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Validity and Reliability of Sign Language Vr Media for Deaf Children's Motor Skills

Fahmil Haris[1], Nugroho Susanto[1], Muhamad Ichsan Sabillah[2], Sari Mustika[3], Fauzan Aulia[4], Johandri Taufan[5], Nessya Fitryona[4], Uswatul Hakim[4]

[1]*Faculty of Sport Science, Universitas Negeri Padang, Indonesia*
[2]*Faculty of Health and Sport Science, Universitas Negeri Surabaya, Indonesia*
[3]*Faculty of Tourism and Hospitality, Universitasn Negeri Padang, Indonesia*
[4]*Faculty of Language and Arts, Universitas Negeri Padang, Indonesia*
[5]*Faculty of Education, Universitas Negeri Padang, Indonesia*

Correspondence:
Muhamad Ichsan Sabillah
Faculty of Health and Sport Science, Universitas Negeri Surabaya, Indonesia, muhamadsabillah@unesa.ac.id

Abstract: *This study aims to validate the gesture coordination learning media based on virtual reality (Vr) technology in sign language in improving the motor skills of deaf children. The method of this research is quantitative descriptive. The data collection technique was through the FGD focus group discussion by asking for opinions from 9 experts consisting of: 3 experts in the field of learning media, 3 experts in the field of children with disabilities, and 3 experts in the field of design and ergonomics, as well as 3 experts from extraordinary school teacher practitioners. The research instrument used a questionnaire given to experts to validate the sign language virtual reality (vr) technology-based motion coordination learning media that had been designed. Data analysis uses narrative to develop a design for motion coordination learning tools based on Virtual Reality (Rv) technology, and Aiken's V analysis to test the validity of motion coordination learning media instruments based on Virtual Reality (Rv) technology, and the cronbach alpha test to test the reliability of the instrument. The results of the study show that in the content aspect of the result of the Aiken's V coefficient of 0.888, the design aspect shows the coefficient value of Aiken's V of 0.902, and the aspect of use shows the coefficient value of Aiken's V of 0.891. Furthermore, an average reliability score of 0.831 was obtained. This means that it can be concluded that all aspects of the gesture coordination learning media based on virtual reality (VR) technology in sign language to improve the motor skills of deaf children have high validity and reliability of the content of the instrument.*

Keywords: *Learning, virtual reality, motor, deaf*

Introduction

The rapid development of communication media at this time encourages seriousness in preparing learning that is easy to understand and easy to implement, while the media technology used by deaf children today in communicating is still in a limited category, including hearing aids (hearing aids), cochlear implants, speech therapy, sign language, and lip-reading (Hermawati & Pieri, 2020). Based on previous research on teaching media technology, researchers want to revolutionize previous learning media that can be repeated to get a clear and effective understanding by children with hearing and speech limitations. Researchers want to provide solutions for children with deaf disabilities in language understanding (Kumala et al., 2022). To overcome the obstacles they face and live independently and productively. It is necessary to pay serious attention to prepare a stimulus for the coordination of hand and foot movements of children with disabilities, as expressed among others: Visual stimulation (Cornejo et al., 2021). Visual stimuli arise because of the object of the image, color, form, so that it can be explored based on direct observation (Adaval et al., 2019; Galvez-Pol et al., 2020). Limitations in coordinating limbs in moving deaf children need serious attention to provide health and fitness for children who have communication barriers (Veiskarami & Roozbahani, 2020). Children who have communication barriers (deaf children) in obtaining lessons also have an impact on communication barriers between teachers and students with special needs (Ntinda et al., 2019). This is very worrisome about the lack of physical fitness and the disruption of the health of the deaf (Calgaro et al., 2021).

There are various movement delays for deaf individuals who experience delays ranging from moving, using their hands and feet, sitting, and speaking (Mishra, 2022). This causes deaf individuals to move more slowly compared to normal individuals. So that it has an impact on mastering self-help skills independently (Grattan & Demchak, 2024). One of the efforts to be able to help improve the motor development of people with deaf disabilities is to follow a learning guide that uses sign language. The communication approach requires a repetitive, varied, and interactive rehabilitation system (Hart et al., 2019). This kind of rehabilitation can utilize VR (Virtual Reality) technology.

