The Weighting of Balance Disorders in Subjects at Risk of Falling Performed by Kinesiologists in Argentina. Cross-Sectional, Survey-Type Study

Gerardo Candoni[1], Fernando D'Andrea[2], Mariela Ricciardelli[3] and Daniel García[4]

1. Servicio de Kinesiología. Hospital de Rehabilitación Manuel Rocca. Buenos Aires, Argentina
2. Carrera de Kinesiología. Universidad de Buenos Aires. Buenos Aires, Argentina
3. Servicio de Kinesiología, Hospital Teodoro J. Schestakow. Mendoza, Argentina
4. Servicio de Kinesiología. Hospital Municipal Dr. Bernardo Houssay. Buenos Aires, Argentina

ABSTRACT

Introduction: Falls are unintentional events that result in losing balance and hitting the body on the ground or another firm surface that stops it. An objective and instrumented gait and balance analysis is an excellent tool for estimating the risk of falls in patients. Our objective was to describe how physical therapists in Argentina weigh balance impairment in the context of neurorehabilitation, vestibular rehabilitation, and older adults. To identify the barriers and facilitators self-perceived by the physical therapists that make it difficult/easy to carry out the weighting of balance impairments.

Methods: We conducted an observational, descriptive, cross-sectional survey-type study. We used the recommendations given by the Checklist for Reporting of Survey Studies. The survey was addressed to all physical therapists in Argentina who work in neurorehabilitation, vestibular rehabilitation, and older adults.

Results: 204 Physical therapists completed the survey. 78.79% of the respondents answered that they always weigh their patients. Biomechanical limitations, sensory strategies, anxiety, and fear of falling were the least weighted factors. The main barrier was patient characteristics (36.76%) and the primary facilitator training (33.33%). 93.63% indicated that they would like training in this area in the future.

Conclusion: Among the physical therapists surveyed, there is a prevalence of weighting their patients; they identify that patient characteristics are a barrier when performing it and that training in its use is a facilitator.

Registry: ClinicalTrials.gov: NCT05285150

Key words: Postural balance; Surveys and questionnaires; Process and outcome evaluation; Health care; Evidence-based clinical practice.

Author for correspondence: gerardocandoni@gmail.com, Candoni G.

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La ponderación de las alteraciones del equilibrio en sujetos con riesgo de caída realizada por los kinesiólogos en la Argentina. Estudio transversal, de tipo encuesta

RESUMEN

Introducción: las caídas son sucesos involuntarios que hacen perder el equilibrio y dar con el cuerpo en el suelo o en otra superficie firme que lo detenga. El análisis objetivo e instrumentado de la marcha y el equilibrio es una herramienta importante para estimar el riesgo de caídas de los pacientes. El objetivo fue describir la forma de ponderación de las alteraciones en el equilibrio que utilizan los kinesiólogos que residen en la Argentina en el marco de la neurorrehabilitación, rehabilitación vestibular y adultos mayores. Otro objetivo: identificar las barreras y facilitadores autopercibidos por los kinesiólogos que dificultan/facilitan la realización de la ponderación de las deficiencias en el equilibrio.

Materiales y método: se realizó un estudio observacional, descriptivo, transversal de tipo encuesta. Se utilizaron las recomendaciones incluidas en la Checklist for Reporting of Survey Studies. La encuesta estuvo destinada a todos aquellos kinesiólogos de la Argentina que se dedican a neurorrehabilitación, rehabilitación vestibular y adultos mayores.

Resultados: doscientos cuatro (204) kinesiólogos completaron la encuesta. El 78,79% de ellos respondieron que siempre ponderan a sus pacientes. Las limitaciones biomecánicas, las estrategias sensoriales, la ansiedad y el miedo a caer son los factores menos ponderados. La principal barrera fueron las características de los pacientes (36,76%) y, como principal facilitador, el entrenamiento (33,33%). El 93,63% indicó que le gustaría en el futuro ser entrenado en el área.

Conclusión: prevalece, entre los kinesiólogos encuestados, ponderar a sus pacientes e identifican que sus características son una barrera al momento de realizarla, y que el entrenamiento es un facilitador.

Registro: ClinicalTrials.gov: NCT05285150

Palabras clave: balance postural, encuestas y cuestionarios, evaluación de procesos y resultados, cuidados de salud, práctica clínica basada en la evidencia.

