Development of new sports for the achievement of inclusion-educated youth (Numbers engineering and adventure ball sports match systems)

Desarrollo de nuevos deportes para el logro de la inclusión de jóvenes educados (Ingeniería de números y sistemas de partidos de deportes de aventura)

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Abstract

Introduction: Inclusion in sports needs to be done as a form of concern so that people with disabilities can contribute to sports activities, especially sports achievements.
Objective: This study aims to develop a valid and effective number and match system to be used as a new competition medium for groups of people with disabilities.
Methodology: This research method adopts 10 steps of Borg and Gall development which are divided into three sessions.
Results: The validation result of the physically disabled group was 90.8%, the deaf group was 88.1% and the blind group was 74.7%. The effectiveness of the physically disabled group was 90.9%, the deaf group was 90.9% and the blind group was 79.6%.
Discussion: The assessment was given by a number of experts, namely psychophysiologists, adaptive game experts and competition experts. Each expert agreed that the match number and system were declared valid and ready to be implemented on the field.
Conclusion: The numbers and system of blind group matches should receive special attention and need further improvement in order to be truly accepted as the official rules of the game. It is concluded that the presence of adventure football sports can be played by groups of people with disabilities, people with disabilities, deaf and blind in full competition through the number of matches, i.e. single numbers, double numbers, mixed numbers and team numbers as well as a match system that accommodates them without worrying about accessibility and disruptive mobility.

Keywords

Bolang; game; competition; education; inclusion.

Resumen

Introducción: La inclusión en el deporte debe hacerse como una forma de preocupación para que las personas con discapacidad puedan contribuir a las actividades deportivas, especialmente a los logros deportivos.
Objetivo: Este estudio tiene como objetivo desarrollar un sistema de números y emparejamiento válido y eficaz que se utilice como nuevo medio de competición para grupos de personas con discapacidad.
Metodología: Este método de investigación adopta 10 pasos del desarrollo de Borg y Gall que se dividen en tres sesiones.
Resultados: El resultado de validación del grupo de personas con discapacidad física fue del 90,8%, del grupo sordo del 88,1% y del grupo ciego del 74,7%. La efectividad del grupo de personas con discapacidad física fue del 90,9%, el grupo de sordos del 90,9% y el grupo ciego del 79,6%.
Discusión: La evaluación fue realizada por varios expertos, concretamente psicofisiólogos, expertos en juegos adaptativos y expertos en competición. Cada experto coincidió en que el número de partido y el sistema fueron declarados válidos y listos para implementarse en el campo.
Conclusión: Los números y el sistema de los partidos de grupos a ciegas deben recibir especial atención y necesitan mejorar aún más para ser verdaderamente aceptados como las reglas oficiales del juego. Se concluye que la presencia de deportes de fútbol de aventura puede ser jugada por grupos de personas con discapacidad, personas con discapacidad, sordos y ciegos en competición completa, a través del número de partidos, es decir, números simples, números dobles, números mixtos y números de equipo, así como un sistema de partidos que los adapte sin preocuparse por la accesibilidad ni la movilidad disruptiva.

Palabras clave

Bolang; juego; competencia; educación; inclusión.

Introduction

Every youth in Indonesia is an asset to the nation and state. The presence of inclusive education for children provides an opportunity for every child to obtain equal rights to normal children in general, Ariani (Ratna, 2025). Inclusive schools are the embodiment of education without discrimination, (Sarima, 2023). Inclusive education accommodates education in a way that is fair to every student, (Oktaviani et al., 2024), considering that every child has the opportunity to enjoy a decent education, (Meka et al., 2023). The urgency is that the child's development grows optimally. Inclusive education aims to accommodate the diverse needs of children, including people with disabilities, so that society accepts them without difference. As a result of developmental disorders, children with special needs need inclusive treatment from families, schools and the community environment. Children with special needs are six times more likely to experience mental disorders, (Fakhiratunnisa et al., 2022).

There is a distinction inherent in children that is referred to as special privileges, (Nisak & Harsiwi, 2024). Unique signs for children with special needs are physical, mental, intellectual and emotional abnormalities, (Rahmawati et al., 2024). In line with the fact that different physical, intellectual and emotional characteristics are the characteristics of children with special needs, (Mardiansah et al., 2024). Different abilities suffered by children with special needs are obtained due to obstacles from birth or accident conditions in their growth and development, (Teddy et al., 2023), this is also stated in (Khushaboo & Dua, 2022) and (Sekarani et al., 2025). Children with special needs have growth and development with conditions that are less common than they should be.

