

Content validity and reliability of agility test in wheelchair tennis

Validez de contenido y confiabilidad del test de agilidad en tenis en silla de ruedas

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Abstract. Purpose. This study aims to develop the construction of an agility test in wheelchair tennis. Material and methods. This research is a research development consisting of four stages. In the first stage, documents and research journals were analyzed to develop the construction of a wheelchair tennis agility test. The first step resulted in six aspects, namely: the definition of the agility test motion aspect, the suitability of the test to the state of the match aspect, ease in the agility test aspect, reliability aspect, clarity instructions on the image aspect, and security aspect. The Delphi technique was used in the second stage, and experts assessed the results of constructing the wheelchair tennis agility test in the first stage. In the third stage, the results of expert judgment with the Aiken formula were analyzed to test the validity of the contents. Participants in this study were documents and seven experts consisting of five national coaches and two experts with Doctoral degrees in tennis science specifications. The fourth step with Cronbach's Alpha reliability test and Intraclass Correlation Coefficient was tested on 16 experienced wheelchair athletes, male and female, with the age of 18-40 years and an average training level of 11.20 ± 1.7 years. Results. The validity test results on aspect 1 show V value of 0.78; on aspect 2 show V value of 0.90; on aspect 3 show V value of 0.85; on aspect 4 show V value of 0.96; on aspect 5 show V value of 0.96; and on aspect 6 show V value of 0.96. The result of Cronbach's Alpha reliability test is 0.804, and the value of the Intraclass Correlation Coefficient is 0.804. Then, the agility test of wheelchair tennis athletes has a valid and reliable value. Conclusions. The wheelchair tennis agility test construct has high validity and reliability. The construction document of the wheelchair tennis agility test instrument shows that it has high content validity and reliability, so it can convince readers and researchers about the instrument. Further research requires more detailed testing of retest test conducted with larger samples.

Key words: wheelchair tennis, content validity, agility, physical

Resumen. Objetivo. Este estudio tiene como objetivo desarrollar la construcción de un test de agilidad en tenis en silla de ruedas. Material y métodos. Esta investigación es un desarrollo investigativo que consta de cuatro etapas. En una primera etapa se analizaron documentos y revistas de investigación para desarrollar la construcción de un test de agilidad en tenis en silla de ruedas. El primer paso resultó en seis aspectos, a saber: la definición del aspecto de movimiento de la prueba de agilidad, la adecuación de la prueba al aspecto del estado del partido, la facilidad en el aspecto de la prueba de agilidad, el aspecto de confiabilidad, la claridad de las instrucciones en el aspecto de la imagen y aspecto de seguridad. En la segunda etapa se utilizó la técnica Delphi y en la primera etapa los expertos evaluaron los resultados de la construcción de la prueba de agilidad del tenis en silla de ruedas. En la tercera etapa se analizaron los resultados del juicio de expertos con la fórmula de Aiken para probar la validez de los contenidos. Los participantes en este estudio fueron documentos y siete expertos, cinco entrenadores nacionales y dos expertos con doctorados en especificaciones científicas del tenis. El cuarto paso con la prueba de confiabilidad Alfa de Cronbach y el coeficiente de correlación intraclass se probó en 16 atletas experimentados en silla de ruedas, hombres y mujeres, con edades comprendidas entre 18 y 40 años y un nivel de entrenamiento promedio de $11,20 \pm 1,7$ años. Resultados. Los resultados de la prueba de validez en el aspecto 1 muestran un valor V de 0,78; en el aspecto 2 muestra un valor V de 0,90; en el aspecto 3 muestra un valor V de 0,85; en el aspecto 4 muestra un valor V de 0,96; en el aspecto 5 muestra un valor V de 0,96; y en el aspecto 6 muestra un valor V de 0,96. El resultado de la prueba de confiabilidad Alfa de Cronbach es 0,804 y el valor del Coeficiente de Correlación Intraclass es 0,804. Entonces, el test de agilidad de los deportistas de tenis en silla de ruedas tiene un valor válido y fiable. Conclusiones. El constructo de la prueba de agilidad del tenis en silla de ruedas tiene alta validez y confiabilidad. El documento de construcción del instrumento de prueba de agilidad del tenis en silla de ruedas muestra que tiene alta validez de contenido y confiabilidad, por lo que puede convencer a lectores e investigadores sobre el instrumento. Se necesitan más investigaciones para realizar pruebas más detalladas de las pruebas repetidas realizadas con muestras más grandes.