INTRODUCTION

Falls are involuntary events that cause a loss of balance, leading to the body hitting the ground or another firm surface that stops it[1]. They occur in approximately 20% of people between the ages of 45 and 65 and 35% of those over 65[2]. In this subgroup, falls cause injuries in more than 65% of cases[2]. Forty percent of people with various neurological disorders fall one or more times, and of these, 21% suffer an injury related to the fall[3].

The causes of these falls may be due to alterations in postural control, which has two objectives: orientation and balance[4]. Postural control refers to the ability to maintain, achieve, or restore balance during any posture or activity, and it involves biomechanical constraints, movement strategies, sensory strategies, spatial orientation, dynamic control, and cognitive processing[4-5]. However, two emotional aspects, such as anxiety and fear of falling, can influence it[6].

On the other hand, in subjects with neurological disorders, falls are identified by the spatio-temporal characteristics of gait, suggesting that the objective and instrumented analysis of gait is an essential tool[7]. However, Muir et al.[8] found that the number of people identified with balance impairment varied depending on the measurement tool used. Regarding the latter, they are neither interchangeable nor equivalent for defining a population at risk since each measures different systems underlying postural control[4].

Noohu et al.[9] found that body functions and structures, activities, and environmental factors of the International Classification of Functioning, Disability, and Health are associated with falls in older adults living in the community. Health professionals evaluate body functions, environmental factors, and body structures more and activities and participation less[10]. We believe that, in the studies mentioned above [9-10], there is no mention of the biopsychosocial aspects of this issue, which still seems to reflect a purely technical approach to addressing it today.

Systematic reviews in kinesiology conclude that the evidence is weak for treatments intended to improve dynamic and static balance in older adults and subjects with neurological sequelae[11-13]. These conclusions derive from reports of studies with low methodological quality, which is why various authors emphasize the need for more rigorous studies[11-13].

That could be because participants in different studies with the same diagnosis can demonstrate differences in forms of movement dysfunction[14]. As long as it is beyond the scope of clinical practice to be more precise in categorization, this problem will continue to exist[14]. We will define weighting as the clinical evaluation or

standardized tool that indicates where the alteration is or which system is affected.

In Canada, it was reported that kinesiologists regularly evaluate a range of constructs (postural alignment, static and dynamic stability, functional balance, and motor systems) and standardized measures[15]. However, there are differences between the scales used and the supposedly evaluated constructs, which do not assess what they claim they do[16]; thus, the most common barriers proved to be lack of time and knowledge[17]. Additionally, the lack of knowledge was the main difficulty in assessing these instruments[17]. So far, we have not found information about the method used to weigh balance alterations by kinesiologists in Latin America.

Research Question

How do kinesiologists in Argentina dedicated to neurorehabilitation, vestibular rehabilitation, and older adults with gait disorders weigh balance alterations in subjects at risk of falling?

Primary Objective

To describe the method of weighting balance alterations used by kinesiologists residing in Argentina in neurorehabilitation, vestibular rehabilitation, and older adults.

Secondary Objective

To identify the self-perceived barriers by kinesiologists that hinder the weighting of balance impairments.

To identify the self-perceived facilitators by kinesiologists that positively influence the weighting of balance impairments.

MATERIALS AND METHOD

Study Design

We conducted an observational, descriptive, cross-sectional study using an online survey. The survey lasted two months, from March to April 2022. We drafted the report following the guidelines recommended in the Checklist for Reporting of Survey Studies (CROSS)[18]. We entered the study protocol with ClinicalTrials.gov: NCT05285150.

Sample Characteristics

All kinesiologists and related professionals dedicated to neurorehabilitation, vestibular rehabilitation, geriatrics, and gerontology practicing in Argentina and with experience in assessing balance deficiencies in individuals at risk of falling were invited to participate. Experience refers to the extent to which knowledge and skills in decision-making are developed[19]. All surveys with missing data were excluded. The sampling method used was non-probabilistic snowball sampling.

Data Collection Methods

We used a survey specially prepared for this study, consisting of an initial section with four questions addressing eligibility criteria and a second section with 25 items divided into four sections (Appendix 1). Each item included a restriction to prevent respondents from leaving it unanswered. Only those who met all the inclusion criteria could access the survey.

The first section comprised ten questions to collect information about the respondent's characteristics. The second section contained 12 questions focusing on the assessments conducted by the respondents. The third section included two questions regarding self-perceived barriers and facilitators in the assessment process. The fourth section had 1 question addressing learning needs.