Law no. 8 of 2016 guarantees the right to services for children with special needs through accessibility standards, (Khairun et al., 2018). In Law No. 4 of 1997 known as "equal opportunity", (Widjaja et al., 2020). This means that every right between the rights of children with special needs and the rights of other normal children certainly achieves equality, even within the scope of limited conditions. Including the right to obtain sports activity services. The South Sumatra National Paralympic Committee released that the involvement of athletes in the 2025 Provincial Paralympic Week in Muba Regency is 751 athletes from 17 city districts in the South Sumatra Region, (Adi, 2025). South Sumatra has a population of 30,157 people, (Hetty, 2023). This data indicates that the participation rate of people with disabilities in sports activities is only around 2. Meanwhile, if you refer to national data, the number of people with disabilities is 17.8 million people, (Novrizaldi, 2025) , while those who participate in Peparnas activities are only around 623 athletes or 0.3% of the total incumbents. The data above shows that from the field of sports development, there is still a lot of homework that must be completed by the government in fulfilling the rights of incumbents. Conditions that occur in the field, it is often encountered that children with special needs have difficulty choosing the type of sports activities that suit their body conditions, youth only do activities that are limited to sports that are easily accessible in their environmental areas, for example playing chess and small movements such as badminton. Youth with special needs will find it very difficult to experience exclusive types of sports such as golf and bowling that can be freely played by normal children. In 2023 and 2024, almost 100% of children with special needs at SLB D-YPAC Palembang City have never played golf or exclusive sports of the same kind. To prove this, a questionnaire was then distributed and found from 28 respondents, 70% had a sense of desire to play, 90% of children believed that they were uncomfortable in playing, 80% of children believed that they did not have confidence and 90% of children felt that it was difficult to play, (Kumbara et al., 2024). Meanwhile, research reveals that the development of golf for people with disabilities as an inclusive sport does not yet have a globally recognized reach. In Europe and America, the involvement of golfers with disability status is only 8% of the total healthy golfer population, (Guillaume et al., 2025). The research (Jayabalan et al., 2023) provides an overview of people with disabilities experiencing difficulties due to difficult to access play facilities according to the circumstances.

The above data then encourages researchers to develop the sport of bola petualang as an alternative form of youth competition activities with special needs status in the area of inclusive education. The sport of bowling was developed as a simplification of the game of golf and bowling through the process of modifying rules and movements. Bolang sports are specially designed for children with special needs with the aim of overcoming the desire of children with all limited conditions to still be able to play elite sports done by other normal children. The sport of bola petualang was created as a new sport that is able to represent the desire of children to compete regardless of movement difficulties and physical

limitations. Bolang sports provide space for children with special needs in the area of inclusive education to be able to compete fully by adjusting to all types of people with disabilities.

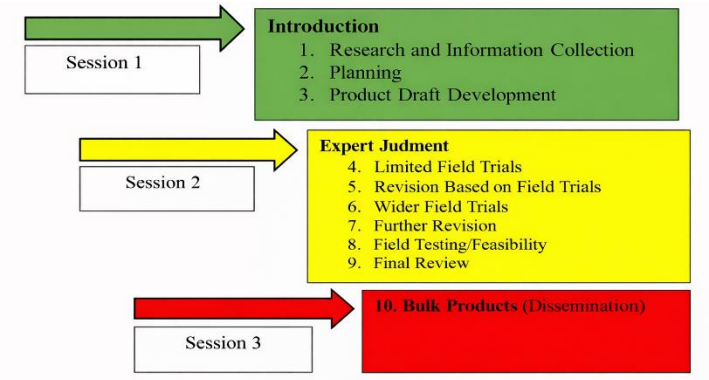
Law No. 8 of 2016 explains several types of people with disabilities including physical, intellectual, mental and sensory variety. Some references regarding the classification of persons with disabilities are (Azzahra, 2020), (Ashar et al., 2019). Persons with disabilities are referred to as physical and non-physical disorders through three types of groups, namely the first group of physical disorders such as the visually impaired, the visually impaired, the deaf and the speech-impaired. The second group is non-physical such as the disabled, autistic and hyperactive and the third group is double difference or sufferers with more than one disorder. The many varieties of people with disabilities above certainly encourage researchers to develop further related to the provision of match numbers and match systems so that every element of the type of people with disabilities in youth with an inclusion education in the city of Palembang can enjoy this sport as a new means of competition in bringing out achievements for youth. The presence of new exclusive sports for inclusive youth certainly provides hope not only to be able to enjoy free time, but also to be used to answer career challenges where nowadays jobs are increasingly difficult and answer the challenge of difficulty in choosing the type of job that suits the condition of disability and reduces the risk of mental burden due to the challenges of uncertain working conditions in their daily lives.