Virtual Reality has many features in helping a series of rehabilitation processes. The combination of traditional cognitive medicine and VR-based methods can provide an interactive, effective and safe approach effect for the treatment of individuals with disabilities (Park et al., 2019). Therefore, current research addresses the contribution of VR to improving skills and motor, which makes them more independent and capable of performing daily tasks. VR technology is increasingly recognized as an effective tool for the rehabilitation of cognitive processes and functional abilities. VR rehabilitation framework for cognitive development first proposed by Rizzo Stasolla et al. (2023) intended for children with ADHD (Attention-Deficit Activity Disorder). Book Cheung et al. (2022) create a VR game system to prepare meals for individuals with intellectual disabilities. Peng et al. (2021) stated that VR methods play an important role in rehabilitation, especially rehabilitation of motor function recovery. VR-based methods, especially in the form of activities that resemble games, are able to move and perform physical activities.

Forms that help the development of these two aspects are usually given repetitive therapy (Schaper et al., 2020). But of course, if the rehabilitation system is not motivating, participants will get bored quickly. Therefore, researchers carry motor movement training in the form of play activities as a rehabilitation technology, because it can provide variety, exciting sensations and motivation to users. In this case, of course, it is not only the exciting aspect that is considered in designing a rehabilitation system (Charles et al., 2022), For this reason, an appropriate exercise guide system design is needed. An appropriate motion coordination design system to improve visual ability to understand information In order to make the instructions more immersive, HMD (Head Mounted Device) in the form of virtual reality is also provided to the user (Kourtesis et al., 2019). But of course, it must be conceptualized as an easy-to-understand movement indicator appearance control that is low-cost. Thus, it is necessary to know the feasibility of the product for the development of a sign language interactive video system that is low-cost, easy to use, and interactive for users. This research seeks to develop the knowledge of deaf children themselves in obtaining instructions and directions from sign language experts through the media because it is not easy to get information media for deaf children (Mohammdi & Elbourhamy, 2023). Based on previous research, the purpose of this study is to test the feasibility of the validity and reliability of the development of motion coordination learning media based on virtual reality (VR) technology-based sign language to improve the motor skills of deaf children.

MATERIALS AND METHODS

Study Participant

Validation of gesture coordination learning media based on virtual reality (Vr) technology in sign language using expert or expert assessment. The assessors consisted of 9 experts, including: 3 experts in the field of motion learning media, 3 experts in the field of children with disabilities, and 3 experts in the field of design and ergonomics, as well as 3 experts from extraordinary school teacher practitioners.

Research Design

This study uses a type of quantitative descriptive research with a development approach.

Research Procedure

The data collection technique uses FGD. The research instrument used a questionnaire given to experts to validate the gesture coordination learning media based on virtual reality (Vr) technology in sign language that had been designed with a score of 1 – 5. The score contains the determination of "very good (5)", "good (4)", "quite good (3)", "less (2)", "very poor (1)". The content of the statement item consists of 3 aspects, namely the content aspect, the design aspect, and the use aspect. and continued with the cronbach alpha test to test the reliability of the instrument.

Analysis Data

Data analysis uses Aiken's V analysis to test the validity of the test instrument, and continued with the cronbach Alpha test to test the reliability of gesture coordination learning media based on virtual reality (Vr) technology using sign language using the help of microssoft excel.

Results

Aiken's V Validity Results

The aspect of motion coordination learning media based on virtual reality (Vr) technology in sign language has experts consisting of 9 experts, namely: 3 experts in the field of motion learning media, 3 experts in the field of design and ergonomics, and asked for the opinions of 3 experts from SLB teacher practitioners, which includes assessment aspects: 1) Content aspect, 2) Design aspect, 3) Usage aspect. Expert assessments use a range of 1 to 4. The assessment is closer to number 1 the less relevant, the closer the assessment is to the number 4 the more relevant. The assessment data was then quantitatively analyzed using Aiken's V formula to test the validity of the motion coordination learning media based on virtual reality (Vr) technology. The results of the acquisition of Aiken's validity test data are as shown in Table 1 below:

Table 1. *Aiken's V Validity Test Results*

Statement	Assessment									V	Information	Aspects
	1	2	3	4	5	6	7	8	9			
1	5	4	5	5	5	4	5	5	4	0.91667	Tinggi	
2	5	4	5	4	4	5	5	5	4	0.88889	Tinggi	
3	5	5	5	4	4	4	4	4	5	0.86111	Sedang	
4	5	4	5	4	5	5	5	5	4	0.91667	Tinggi	
5	5	4	4	4	5	4	4	5	4	0.83333	Sedang	Fill
6	5	4	5	4	4	5	5	5	4	0.88889	Tinggi	
7	5	5	5	5	4	5	5	4	4	0.91667	Tinggi	
Mean	5	4.28	4.85	4.28	4.42	4.57	4.71	4.71	4.14	0.88889	Tinggi	
1	5	4	4	5	5	4	5	4	4	0.86111	Sedang	
2	5	5	4	5	5	4	5	5	4	0.91667	Tinggi	
3	5	5	4	5	4	4	4	5	4	0.86111	Sedang	Design
4	5	5	5	5	5	4	5	5	4	0.94444	Tinggi	
5	5	5	4	5	5	4	4	5	4	0.88889	Tinggi	
6	5	5	5	5	5	4	5	5	4	0.94444	Tinggi	
Mean	5	4.83	4.33	5	4.83	4	4.66	4.83	4	0.90278	Tinggi	
1	4	4	5	4	5	5	5	5	5	0.91667	Tinggi	
2	5	5	5	5	5	4	4	4	4	0.88889	Tinggi	
3	5	4	4	5	5	4	4	4	4	0.83333	Sedang	
4	5	5	4	5	4	4	5	4	4	0.86111	Sedang	
5	5	4	4	5	4	5	5	4	4	0.86111	Sedang	Use
6	5	5	5	4	5	5	5	4	4	0.91667	Tinggi	
7	5	5	5	4	5	5	5	4	4	0.91667	Tinggi	
8	5	5	5	5	4	5	4	5	4	0.91667	Tinggi	
9	4	4	4	5	5	5	5	5	4	0.88889	Tinggi	
10	4	4	5	4	5	5	5	5	5	0.91667	Tinggi	
11	5	5	4	5	5	4	4	5	4	0.88889	Tinggi	
Mean	4.727	4.54	4.54	4.63	4.72	4.63	4.63	4.45	4.18	0.89142	Tinggi	
Overall Mean Score	4.90	4.55	4.57	4.64	4.66	4.40	4.67	4.668	4.10	0.894361	Tinggi	

Based on table 1. The aspect (content) shows the average result of Aiken's V coefficient of 0.888 including the medium category, the aspect (design) shows the average value of Aiken's V coefficient of 0.902 including the high category, the aspect (use) shows the average value of Aiken's V coefficient of 0.891 including the high category. Based on the classification of validity submitted by (Duke et al., 2020) are as follows: $V < 0.00$:invalid, $V \leq 0.4$ low validity, $0.4 \leq V \leq 0.8$ low validity, and $V \geq 0.8$ high validity. The average value of all aspects shows that the coefficient value of Aiken's V is 0.894, so it can be concluded that all aspects of the gesture coordination learning media based on virtual reality (Vr) technology with sign language for the motor deaf have high or valid content validity.

Instrument Reliability Results

Based on statistical analysis using the Cronbach Alpha formula, the following data are obtained:

Table 2. *Instrument Reliability Test Results*

Assessment	X
1	117
2	109
3	108
4	110
5	113
6	105
7	111
8	109
9	98
Total Variants	27.861111
Item Variants	6.25
Cronbach Alpha Values	0.8319308
Standard	0.6
Information	Reliable

Based on statistical analysis of reliability tests that have been carried out using the Cronbach Alpha test. The results of the calculation obtained a significance value of $0.830 \geq 0.06$. This means that in the virtual reality (Vr) technology-based movement coordination learning media with sign language for deaf children's motor skills has high and adequate reliability. Therefore, it has been declared reliable and has a high level of consistency and stability.