In the second section, the choice of scales depended on a prior literature review[15-17,20,21]. However, most of these scales currently lack validation in Spanish[22].

Before starting the study, a pilot test was conducted with ten experts in the field to assess the survey's comprehensibility[23]. Experts were defined as individuals with special skills or knowledge that show mastery of a particular subject[24]. They received a sheet with questions intended to identify any difficulties encountered while answering the survey in general or specific questions (Appendix 2). We made modifications based on consensus.

Survey Administration

Participants were invited to the study via various platforms, including Facebook™, Twitter™, Instagram™, LinkedIn™, and WhatsApp™. The invitations went to specialized groups in the field, specialized programs, kinesiologist associations across the country, and the Argentine Association of Kinesiology. Each invitation included the study's objective and a link for accessing the online survey administered through SurveyMonkey™.

The link remained active for two months. To prevent multiple submissions from the same participants, we used SurveyMonkey™, configured to block duplicate entries from the same device.

Sample Size

To estimate the sample size, we considered a review25 that explores various proposals for calculating sample size for electronic surveys. According to Weisberg & Bowen's (1977) approach, to maintain a maximum sampling error of 5% in random samples, 400 participants are required for a generic estimate.

Study Preparation

Before activating the survey link, we spent the entire previous month contacting various institutions and experts in the field to increase awareness and interest at the start of the study. We used multiple platforms for these contacts, including Facebook™, Twitter™, and Instagram™. The procedures manual is in Appendix 3.

Data Analysis

Quantitative variables were described using the mean and standard deviation for parametric distributions or the median and interquartile range for non-parametric

distributions. Categorical variables were expressed as proportions, with their corresponding absolute values for each category. Data analysis was performed using Stata, version 15® (StataCorp, College Station, TX, USA).

We used deductive content analysis to study responses from items 13 to 24, coded with predetermined categories previously reported in the literature.

Ethical Considerations

Given the voluntary and anonymous nature of the study, participants didn't have to sign an informed consent form, as established by Resolution 1480/2011. Before accessing the questionnaire, participants received an information sheet that included details about the study, contact information for the researchers, a privacy statement, and a declaration of voluntary participation. The identity and data protection of the study participants were preserved throughout, under the National Personal Data Protection Act 25326, and in line with international regulations established by the Declaration of Helsinki.

The study took place after the approval of the Ethics and Research Committee of the Hospital General de Agudos Dr. Teodoro Álvarez (protocol number: 6550).

RESULTS

Pilot Test

Ten experts in the fields participated in the pilot test. The mean age was 43.3 years (SD 8.12); all were of Argentine nationality. They had an average of 16.6 years of professional experience (SD 8.65). The locations where they practiced were as follows: seven (70%) in Ciudad Autónoma Buenos Aires (CABA), three (30%) in Buenos Aires, and one (10%) in Mendoza. The remaining variables are shown in Table 1.

All ten experts invited to the pilot test completed the comprehension questionnaire. Two of them (20%) reported no difficulties understanding the items. The others suggested changes related to semantics, the order of questions, additional response options, and elimination of questions. Questions addressing barriers, facilitators, and level of academic training received the most suggested modifications. Based on consensus among the authors, a final survey version was agreed upon (see Appendix 1).

Participant Characteristics

En la figura 1 se describen la cantidad de encuestados finales y los motivos de exclusión de algunos.

Descriptive Results

In total, we included responses from 204 survey participants. The median and interquartile range for age was 37.5 (31-46), and for years of professional registration was 11 (5-18.5). Out of the total, three respondents were of foreign nationality (1 Bolivian, 1 Paraguayan, and 1 Peruvian).

One hundred seventy-two (84.31%) professionals were practicing in the central region of the country (Buenos Aires, Córdoba, Entre Ríos, Santa Fe, and CABA), 10 (4.90%) in the northwest region (Catamarca, Jujuy, Tucumán, Salta, and Santiago del Estero), 1 (0.49%) in the northeast region (Chaco, Corrientes, Formosa, and Misiones), 20 (9.80%) in Cuyo (La Rioja, Mendoza, San Juan, and San Luis), and 14 (6.86%) in Patagonia (Chubut, La Pampa, Neuquén, Río Negro, Santa Cruz, and Tierra del Fuego). The remaining characteristics of the respondents appear in Table 1.

Key Findings

Table 2 shows the weighting performed by the respondents.