This research aims to develop valid and effective numbers and match systems in the sport of adventure ball (bolang). The development of numbers and systems for adventure ball (bolang) matches includes three groups of people with disabilities, namely the blind group, the deaf group and the blind group. With the development of numbers and match systems formatted through competition tests on incumbents, this rule then allows everyone in the inclusion education environment to enjoy the sport of adventure ball (bolang) with a wide selection of numbers according to their specialties without worrying about the accessibility of movements. The adjustment of the number and the match system is then expected that the person can fully participate in the competition because the number and match system of the adventure ball (bolang) sport have been adjusted to the character of each person.

Method

The procedure for conducting the research uses 10 stages of Borg and Gall by dividing the implementation time into three sessions. In general, the research flow chart can be seen in the image below:

Figure 1. Research Flow Diagram



Session 1:

(a) to raise potential problems through the collection of information both through observation, interviews and other literature studies on the research sample, namely the visually impaired, the deaf and the blind; (b) the researcher concludes that based on the study of potential problems that arise, it is necessary to plan to develop match numbers and systems so that each person can potentially play match numbers based on choice; (c) The plan is prepared on the main design of the number and match system for the types of people with disabilities, deaf and blind.

Session 2:

The expert judment procedure for model validation involves as many as 3 expert fields consisting of 2 psychopathologists, 2 adaptive game experts and 2 competition experts.

The effectiveness test of the blind group (a) on a limited scale was tested by 10 students; (b) revise the results of effectiveness on a limited scale; (c) on a wider scale tested on 20 students; (d) make revisions on a wider scale; (e) on a comprehensive scale involving as many as 50 students; (f) Further final revision to ensure the product is ready for dissemination.

The effectiveness test of the deaf group (a) on a limited scale was tested by 10 students; (b) revise the results of effectiveness on a limited scale; (c) on a wider scale tested on 20 students; (d) make revisions on a wider scale; (e) on a comprehensive scale involving as many as 50 students; (f) Further final revision to ensure the product is ready for dissemination.

The effectiveness test of the blind group (a) on a limited scale was tested by 10 students; (b) revise the results of effectiveness on a limited scale; (c) on a wider scale tested on 20 students; (d) make revisions on a wider scale; (e) on a comprehensive scale involving as many as 50 students; (f) Further final revision to ensure the product is ready for dissemination.

Session 3:

This stage is the last stage where the researcher concludes that the developed match numbers and systems are ready to be applied in official sports competitions.

Experts evaluated and assessed the level of validation of numbers and match systems based on the indicators in the table below:

Table 1. Expert Examination Indicators

Groups	Examination Indicators	Observation Description	Focus	Groups			Number of Items
				A	B	C	
Classification and Eligibility	Eligibility and Classification	The numbers and match system developed accommodate the range of motion in the disabled group	Limb deformities	√			3
			Severe hearing loss		√		
			Low vision			√	
	Minimum Impairment Criteria	The number and match system have clear criteria for the severity of the disability group	Walking with the help of a cane	√			3
			Greater than 90 decibels		√		
			Light projection			√	
	Classification System	The number and match system have made it a requirement that athletes be grouped by gender	Men and Women	√	√	√	3
Accessibility and Inclusivity	Facilities	Match numbers and systems require the availability of easily accessible facilities	Playground	√	√	√	3
	Adaptive Equipment	Match numbers and systems guarantee the suitability of the tools	Game tools	√	√	√	5
	Training and Instructors	Match numbers and system make training easy	Skill type	√	√	√	2
Safety and Comfort	Risk of Injury	Match numbers and systems are safe against potential injury risks	All movements	√	√	√	5
	Physical and Mental Well-Being	Positive impact on health and wellness	Physical and mental development	√	√	√	2
	Convenience	Comfort level in mobility	Mobility	√	√	√	1
Potential for Participation and Development	Long-term participation	Match numbers and systems are able to attract interest and last over time	Long-term participation	√	√	√	1
	Governance	Match numbers and systems make it easy to manage the match system	Human resource development	√	√	√	2
	Policy and Funding	The number and system of matches do not burden policy and funding aspects	Policies and funding support	√	√	√	2
		Number of Items					32

