suggestions of the evaluators. The validity

of an instrument refers to how much a test measures what it intends to measure, that is, it is the ability of an instrument to accurately measure the phenomenon to be studied17.

Reliability

To assess reliability, the intra-evaluator evaluation method (test-retest) was used to identify the reliability of the instruments, while the inter-evaluator evaluation aimed to identify their objectivity.

The battery was applied simultaneously by two evaluators (a responsible researcher and a trained evaluator) who had no contact with each other during the collections. The assessments were performed on the same subjects with an interval of 30 to 45 minutes between them. Two people were scheduled per time and the evaluation was performed simultaneously by the two evaluators. After the first measurement, an interval of 30 minutes was given and the evaluators changed subjects among themselves, thus making a cross-assessment of the participants. The battery was reapplied after seven days, in the same subjects, only with the responsible researcher.

Reliability is the ability of a test to reproduce a result consistently in a given time with the same evaluator in the same people (reliability or reproducibility) or with different observers (objectivity)17. The methods used in this study are consistent with other studies carried out in the area for validation purposes14.

The tests were applied in the gymnasium of the Escola Superior de Educação Física, Universidade Federal de Pelotas. Assessments and reassessments were always carried out at the same times and places, thus avoiding possible interference from external factors.

Data Collection

A semi-structured questionnaire was used to verify sociodemographic data, SD information, and shirt size, which was answered by proxy.

In addition, the volunteers were weighed and measured simultaneously with the application of the tests. For this, a G-Tech digital scale was used for personal use, model Glass 10, with a maximum capacity of 150 kg. To measure height, an inverted metallic tape measure was used (zero value pointed down) glued to the wall one meter from the ground. The individual was asked to keep the head and heels touching the wall and the body erects during the height assessment. Subjects should wear light, comfortable clothing and be barefoot.

Based on the body mass and height, the BMI variable was created and its classification followed the guidelines suggested by the World Health Organization (WHO)[18].

Data analysis

For data analysis, in the content validity phase, descriptive statistics (absolute and relative frequencies) and the content validity index (CVI) method were used. For the battery to be judged as having excellent content validity, it should achieve a CVI of at least 0.80 and a content validity index per item or test (IVCi) of at least 0.75 16.

The degree of reliability was verified using the intraclass correlation coefficient (ICC) in all tests individually. The analysis was performed intra-rater and inter-rater. The ICC was interpreted as being very low (≤0.25), low (0.26–0.49), moderate (0.50–0.69), high (0.7–0.89), and very high (0.9–1.0)19.

A significance level of 5% was adopted and the data were entered into Excel and processed in the SPSS 22 program.

Ethical procedures

All legal guardians read and signed the Free and Informed Consent Term (FICT) for the person with DS to participate in the study. The project was approved by the Ethics Committee in Research Involving Human Beings of the Escola Superior de Educação Física, Universidade Federal de Pelotas, through opinion number 1,465,643.

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RESULTS

Content validity

Six judges were selected for their connection and knowledge of the topic of physical education and disability. Among the judges, one was a man and five were women, all were permanent professors at federal universities, two had post-doctoral degrees and four had doctorates, and had more than 9 years of experience in the area (average of 28.33 years (σ). =11.77)).

Table 1 presents the general assessment of the battery of tests in the four classification levels analyzed by the judges in the content validation stage. This assessment refers to the understanding, feasibility, effectiveness, and applicability of the tests.

Classification three, which suggests alteration or exclusion of the test, was attributed by two evaluators and referred to the understanding of the breakfast test (BCT) and the unimodal support test (TAU) and the feasibility of the breakfast test and the test wear t-shirt.

It can be seen that only one judge assigned a rating of four (negative) to the efficiency of the 10-meter walk test. These tests were revised and changed according to the judges' suggestions and kept in the battery.

Table 1. Judges' assessment regarding the comprehension, feasibility, effectiveness, and applicability of the test battery for evaluating functional capacity (FC) in individuals with Down syndrome.

	Class.1	Class.2	Class.3	Class.4
	% (n)	% (n)	% (n)	% (n)
Evaluator 1	66,7 (24)	22,2 (8)	8,3 (3)	2,8 (1)
Evaluator 2	72,2 (26)	27,8 (10)	-	-
Evaluator 3	77,8 (28)	22,2 (8)	-	-
Evaluator 4	69,4 (25)	30,6 (11)	-	-
Evaluator 5	100 (36)	-	-	-
Evaluator 6	2,8 (1)	91,7 (33)	5,6 (2)	-

*Note: Class: classification of tests by levels, with 1 being the highest evaluation and 4 being the lowest evaluation.