The most commonly used standardized scales were Balance Evaluation Systems Test® for movement strategies, Time Up and Go® for spatial orientation, Functional Gait Assessment® for dynamic control, and Time Up and Go-Cognitive® for cognitive processing. Additionally, the "other" option was selected in various domains by between one (0.49%) and 23 (11.27%) individuals; the coded responses are in Table 3.

Two respondents also mentioned weighting personal factors using the Romero method (one) (0.49%) and fear (one) (0.49%).

One respondent mentioned weighting equipment and architectural barriers through environmental modifications (one) (0.49%).

DISCUSSION

This study describes how kinesiologists in Argentina weight balance impairments in neurorehabilitation, vestibular rehabilitation, and elderly care. It also identifies self-perceived barriers and facilitators that affect how kinesiologists assess balance deficits/components.

More than 75% of respondents indicated that they always assess their patients. However, the "does not assess" option was most selected for biomechanical limitations, sensory strategies, anxiety, and fear of falling.

In previous studies, biomechanical limitations and sensory strategies turned out to be regularly assessed or less regularly[16,17]. However, due to differences in the conceptual definition of biomechanical limitations, the assessment of mobility range was not included in the studies mentioned. To our knowledge, this is the first study to make that distinction.

Both fear of falling and anxiety are behavioral factors considered key conceptual elements related to balance[26]. However, the surveyed kinesiologists most frequently selected "they do not weigh" for these factors. To our knowledge, no previous studies have made this distinction.

Nearly all respondents expressed a desire to further their learning about assessment in the future. That aligns with the surveyed kinesiologists' identification of training

Table 1. Characteristics of respondents and experts

Variables	n (%)	N% pilot test
Respondent characteristics		
Gender		
Feminin	127(62.25)	5 (50)
Nationality		
Argentine	201(98.53)	
Area*		
Neurorehabilitation	131(64.22)	8 (80)
Geriatrics and Gerontology	87(42.65)	7 (70)
Vestibular rehabilitation	68(33.33)	3 (30)
Education*		
Undergraduate course	146 (71.57)	6 (60)
Postgraduate course	122(59.80)	5 (50)
Residency-concurrent-scholarship	54(26.47)	7 (70)
Specialization course	39(19.12)	3 (30)
Diploma	17(8.33)	
Master's degree	2 (0.8)	1 (10)
Post-doctorate	1(0.49)	
Works		
Private	133(65.20)	7 (70)
Public	37(18.14)	1 (10)
Both	34(16.67)	2 (20)
Attends*		
Home care	109(53.43)	3 (30)
Private practice	107(52.45)	5 (50)
Tertiary care centers	73(35.78)	4 (40)
Hospital	71(34.80)	5 (50)
Weighting		
Yes	161(78.92)	
Weighting made by the respondent		
Kinesthetic diagnosis		
Clinical evaluation	71(34.80)	
Standardized tool	16 (7.84)	
Both	117(57.35)	
Self-perception of barriers and facilitators at the time of weighting		
Barriers		
Patient characteristics	75(36.76)	
Training	32(15.69)	
Time	32(15.69)	
Knowledge	24(11.76)	
Work organization	16(7.84)	
Equipment	14(6.86)	
Human resources	9(4.41)	
Other[1]	2(0.98)	
Facilitators		
Training	68(33.33)	
Patient characteristics	36(17.65)	
Knowledge	36(17.65)	
Equipment	33(16.18)	
Human resources	13(6.37)	
Labor organization	9(4.41)	
Time	9(4.41)	
Learning needs		
Learning		
Yes	191(93.63)	

[1] Physical space

* For each variable whose sum exceeds ten subjects, the difference corresponds to respondents belonging to more than one category