(Source: Researcher Document, 2025)
Description :
A : Physical Handicap

B : The Deaf
C : The Blind

Based on the information on the validity results above, it is then continued by testing the number and match system developed through competition tests. The assessment of the competition test for the implementation of numbers and match systems is based on indicators of the number of participants, match times, match rules and field adjustments based on the table below:

Table 2. Competition Test Assessment Indicators

Indicator	Description of Assessment	Assessment Focus	Groups			Number of Items
			A	B	C	
Number of Participants	Certainty of the involvement of the number of participants without obstacles	Estimation dassa	√	√	√	2
Match Time	Certainty of match times with the number of participants available	Crowd and Match Time	√	√	√	2
Competition Rules	Ensure that all the rules of the match are met	Implementation of rules	√	√	√	5
Field adjustment	Certainty of participants' adaptation to field conditions	Mass adaptation	√	√	√	1

(Source: Researcher Document, 2025)
Description :
A : Physical Handicap
B : The Deaf
C : The Blind

The gradation of the answer to each statement item refers to the scale of the agreement and disagreement, (Yulianto, 2023). To calculate the percentage of the value the following formula is required:

$$P\ \% = \frac{Max\ Score}{Achievement\ Score}\ x\ 100$$

The analysis of the validity of the data and the effectiveness of the model is carried out by calculating the percentage of values then matched in the table below:

Table 3. Model Validity and Feasibility Criteria

Value (%)	Criteria	Results (Effectiveness)
79,78 - 100	Highly Valid	Products are ready to be used in the field
59-52 - 79,77	Valid	Can be used but needs to be added at the missing points
39,26 - 59,51	Less Valid	It is recommended not to be used as it needs to be revised in detail
19,00 – 39,25	Invalid	Cannot be used

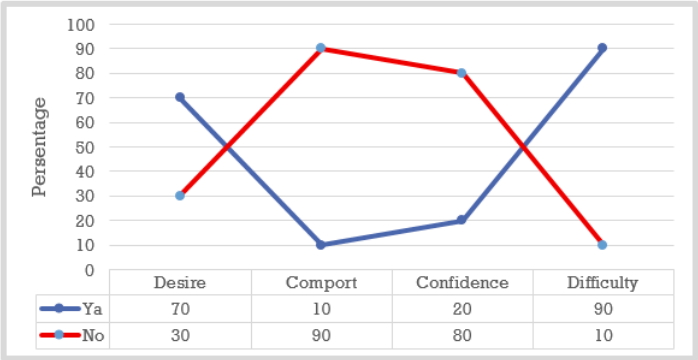
Source : (Riefani, 2020)

Results

Sesion 1:

Special findings through a series of needs analysis activities obtained information that 95% of the youth who were the object of the study had never played exclusive sports such as golf and bowling based on data from 2023, 2024 until now. To strengthen this, the researcher then distributed a questionnaire by measuring aspects of desire to play, aspects of comfort, aspects of confidence and aspects of difficulty. While the results can be seen in the graph below:

Figure 2. Students' Perception of Exclusive Sports



The graph above explains that the desire of youth to play exclusive sports is high, namely 70%, but 90% of them feel uncomfortable, 80% give a response of lack of confidence and 90% of them feel difficulties if they have to play exclusive types of sports such as golf and bowling. This data then provides a strong impetus for researchers, to develop a new game, namely adventure ball sports as a competition tool that can represent all aspects of the feelings and desires of youth to compete in the field of sports without worrying about the accessibility suffered. To ensure that all types of people can be involved, development is then carried out by involving several classifications of people, namely the visually impaired, the deaf and the blind.