Table 2 presents the results found for IVCi and the total value of the tests, as well as the total IVC of the battery. It can be seen that all tests presented a value of IVCi greater than 0.87, the minimum value defined for the permanence of the tests was 0.75. In this way, all tests remained on the battery.

About the total values of CVI for the battery of tests, an index of 0.95 was obtained; thus, it is understood that the battery has a content validity above the acceptable level (IVC equal to or greater than 0.80).

Table 2. Item Content Validity Index (IVCi) and Total Content Validity Index (IVC) of the test battery for evaluating functional capacity in adults with Down syndrome

Test	Comprehension IVCi	Feasibility IVCi	Effectiveness IVC	Applicability IVCi	Total
TW10m	1	1	0,83	1	0,95
TUG	1	1	1	1	1
TUS	0,83	1	1	1	0,95
CST	1	1	1	1	1
GLT	1	1	1	1	1
TWS	1	0,83	1	0,83	0,91
TB	0,83	0,83	1	0,83	0,87
Battery	-	-	-	-	0,95IVC

***Note:** TC10m Try walking 10 meters. TUG Test and done. TAU Unileg support test. TSLC Test Sit Up from Chair. TLS Test lift off the ground. TCM Breakfast Test.

Table 3. Characterization of individuals with Down syndrome who participated in the sample according to age, biometric data, and functional capacity score (sFC).

Variable	Mean ± σ	Median (IQR)	95% CI
Age (years)	30,41+-10,41	29 (17)	27,13 – 33,70
Body mass (kg)	68,57+-17,18	68,20 (21,50)	63,20 – 74,00
Height (cm)	1,52+-0,09	1,54 (0,17)	1,49 – 1,55
Body Mass Index (BMI) (kg/m²)	28,76+-6,51	27,98 (8,08)	26,67 – 30,84
sCF	81,48+-24,29	79,18 (89,46)	41,51 – 135,02

***Note:** σ standard deviation. BMI body mass index. 95% CI 95% confidence interval.

Table 4 describes the results about the verification of the reliability of the tests based on the results of the evaluation of the first and second days of data collection.

Table 4. Descriptive analysis of intra-rater evaluation results (reliability) conducted in individuals with Down syndrome with a seven-day interval.

	Median (IQR)	Mean ± SD	95% CI	Standard Error
TW10m (sec) – day 1	5,96 (1,29)	6,21+-1,13	5,84 – 6,59	0,18
TW10m (sec) – day 2	5,95 (1,49)	6,32+-1,33	5,88 – 6,77	0,21
TUG (sec) – day 1	7,58 (2,89)	8,39+-1,90	7,76 – 9,03	0,31
TUG (sec) – day 2	7,64 (3,32)	8,31+-2,31	7,54 – 9,08	0,37
TUS (sec) – day 1	3,21 (8,22)	4,65+-3,68	3,45 – 5,84	0,58
TUS (sec) – day 2	3,32 (8,11)	4,95+-3,86	3,69 – 6,20	0,61
CST (rep) – day 1	12 (4)	10,94+-2,65	10,94 – 11,83	0,43
CST (rep) – day 2	11 (5)	10,54+-2,68	9,65 – 11,44	0,44
GLT (sec) – day 1	3,18 (1,63)	3,53+-1,67	2,97 – 4,09	0,27
GLT (sec) – day 2	3,04 (1,73)	3,70+-1,84	3,08 – 4,31	0,30
TWS (sec) – day 1	21,68 (14,26)	22,97+-8,34	20,19 – 25,76	1,37
TWS (sec) – day 2	18,63 (13,23)	22,12+-8,83	19,19 – 25,08	1,45
TB (sec) – day 1	27,76 (24,09)	32,56+-13,01	28,23 – 36,90	2,13
TB (sec) – day 2	28,09 (18,11)	30,07+-13,17	26,31 – 35,09	2,16

***Note:** TC10m test walk 10 meters. TUG time up and go. TAU single leg support test. TSLC sit-to-stand test. TLS chair stand test. TVC test wear shirt. TCM breakfast test. sec seconds. Rep Number of repetitions. SD standard deviation. CI confidence interval. IQ interquartile range.

Reliability

In the reliability verification stage, 41 people with DS participated in the study, where the majority (53.7% (n=22)) were male and the age ranged from 18 to 59 years. The characterization of people with DS is presented in Table 3.