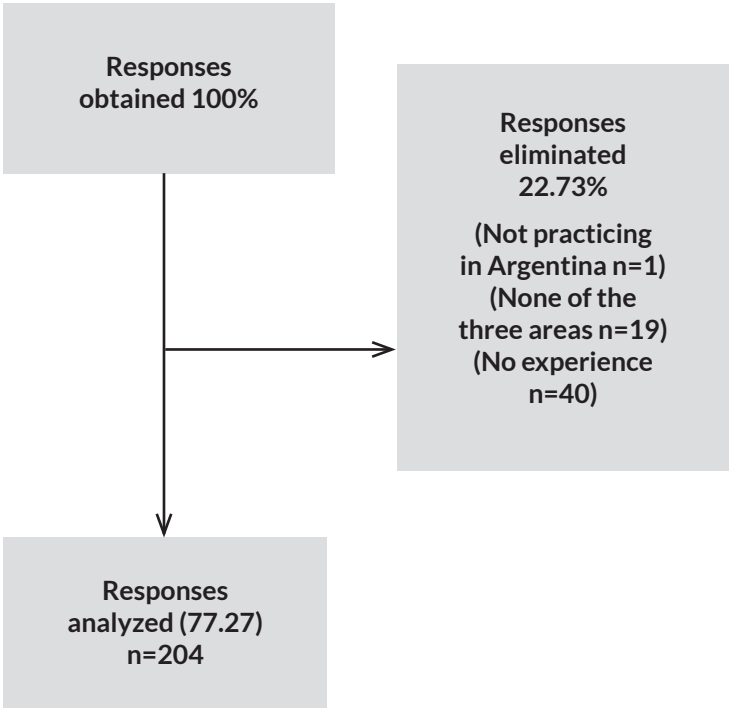

Figure 1. Flow chart.

as the primary facilitator and knowledge and training as the primary barriers. Renteria et al. found similar results among 606 Colombian kinesiologists, nearly half of whom worked in neurology and a third in elderly care when asked about the need for learning about functional scales use and deficiency assessment[27].

On the other hand, kinesiologists identified patient characteristics as the most voted barrier and training as the primary facilitator. However, according to Sibley et al., the factors influencing the assessment of certain aspects of balance were lack of time, knowledge, and the absence of validated scales[17], which does not align with our findings. In our view, this is the first study that evaluates the factors considered barriers and facilitators by kinesiologists[15,17].

As in previous studies, the most selected academic level was a bachelor's degree[15,17]. For the variables of professional practice establishment, location, and workplace, the operational definition differs from previously compared studies, which makes their results not comparable[15-17,27].

Limitations

This study presents certain limitations. Since it is a survey-type study, the social desirability bias or courtesy bias must be considered, as well as possible selection bias, since older individuals are less likely to use mobile devices to complete a survey. Additionally, there was a lack of definition regarding the experience link. The lack of response from kinesiological authorities (colleges, associations, circles) prevented widespread national dissemination. Furthermore, we have not found a census of practicing kinesiologists in Argentina, which makes it impossible to determine the response rate. Despite distributing the survey through various channels, the response rate declined over the two months the link was active. Therefore, we should consider cautiously the results reported in this study because they do not reach the intended sample size, reflecting a 7.2% error rate, and the study did not rely on random sampling. Additionally, we used a non-validated tool, and since it is a self-reported measure, recall bias could influence the results obtained.

Strengths

The strengths of this study include:1) It uses a platform that prevents duplicate data entries, which avoids multiple survey completions by a single user, 2) Survey dissemination through various social media networks and channels, 3) An anonymous survey could avoid social desirability bias, 4) Conducting a pilot test improved comprehension and avoided including these experts in the main study to prevent result bias, 5) Data entry

Table 2. Weighting made by respondents

Variables	n (%)
Personal factors	
History of falls	137(67,49)
Age	27 (13,30)
Medication	19 (9,36)
No weighting	18 (8,87)
Other	2 (0,99)
Equipment and architectural barriers	
Floor surfaces	87(42,86)
Accessibility to the house	71(34,98)
Footwear	37(18,23)
No weighting	7(3,45)
Others	1(0,49)
Biomechanical limitations	
No weighting	82 (40,20)
Mini Balance Evaluation Systems Test	59 (28,92)
Tinetti Performance Oriented Mobility Assessment	36 (17,65)
Other	23 (11,27)
Functional Reach Test	4 (1,96)
Movement strategies	
Balance Evaluation Systems Test	
No weighting	78 (38,24)
Modified Clinical Test of Sensory	19 (9,31)
Interaction on Balance Dizziness Handicap Inventory	18 (8,82)
Other	10 (4,90)
Sensory strategies	
No weighting	99 (48,53)
Modified Clinical Test of Sensory	60 (29,41)
Interaction on Balance	
Activities-Specific Balance Confidence Scale	27 (13,24)
Four-Square Step Test	13 (6,37)
Other	5(2,45)
Orientation in space	
Time Up and Go	76(37,25)
No weighting	69(33,82)
Balance Evaluation Systems Test	39(19,12)
Test en L	12(5,88)
Other	8(3,92)
Control of dynamics	
Functional Gait Assessment	78(38,24)
No weighting	66(32,35)
Berg Balance Scale	48(23,53)
Brunel Balance Assessment	6(2,94)
Other	6(2,94)
Cognitive processing	
Time Up and Go-Cognitive	78(38,24)
No weighting	79(38,73)
Dynamic Gait Index	32(15,69)
Community Balance and MobilityScale	9(4,41)
Other	6(2,94)
Anxiety	
No weighting	127(62,25)
Visual Analog Scale	61(29,90)
Likert-type scale	8(3,92)
Short Form-36	6(2,94)
Other	2(0,98)
Fear of falling	
No weighting	92(45,10)
Berg Balance Scale	46(22,55)
Activities-Specific Balance Confidence Scale	35(17,16)
Fall Efficacy Scale	24(11,76)
Other	7(3,43)