Session 2:

Expert Judgment:

Table 4. Validation of Bolang Sports Design

Competition Criteria	Order	First Person	Second Person	Caption Value	
				Mean	Information
Physical handicap	Psychophysiology	91.4	92.7	90.8	Highly Valid
	Adaptive Games	94.4	90.6		
	Competition	86.3	89.6		
The Deaf	Psychophysiology	90.2	84.3	88.1	Highly Valid
	Adaptive Games	88.3	92.3		
	Competition	82.7	90.6		
The Blind	Psychophysiology	72.3	72.4	74.7	Valid
	Adaptive Games	77.5	77.4		
	Competition	74.7	73.6		

(Source: Researcher Document, 2025)

Based on the validation table above, it is explained that the counter numbers developed for the disabled group have very valid information because the validity percentage value is 90.8%. The same thing in the deaf group has very valid information because the percentage of validity value is 88.1%. Meanwhile, the blind group has valid information because the percentage of validity value is 74.7%.

Table 5. Effectiveness Test

Competition Criteria	Skala			Mean	Keputusan
	Limmited	Wide	Feasibility		
Physical Handicap	91.6	90.9	90.2	90.9	Games are ready to be used in the field
The Deaf	94.2	91.1	87.5	90.9	Games are ready to be used in the field
The Blind	77.3	76.6	81.8	79.6	It is recommended not to be used as it needs to be revised in detail

Limmited Field Trials

The number and system of matches tested on the limited field explained that for the blind group there was a percentage of 91.6% with the status of a game ready to be used for competition, the same thing in the deaf group had a percentage of 94.2% with the status of a game ready to be used for competition.

Meanwhile, the blind group has a percentage of 77.3% with the game status can be recommended but needs to be improved.

Revised Based on Fields Trials

After distributing the questionnaire to a number of samples in a limited field test, some of the notes that the researchers concluded to revise the results of the development of numbers and match systems can be seen in the table below:

Table 6. Revised Based on Fields Trials

Notes	Clasification	Revised Results
Match Number	Physical Handicap	Appropriate
	The Deaf	Appropriate
	The Blind	Appropriate
Match System	Physical Handicap	Appropriate
	The Deaf	Appropriate
	The Blind	Each player must be accompanied by a guide
		Warning of danger signs informed through the guide
		The field is adjusted to the player's circumstances by getting closer to the distance but the width size remains the same
		Harmful rules reviewed

Wider Fields Trials

The numbers and match systems tested on the wider field explained that for the blind group there was a percentage of 90.9% with the status of the game ready for the competition, the same in the deaf group had a percentage of 91.1% with the status of the game ready to be used for the competition. Meanwhile, the blind group has a percentage of 76.6% with the game status can be recommended but needs to be improved.

Further Revision

There are still few records before the numbers and match system were refined to become the rules of the game. These records can be seen in the table below:

Table 7. Description of Large-Scale Revision

Notes	Revision Notes	Repairs
Match Number	Appropriate	No Revisions
Match System	In the blind group The distance between the fields is distanced, this has the potential to interfere with the player's auditory focus	Given a distance between the fields of approximately 10-15 meters
	The rule of the position of the throws on advanced throws, players are often seen stealing the limit.	Provides a line marked with chalk or colored ciran when the player is about to throw. This indicates that players should not cross the mark.

Thorough Field Test/Feasibility

The numbers and match systems tested on the thorough field explained that for the blind group there was a percentage of 90.2% with the status of the game ready for the competition, the same in the deaf group had a percentage of 87.5% with the status of the game ready to be used for the competition. Meanwhile, the blind group has a percentage of 81.8% with the status of games ready to be used for competitions.

Final Riview

Based on the results of a thorough field test, no elements of improvement were found in the number and match system that had been determined. All have the meaning that the number and system of the ball match are ready to be applied on the field.

Session 3:

Bulk Product:

The result of this study is in the form of a technical guidebook regarding the regulation of the game of bowling which contains instructions on the rules of numbers and the system of adventure ball matches. The rules of the number and the match system are determined based on the final results of the comprehensive scale test or the effectiveness test of the guidelines.

Discussion

This study examines the development of numbers and match systems in new sports. This sport is prepared for the needs of youth in an inclusive education environment. The reason is because exclusive sports have not accommodated the desires of most people in exercising. The bottom line is that some listeners are eager to compete but accessibility is a hindrance. Research (Elipe-lorenzo et al., 2025) inhibits people from participating in achievement sports due to coaching factors, ableist mindsets, negative and discriminatory attitudes, limited access to information and supporting facilities. The other side (Hillan et al., 2023) explains that sports offerings that do not pay attention to individual preferences also hinder people from participating. Adventure bolang sports will begin to be developed from 2024. This sport adopts several types of exclusive sports that are very difficult for youth to play in an inclusive education environment such as golf and bowling. While in previous years, even until now, the right inclusion for people with disabilities, especially in Indonesia, has not been found in the development of sports similar to the game of golf and bowling.