Regarding the classification of the body mass index (BMI) of the participants, the majority (41.5%; n=17) were in a situation of obesity grade I, II, or III, 31.7% (n=13) were classified overweight, and 26.8% (n=11) with normal weight.

Table 5 presents the results found through the analysis of the intra-class correlation coefficient (ICC) intra-rater and inter-rater. Note that the intra-evaluator method has an ICC equal toor greater than 0.75 in all tests, which suggests an excellent correlation. However, in the inter-rater evaluation method, it is noted that the TVC was below the expected value (ICC<0.75), so a correlation considered weak inter-rater was verified, with values of ICC<0.001 and p=0.49, a fact which portrays a total lack of agreement between the research evaluators in the application of this test.

Table 5. Intraclass correlation coefficient (ICC) intra-rater and inter-rater of functional capacity assessment tests in individuals with Down syndrome.

Variable	Intrarater ICC	p	Inter-rater ICC	P
TW10m (sec)	0,85**	<0,001*	0,84**	<0,001*
TUG (sec)	0,93**	<0,001*	0,91**	<0,001*
TUG (sec)	0,84**	<0,001*	0,75**	<0,001*
CST (rep)	0,84**	<0,001*	0,84**	<0,001*
GLT (sec)	0,93**	<0,001*	0,92**	<0,001*
TWS (sec)	0,84**	<0,001*	0,00	0,49
TB (sec)	0,83**	<0,001*	0,83**	<0,001*

***Note:** TC10m: 10-meter walk test. TUG: time up and go. TAU: unipedal support test. TSLC: chair sit-to-stand test. TLS: chair lift test. TVC: t-shirt wearing test. TCM: breakfast test. Sec: seconds. Rep: Number of repetitions. P: p-value of ICC. *: statistically significant p-values. **: ICC values greater than or equal to 0.75.

DISCUSSION

This study showed content validity and high reliability in almost all tests, so this battery becomes valid and reliable for the assessment of FC in adults with DS, in addition to being simple, easy, fast, and low cost.

The literature presents few studies that assess the FC of adults with DS in general6, 20, 5, 21.

Validated instruments to assess these parameters in people with DS are rare. To the best of our knowledge, this is the first study to create and validate a battery of tests aimed at assessing FC in this population. However, Boer and Moss6 performed a similar study.

They verified the reliability of 12 tests of functional fitness in adults with DS, three of the 12 tests verified by them are part of the battery created in this study. However, the battery of tests created here differs from the study by Boer and Moss6, as in addition to verifying the reliability of tests already used to verify FC, the tests were selected and adapted (when necessary) for people with DS.

Recently, there has been a concern in the scientific community regarding validated instruments for people with ID. Some batteries of tests that assess physical fitness have been adapted and validated, as is the case with FUNFitness22. It is worth mentioning that this instrument is validated to assess the physical fitness of people with ID without distinguishing people with DS. Also, about physical fitness, recently Cabeza-Ruiz et al.23 created the SAMU-DISFIT, a battery of specific tests to assess the physical fitness of adults with DS, which includes six physical tests and assessment of body composition.

In this study, in addition to anthropometric indicators, seven assessment tests of FC were selected. As described in the materials and methods section, two tests were adapted for better applicability in people with DS, one test was created and four were used according to the original protocols, as they were considered adequate and applicable in people with DS without prejudice.

Regarding the tests, TAU, TSLC, and TUG are the only ones that have already been tested for reliability in people with SD6,7. Regarding the TAU, Boer and Moss6 verified the reliability of the test and found ICC values of 0.98 in the left leg and 0.93 in the right leg. Villamont et al7 also verified the reliability of the test, however, the authors do not present the ICC results, claiming that they did not find significant values or that it was not possible to calculate the ICC. This study showed high intra and inter-evaluator correlation values (ICC 0.84 and 0.75 respectively), in addition, it is considered an important test for the prevention of falls about FC.

The ICC values found for the TSLC were also considered high in the center and inter-rater assessment (ICC 0.84 in both cases). Boer and Moss6 found ICC values of 0.94 for the sit-and-stand test. In turn, Cabeza-Ruiz et al23 verified the reliability of a test, named TST, which consists of performing the greatest number of squats in 10 seconds, without using a chair. The authors found an ICC of 0.80 and viability in 97.3% of the cases. Lower limb strength tests are important for the assessment of FC and are related to the performance of several essential daily activities for human life, such as climbing stairs, stairs, sitting, and getting up.