Discussion

Based on the results of the study, it can be discussed in this study, namely that the sign language virtual reality (Vr) technology-based movement coordination learning media for deaf motor children has a fairly high level of validity and reliability. The validation sheet was filled out by 9 experts, namely: 3 experts in the field of motion learning media, and 3 experts in the field of design and ergonomics, and asked for opinions from 3 experts from SLB teacher practitioners.

In June 2024, the first FGD was carried out and received comments and suggestions from experts to optimize movement coordination learning media based on virtual reality (Vr) technology, especially for people with hearing impairments, including the following: a) the materials used are ensured to be of good quality and safe to use for users, b) must pay attention to the dimensions or size of the device so that it is stable, c) need information on the function of VR tools, d), e) pay attention to the safety of using virtual reality (VR) tools.

After the first FGD was carried out by 9 experts, then the researcher improved the design of the virtual reality (Vr) technology-based learning media according to the advice of experts or experts. One month later, a second FGD was held again in July 2024 to see the extent of the development of the learning media carried out by experts, and can summarize some comments from experts as follows: a) virtual reality (VR) tools have undergone changes for the better in terms of materials, safety, comfort and accuracy. b) from the aspect of designing a framework for learning media based on virtual reality (Vr) technology for deaf children is good, c) the learning media is adaptive so that it is suitable for people with disabilities to be used, d) virtual reality (Vr) technology-based learning media can help teachers or trainers to improve motor skills for people with deaf disabilities and are easy to carry anywhere, e) virtual images have functioned well and the objects of learning media have been seen very clearly and easily interact with the environment in front of them, e) visual videos in each motion learning model are good, f) the display of colors and images has been able to attract the attention of people with deaf disabilities.

Research findings on virtual reality (Vr) technology-based motion coordination learning media corroborate the findings (Alim et al., 2023; Susiono et al., 2024) which states that the V coefficient above 0.760 indicates adequate content validity. In other words, the design of a gesture-based virtual reality (Vr) technology-based motion coordination learning media to improve the motor skills of deaf children has been supported by nine academic and professional experts. Their ranking shows that the virtual reality (Vr) technology-based motion coordination learning media has high content validity. Experts support the learning media of movement coordination based on virtual reality (Vr) technology, which is the last learning medium to improve motor skills for people with disabilities.

In addition to having high validity, sign language virtual reality (Vr) technology-based motion coordination learning media to improve the motor skills of deaf children must also be measured for reliability. After being analyzed, the physical fitness test instrument has a reliability value using the Cronbach Alpha formula ≥ 0.06, which means that the virtual reality (Vr) technology-based motion coordination learning media has a very good reliability value. This is reinforced by the findings (Taber, 2018) who said that the Cronbach Alpha value above 0.06 shows that it has high enough reliability, so the virtual reality (Vr) technology-based motion learning media is feasible to use.

In the first stage, the definition of virtual reality (Vr) technology-based motion learning media for the deaf was derived from a literature review with thematic analysis, showing that it is a tool that can be used as a learning medium for the deaf. To ensure the quality of technology-based learning media for deaf children, it is necessary to have empirical content, validity and reliability (Mohamad et al., 2015). On the one hand, if the virtual reality (Vr) technology-based motion learning media for deaf people used in the study shows high content validity and reliability, it means that the learning media can effectively fulfill the function of its use in accordance with the intended goal of improving the motor skills of deaf children.

Therefore, it can be concluded that all aspects of motion learning media based on virtual reality (Vr) technology for the deaf to improve motor skills have excellent content validity and reliability. The results of the validity of the content in this study can be used as a basis for testing with users. The empirical results of the trial will strengthen the validity and reliability of this trial. This virtual reality (Vr) technology-based motion learning media has been specially designed for children with deaf disabilities with the aim of improving children's motor skills.

Conclusion

Based on the results and discussion, it can be concluded that the virtual reality (Vr) technology-based motion coordination learning media has high content validity according to the Aiken Criteria. The average value of all aspects shows that the coefficient value of Aiken's V is 0.894, so it can be said that all aspects of the virtual reality (Vr) technology-based movement coordination learning media to improve motor skills for the deaf have high or valid content validity. It is recommended to further strengthen this virtual reality (Vr) technology-based motion coordination learning media by carrying out empirical validity and reliability.

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