Palabras clave: tenis en silla de ruedas, validez de contenido, agilidad, física

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Introduction

Disability is a person's limited ability to perform specific roles and tasks. Therefore, physical disability is the third most common developmental disability after mental retardation and autism ((Camargo Rojas et al., 2023), (Campos Campos et al., 2023), (Nugroho et al., 2021)). Wheelchair tennis is one of the Paralympic sports carried out by tennis athletes with disabilities, especially those with physical disabilities ((A. Sánchez-Pay et al., 2016), (Alejandro Sánchez-Pay et al., 2021), Nasrulloh et al., 2020)). Participation in wheelchair tennis today has shown

a thorough progression of athletes and coaches ((A. Sánchez-Pay et al., 2016), (Alejandro Sánchez-Pay et al., 2021), (Sutapa et al., 2020)). The task of a coach is to optimally improve technical, psychological, physiological, and physical abilities and be able to control the exercise program so as not to cause overtraining ((Alejandro Sánchez-Pay & Sanz-Rivas, 2021), (Zambrano Palencia & Hincapié Gallón, 2021), (Prabowo et al., 2023), (Nasrulloh et al., 2021)).

Agility has been defined as a person's ability to make movements and the ability to stop then start the movement again quickly, or as a whole-body movement that is

done quickly with a rapid change in direction in response to a stimulus ((Kovacikova & Zemková, 2021), (Manurung et al., 2022), (Prabowo et al., 2022), (Kristiyanto et al., 2020)). In physical training, agility is the ability of a person to move from one place to another to change the body's position or the position of different body changes ((Szabo et al., 2020), (Prabowo et al., 2022), (Luna-Villouta et al., 2023), (Almas et al., 2023), (Nasrulloh et al., 2022)). Agility can be defined as the movement of the entire body in rapid activity with speed changes or one's ability to accurately change direction at high speed without losing balance. In other words, one's ability to move quickly forward, sideways, and backward ((Luna Villouta et al., 2019), (Salekar et al., 2020), (Sinkovic et al., 2023), (Hikmah et al., 2023), (Listyarini et al., 2021)). Therefore, tennis coaches need a training program and measuring instruments to measure the elements of reaction, agility, and balance called agility. Agility tests can be described as the ability to regulate changes in motion as quickly as possible and maintain balance in responding to stimuli ((Young et al., 2015), (BEYLEROĞLU et al., 2016), (Valle García, 2020), (Ergin & Arslan, 2020), (Sukendro et al., 2021)).

However, many tennis agility tests cannot measure tennis skill movements holistically and have not been applied in wheelchair tennis. Therefore, a valid and reliable agility test instrument is needed to assess tennis agility accurately. Previous study examines the development of soccer agility tests ((Tomoliyus & Sunardianta, 2020), (Nugroho et al., 2022), (Ilham et al., 2021), (Sutapa et al., 2021)). The results show that the agility test is valid and reliable for football. Another study also examines the development of agility tests for hockey ((Morland et al., 2013), (Saifu et al., 2021), (Nopembri et al., 2022), (Hastuti et al., 2021)). The results show that the agility test is valid and reliable for hockey. In addition, another study researches the development of karate agility test ((Yudhistira et al., 2021), (Hardianto et al., 2022), (Pratama et al., 2022), (Adji et al., 2022), (Jufrianis et al., 2021), (Yuniana et al., 2023)). The results show that the agility of the karate test had high content validity and reliability between assessors. Moreover, research has been conducted related to battery tests for wheelchair tennis ((Alejandro Sánchez-Pay & Sanz-Rivas, 2019), (Alejandro Sánchez-Pay & Sanz-Rivas, 2019), (Gavel et al., 2023), (Salafi et al., 2022), (Utami et al., 2023)). The results show high content validity and reliability. However, the measuring instrument is less effective for measuring agility in wheelchair tennis. Furthermore, based on the above data, the development of agility test in wheelchair tennis must be done. This study aims to test the validity and reliability of the agility test instrument on wheelchair tennis achievements. The findings of this agility test can be helpful for wheelchair tennis coaches, especially for measuring agility in wheelchair tennis players. It can also contribute to the development of competitive sports evaluation.