The reliability of the TUG was the most verified in the literature6,7,23. There is no doubt that the TUG is an important test for the assessment of FC and is also used to assess physical fitness. The test assesses dynamic balance and agility, important factors in performing tasks such as performing rapid speed changes, performing a sequence of diversified activities, and preventing falls.

This study showed that even with the chair adaptations, the reliability of the TUG was considered very high for intra- and inter-evaluators (ICC 0.93-0.91). Recently, Cabeza-Ruiz et al.23 verified the reliability of the TUG in the SAMU-DISFIT battery and found ICC equal to 0.89. The authors also report that direct information, such as “do this as quickly as possible”, is important for better test execution in people with ID and compare this information to the command used by Villamont7 which uses the command “use the comfortable speed” for test execution, this command can make it difficult to understand when performing the test. For the current study, the same command used by Cabeza-Ruiz et al.23 was used, as it was also considered more effective for understanding people with ID. Boer and Moss6, as in this study, also found very high reliability in the test in people with DS (ICC 0.94). Villamont et al.7 showed little reliability in the ICC values (0.22-0.24). This study had a reasonably small sample (21 individuals) and great variability in the age group (5 to 31 years), a fact that may contribute to low reliability.

Regarding the 10mWT, the TLS, and the TVC, no studies were found that evaluated the reliability in people with DS. Regarding the applicability of the 10mWT in people with DS, some authors used the test to assess physical fitness24,25. In this study, the application of the 10mWT was used to assess the ability to walk and the maximum gait speed is an important factor of FC.

The TLS was used by Silveira3 to assess the FC of people with DS and no other studies were found that used the same test or similar tests in the literature. The ability to get up from the floor requires abdominal strength and joint mobility, a fact that makes tests like these important in the assessment of FC, in addition to being simple, practical, and direct.

The TVC was used for the first time in people with DS. To the best of our knowledge, this test has not been performed previously in other studies. The TVC is a test created and performed so far on the elderly15. The choice to include this test in the battery was due to its direct connection with the ability to wear a piece of clothing whose relationship with FC is indisputable. However, although the ICC values were high intra-rater (0.84), there was no inter-rater relationship and the correlation was not significant. It is believed that an error in the inter-evaluator evaluation method may have been the cause of this result. New studies should be carried out controlling the use of the same T-shirt size by the two evaluators.

The TCM was created specifically for this battery and in addition to showing high reliability, it showed content validity and effectiveness to assess FC in people with DS. The test depicts simple tasks related to preparing a simple meal such as breakfast.

It is important to clarify the reason for the lack of tests that assess the flexibility of the proposed battery. Flexibility, despite being fundamental for FC, may not faithfully portray this ability in people with DS due to ligament laxity present in about 61.2% of the population with people with DS, making them hyperflexible26. Marques1, also chose to withdraw the flexibility test from ProDown (a battery of tests that assess physical fitness in children and adolescents with DS) for the same reasons.

Regarding the limitations of the study, the fact of performing the tests on the same day with an interval of 30-45 minutes between them may have been a limitation of the study. However, since the tests do not present great demands from a physiological point of view, it is believed that this motive may not interfere in the reduction of the reliability of the tests, but it may have an impact on memory and learning, facilitating the execution in the second evaluation of the same.

It is also understood that it is necessary to carry out a population study so that it is possible to create a normative classification of FC for individuals with DS stratified by sex and age.

This instrument will be an important tool in the assessment of people with DS, offering support for the development of physical exercise and occupational therapy programs. In addition, the proposed tests are simple and quick to apply, using accessible materials, making the battery easy to apply in small places with few resources. In this way, they can be developed in schools and public and private institutions, thus favoring the work of professionals and scholars in the area.

CONCLUSION

The instrument proposed in this study has content validity (CVI and IVCi) and reliability (intra- and inter-evaluators) in all tests, except the TVC, which did not show inter-evaluator reliability. It is understood, therefore, that the evaluation of FC from the use of this instrument will bring the academic community and professionals in the area a planned, applicable, structured, and validated option for people with DS.
The evaluation protocol is available at https://encurtador.com.br/ (withdrawn due to author identification).

Authors' contribution: JRS, GGS, ACM contributed to the elaboration of the design of the study; JRS, GGS, ACM development of the study and data acquisition. JRS, GGS, ACM contributed to article design and data tabulation. JRS, GGS, ACM contributed to the critical review, correction and approval of the final version.

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