through a digital platform avoided the typographical errors that could occur with pencil and paper methods, 6) Having a procedural manual ensured higher quality data collection.

Generability

In our view, this would be the first survey-based study to evaluate this issue in Argentina. This study successfully obtained responses from every geographic region of the country. Due to the eligibility criteria, only 22.73% of participants who accessed the link were not screened. This response rate is higher than those reported in previous surveys, both in high-income countries and in countries in the region[15-17,27].

Implications for Practice

The surveyed kinesiologists indicated that over 75% assess their patients for fall risk; however, there are four key aspects where the "does not assess" option was the most selected despite their importance in improving patient conditions; that would be an indication that the surveyed kinesiologists might not be conducting comprehensive evaluations. We believe patient assessments should also focus on biomechanical limitations, sensory strategies, anxiety, and fear of falling. In addition, the need for learning and updating on the subject should be constant.

Implications for Research

Future research should investigate why the surveyed kinesiologists might not conduct comprehensive gait and balance evaluations and the impact on their patient's outcomes. It should also explore the patient characteristics that act as barriers during assessments. Qualitative studies are needed to understand these patient characteristics, why Argentine kinesiologists do not assess equipment and architectural barriers despite not needing standardized evaluation, and whether there are differences based on the population addressed. Additionally, research should investigate whether a lack of knowledge or the absence of adaptations of the mentioned scales to Argentine Spanish influences decision-making.

We believe strategies should be generated in the future to meet the demand for learning needs of kinesiologists in Argentina, considering that passive dissemination (e.g., sending educational materials by mail) is generally ineffective and unlikely to lead to behavior change when used alone[28]. Behavioral changes should rely on strategies informed by behavior change theories[29]. Such changes may require individual and organizational commitment and should target non-traditional stakeholders in healthcare (such as middle management).

CONCLUSION

This study provided informative data on how surveyed kinesiologists assess balance impairments in neurorehabilitation, vestibular rehabilitation, and geriatrics. It also identified self-perceived barriers and

Table 3. Weighting "other"

	Biomechanical limits	Movement strategies	Sensory strategies	Orientation in space	Control of dynamics	Cognitive processing	Anxiety	Fear of falling
BesTEST	8 (3.92)							
Medical research council	4 (1.96)							
Goniometry	3 (1.47)							
Berg Balance scale	2 (0.98)	4 (1.96)						
Clinical evaluation	2 (0.98)	3 (1.47)	3 (1.47)	3 (1.47)	2 (0.98)	3 (1.47)	1 (0.49)	5 (2.45)
Romero Method	1 (0.49)	1 (0.49)	1 (0.49)	1 (0.49)	1 (0.49)	1 (0.49)		
Daniels Scale	1 (.049)							
Dinamic Gait Index	1 (0.49)				1 (0.49)			
Manual Strength Test	1 (0.49)							
Mini-BESTest		1 (0.49)			1 (0.49)			
Sensory Organization Test			1 (0.49)					
Posturography				1 (0.49)				
Subjective vertical visual				1 (0.49)				
Bucket Test				1 (0.49)				
Oculomotor evaluation				1 (0.49)				
Tinetti Performance Oriented Mobility Assessment					1 (0.49)			
Mini Mental State Examination						1 (0.49)		
Stop Walking While Talking Test						1 (0.49)		
Kessler 10							1 (0.49)	
Likert-type scale								1 (0.49)
Time Up and Go								1 (0.49)

facilitators that affect their assessment processes and subsequent analysis for developing a kinesiological diagnosis. The most selected option among respondents was the non-assessment of biomechanical limitations, sensory strategies, anxiety, and fear of falling. The most frequently chosen barriers were patient characteristics and being skilled as a facilitator. Lastly, almost the entire sample indicated a need for further training in this area.

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