Material and methods

This research uses the development method by combining qualitative and quantitative approaches. This mixed research combines two approaches, namely qualitative and quantitative, to obtain more comprehensive data ((Schoonenboom & Johnson, 2017), (Kogoya et al., 2023), (Nugroho et al., 2022)). The mixed method is when an expert or researcher combines qualitative and quantitative research methods with one concept or when a study is conducted sequentially or simultaneously to examine the research in depth ((Guest, 2013), (Kansteiner & König, 2020), (Trisnadi et al., 2023)). Participants in this study were documents and seven experts. The seven experts have qualifications as follows: two experts with doctoral degrees in sports evaluation and five tennis coaches who have a license for wheelchair tennis coaches, and they have a bachelor's degree in sports.

There are four steps in this study. The first step was qualitatively analyzing relevant research documents, textbooks, and journals to develop an agility test construction ((Ferrari, 2015), (Tikito & Souissi, 2019), (Amran et al., 2023)). This step analyzes the physical components of wheelchair tennis athletes and the agility tests that have been developed for athletes with disabilities in general. The first step produces six aspects of agility tests for wheelchair tennis athletes which are the definition of agility test motion aspect, the suitability of the test to the state of the match aspect, the ease in agility test aspect, reliability aspect, clarity instructions on the image aspect, and safety aspect. The second step was quantitative analysis with the Delphi technique, which was carried out by asking experts to assess the construction of the wheelchair tennis agility test produced in the first stage. The third step is to analyze the results of expert judgment using the Aiken formula to test the validity of the contents of the wheelchair tennis agility test. The fourth step was Cronbach's Alpha and Intraclass Correlation Coefficient reliability tests, which were tested on 16 experienced wheelchair athletes aged 18 - 40 years with an average level of training of 11.20 ± 1.7 years.

The analysis in this study used the help of SPSS version 26. Data was collected using a questionnaire that a rater assessed using a rating scale of 4. Aiken's formula is as follows:

$$V = \sum s / [n (C-1)]$$

$S = r - lo$ Lo = lowest value C = highest value R = numbers given by the rater

Results

Validity Test

Document analysis resulted in the conceptual definition of wheelchair tennis agility. Reactive agility in tennis is the ability to move quickly, change motion, and maintain balance in response to a stimulus. In addition, an operational definition is found that stated the ability to move at speed within seconds after receiving verbal and visual stimuli. The construction design of the wheelchair tennis agility test is shown in Figure 1 as follows:

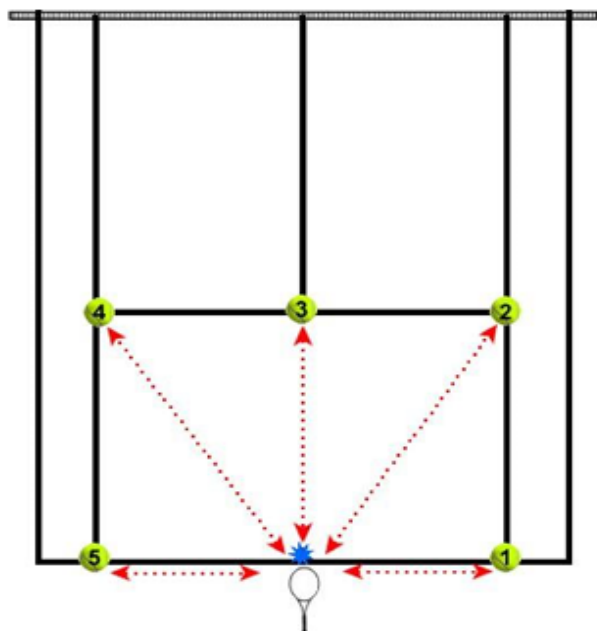


Figure 1. Wheelchair tennis agility test construction design

Instrument size distance

The distance between center mark 1 and 5 is 4.115 meters

The distance between center mark 2 and 4 is 6.7 meters

The distance between the center mark and cone 3 is 5.5 meters

The equipment used for the test is as follows:

- A. Tennis court
- B. Four cones
- C. One whistle
- D. One stopwatch

Number of Assessors

- A. One person gives instructions
- B. One person holding a stopwatch
- C. One person records the results

Test Procedure

- a) Athletes prepare themselves by standing at center line of the baseline.
- b) Each athlete runs when he hears the “ready go” signal.
- c) Each athlete must pass through the cones return to the baseline, and return to the other cones.
- d) It can be performed freely, and the time when they have passed the six cones is recorded.

Table 1. The result of Content Validation Test with Aiken Formula

Panelists	Aspect 1		Aspect 2		Aspect 3		Aspect 4		Aspect 5		Aspect 6	
	Score	A	Score	A	Score	A	Score	A	Score	A	Score	A
A	4	3	4	3	5	4	5	4	4	3	4	3
B	5	4	4	3	4	3	5	4	5	4	5	4
C	4	3	4	3	5	4	5	4	5	4	4	4
D	4	3	5	4	4	3	5	4	5	4	4	4
E	4	3	5	4	5	4	4	3	5	4	5	4
F	4	3	5	4	4	3	5	4	5	4	5	4
G	4	3	5	4	4	3	5	4	5	4	5	4
	22		25		24		27		27		27	
V	0.78		0.90		0.85		0.96		0.96		0.96	

Based on Table 1, item 1 or the suitability of the test material with the wheelchair tennis agility category, has a coefficient value of V 0.78; item 2, the suitability of the distance between the cones, has a coefficient value of V 0.90; item 3 or the safety of the equipment used has a coefficient value of V 0.85; item 4, the number of repetition, has a coefficient value of V 0.96; fifth point, the clarity of instrument procedures has a coefficient value of V 0.96; and the sixth item or clarity test score has a coefficient value of V 0.96. Based on the results obtained, if the Aiken value is 0.81 to 1.00 then it can be said that the data has high expert agreement, apart from that, if the Aiken value is 0.78, it can be said as good ((Yulianto et al., 2021), (Kauki et al., 2024)).

Reliability Test

After going through the validity test stage conducted by experts and producing a valid value, a reliability test was carried out on 16 wheelchair tennis athletes. The following are the results of the reliability test of the agility test for wheelchair tennis athletes:

Table 2. Cronbach's Alpha Results

Reliability Statistics	
Cronbach's Alpha	N of Items
0.804	6

Based on the results of Table 2, Cronbach's Alpha value of 0.804 means that the value is more than 0.6 so that the agility test for wheelchair tennis athletes is declared reliable.

Table 2. Results on the aspects of the definition of agility test motion, aspects of the suitability of the test to the state of the match, aspects of ease in the agility test, aspects of reliability, aspects of clarity instructions on the image, and aspects of security

Then, based on the results portrayed in Table 3, all six aspects of the item are as follow: the aspect of the definition of agility test motion is $0.755 > 0.6$, the aspect of test conformity to match conditions is $0.793 > 0.6$, the aspect of ease in agility tests is $0.736 > 0.6$, the aspect of reliability is $0.772 > 0.6$, the aspect of clarity clues in figure $0.778 > 0.6$, and the aspect of security is $0.800 > 0.6$.

Table 3. Intraclass Correlation Coefficient Results

	Intraclass Correlation	Intraclass Correlation Coefficient		F Test with True Value 0			
		95% Confidence Interval		Value	df1	df2	Sig
		Lower Bound	Upper Bound				
Single Measures	0.406	0.203	0.662	5.094	15	75	0.000
Average Measures	0.804	0.605	0.921	5.094	15	75	0.000

Based on the results in Table 3, the Intraclass Correlation Coefficient value shows a result of 0.804, which means that the agility test for wheelchair tennis athletes has a good level

of reliability. The Cronbach's Alpha and Intraclass Correlation Coefficient results show a reliability value above 0.6, so the agility test is feasible for wheelchair tennis athletes.