After the research was carried out, it was found that the results of the validation of the number design and the match system where that the experts responded where the numbers and match systems in the adventure ball sport (bolang) that the physical handicap group had a validity of 90.8%, while the deaf group had a validity rate of 88.1% and the blind group had a validity rate of 74.7%. The assessment was given by a number of experts, namely Psychophysiology experts, adventurous game experts and competition experts. Each expert agreed that the number and system of the match are valid and the game is ready to be applied on the field. Meanwhile, the results of the effectiveness test through feasibility tests on a number of research samples explained that the physical handicap group had a result of 90.9%, meaning that the number and system of adventure ball sports matches could be applied to the physical handicap group. The same thing in the deaf group has a result of 90.9%, meaning that the number and system of adventure ball sports matches can be applied to the deaf group. While the blind group had a result of 79.6%, slightly lower than the other groups, it means that the numbers and system of adventure ball sports matches can be applied to the blind group, only in this group special attention and some further improvements are needed so that it can be truly accepted as the official rules of the game.

The basis for the development of inclusion in playing golf has been carried out by several researchers, for example (Hawkes & Bennett, 2023), (Parziale & Luigi, 2023) but with the conditions of the rules made, researchers believe that people with disabilities, especially in some regions of Indonesia, will still have difficulty participating because still with the pattern they do, players need a cost that is not cheap. The above results then support that the sport of adventure football provides the reality of the birth of new competitions for groups with disabilities. This can certainly reduce the gap in exclusivity in certain sports. A study (EA et al., 2014) illustrates that the average difficulty of people with disabilities in their involvement in sports activities is due to facilities, transportation and accessibility. Another factor explained by (Bonnell et al., 2021), (Ralph et al., 2022) is the influence of cost. All types of exclusive sports have the reality of both facilities, transportation, accessibility and the cost is very burdensome for people to participate. While the sport of adventure football provides new hope for every person without worrying about the above inhibiting factors. The sport of adventurous ball (bolang) offers every person how to play golf. The advantage of this adventurous ball sport is that the game provides an opportunity for people to enjoy an atmosphere like playing golf without worrying about the influence of mobility, cost, and other facilities. Currently, researchers are developing match numbers and match systems that are suitable for several groups of people with disabilities, namely the physical handicap group, the deaf group and the blind group. From the development of the number and match system, adventure ball sports can be enjoyed by groups of people with disabilities, groups of the deaf and blind. Each group can play several match numbers such as single numbers, double numbers, mixed numbers and team numbers.

This research has the advantage that the experts who are assigned to carry out validation are experts who have expertise in their fields, so that the results of the validity of the research are relevant to the results of the effectiveness test on the sample, this causes that the number and system of adventure ball sports matches can be applied in the field. Another advantage is that the numbers and match system are arranged based on the needs of several groups of holders, meaning that this game can not only be enjoyed by one group with a choice of one number but many numbers available. The weakness of this study is that the limited number of samples with limited locations makes researchers worried that in some areas outside South Sumatra the number rules and the designed match system may not be representative of the character of the people. For this reason, it is hoped that the future research group can conduct a study that the sport of bolang must be accepted by all people, not only in the South Sumatra region, but must be validated at a wider level on an international scale, so that this sport can be accepted and played by people with disabilities around the world.

Conclusions

Based on the results of research on the development of new sports branches, efforts to encourage the achievement of youth with an inclusion education (number engineering and adventure ball match system), it is concluded that the presence of adventure ball sports has an impact not only on the fitness aspect but also on the impact of achievements in the field of exclusive sports. The results of this development provide information that the sport of bowling can be played by groups of people with disabilities, deaf and blind people in full competition through match numbers, namely single numbers, double numbers, mixed numbers and team numbers as well as the match system that overshadows them without worrying about accessibility and mobility of the incumbents. Furthermore, this research can be used as a study material as a means of comparison and inspiration for researchers in innovating the development of similar research as an effort to design new games for the needs of youth in an inclusive education environment.

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