Discussion

A test instrument is said to be good if it has validity and reliability values ((Heale & Twycross, 2015), (SÜRÜCÜ & MASLAKÇI, 2020), (Mellinger & Hanson, 2020), (Nha, 2021), (Trisnadi et al., 2024)). Validity and reliability are prerequisites for ensuring the integrity and quality of the test instrument ((Mohamad et al., 2015), (Sundram & Romli, 2023), (Pratama et al., 2024)). Content validity is to test the appropriateness of a competent expert's assessment ((Chu, PH. and Chang, 2017), (Arifin et al., 2024)).

Agility is the product of a complex combination of speed, coordination, flexibility and power as practiced in the sports of gymnastics, wrestling, football, volleyball, boxing, etc. Agility has been defined as a person's ability to make movements and the ability to stop then start the movement again quickly, or as a whole-body movement that is done quickly with a rapid change in direction in response to a stimulus ((Kovacikova & Zemková, 2021), (Salafi et al., 2023)).

A previous study related the validity and reliability of the wheelchair tennis test was the speed test of junior athletes and seniors (Rietveld et al., 2019). The speed test tested was 20 m sprint test, spider test, butterfly sprint test, and Illinois test with an inertia gauge attached to the wheel. The results of the study stated that the four tests were feasible to be tested on athletes. From the results of this study, there were many movement paths that changed direction. In principle, the definition of an agility test is how the form of the test such as the direction and path that the athlete passes is not one line or changes direction ((Jansen et al., 2021), (Sinkovic et al., 2022), (Pratama et al., 2023), (Marin et al., 2023), (Aziz et al., 2023), (Hardinata et al., 2023)). The difference between the previous research and this research lies in the purpose of creating a test development, namely speed with agility. Thus, in the results of the study, the validity of the wheelchair athlete agility test can be an update and innovation of the agility test.

Furthermore, the level of validity and reliability was also tested to measure aerobic and anaerobic endurance, one of which was wheelchair tennis ((Gavel et al., 2023), (Riyana et al., 2023)). The results of the study concluded that it was necessary to measure and track the performance of wheelchair tennis athletes. Then, from the other results reported, there is a relationship between anaerobic endurance and agility through tests. However, the results of the study did not show the form of the test. The combination of the results of this study and the results of the study of the validity test of the agility test can be a reference that the need for more tests to measure the ability of disabled athletes, especially wheelchair tennis athletes ((Brechtbuhl et al., 2016), (Alfonso-Asencio et al., 2020), (Siahaan et al., 2020), (Alim & Nurfadhila, 2021)).

Qualitative analysis is also needed in the discussion of this study, the rater agreed that the tests used to measure athletes with disabilities must be safe to use to avoid unexpected injuries or accidents. In general, when conducting an agility test, the athlete must be ready, concentrated to perform the test at high speed and change the direction of motion ((BEYLEROĞLU et al., 2016), (Hernández-Davo et al., 2021), (Đorđević et al., 2022), (Baja et al., 2022)). In the case of wheelchair sports, an important role is the condition of the athlete, the wheels on the chair, and the field used to conduct the test ((Rietveld et al., 2021), (Ju et al., 2021), (Rietveld et al., 2023)). Then the test instructions, convenience, and reliability were highly considered in this study.

The limitation of this study is the absence of an agility test which is specific for wheelchair athletes, even apart from wheelchair tennis. Furthermore, the particular agility test of wheelchair tennis has not been found in other studies. However, the researchers strongly believe that the results of this study can be the best step to create future development research with more valid and reliable values. Therefore, the researchers want to take the first step by conducting validity tests on experts, especially wheelchair tennis and reliability tests conducted directly on wheelchair tennis athletes so that this agility test not only has valid and reliable values but also is a form of test that has a better level of safety when it is used repeatedly.

Conclusions

The results of the discussion conclude that the construction of the wheelchair tennis agility test has high validity and reliability. With the document of the wheelchair tennis agility test construction test instrument, the test has high content validity and reliability. This can help ensure construct validity and provide confidence to readers and researchers regarding this instrument. Future research requires more detailed testing of the level of validity and reliability carried out directly by wheelchair tennis athletes and with large samples and tested repeatedly.

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