

## The Biomechanical Analysis of Movement's Skills Accuracy of Smash in Badminton of The Deaf Students

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### Abstract

The physical condition and movement systems of deaf students are the same as normal students in general. One sport that suits the needs of the deaf to develop their potential is badminton. In badminton, there is a forehand smash, which is an accuracy exercise using the drill method. In addition to the drill method, the biomechanical aspects of the smash motion such as the initial stage, hit and advanced motion determine the accuracy of the smash. The purpose of this study is to analyze the stages of pre-stage, strike and follow-up motion to produce smash accuracy for the deaf students. This type of research is a survey, with a sample of 14 deaf students consisting of 8 male and 6 female aged 16 years and over. Data collection techniques using test methods and recording results. The data analysis uses quantitative descriptive. The result of this research is that the average accuracy of badminton smash hits is in the low category and movement skills are in the adequate category. In the pre-stage of badminton skills, it affects 21% of the accuracy of the smash, the hit stage affects 71% of the accuracy of the smash and the advanced stage of movement affects 50% of the accuracy of the smash. The conclusion from this research is the stage of exposure affects the results of the accuracy of badminton smashes more, so it is necessary to teach more drill exercises and variations of drill smashes to deaf students in order to produce good smash accuracy.

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## INTRODUCTION

The deaf children have a physical appearance that is almost the same as normal children in general (Atmaja, 2018). The difference is only when speaking, usually the deaf speak without a voice or in an unclear voice and many use sign language to communicate. Three of every 1000 children are born with hearing loss and as a surprised finding, 90% are born from the hearing parents (Hoffman et al., 2010). According to the American Speech-Language Hearing Association, ear hearing loss is classified as low (20-40 dB), adequate (40- 60 dB), bad (60-80 Db) and very bad (more than 80 dB loss) (Danermark et al., 2013). A person is deaf if s/he loses the ability to hear at a level of 70 dB (decibels) ISO or more, someone is said to be hearing less if s/he loses hearing at 35 dB (decibels) ISO (Moores & Donald, 1982). So, it can be concluded that someone who is not or less able to hear voices is said to be deaf (Soemantri, 2007).

The characteristics of the deaf children when compared to other disabilities are not clear, because at first glance they do not appear to be physically impaired (Somad & Tati Hernawati, 1996). This can be seen when deaf people have difficulty pronouncing words due to a lack of vocabulary. This is also corroborated by the opinion of Van Uden (1977) that as a result children are not only deaf but language impaired either.

Furthermore, Grige Leigh (2000) suggests that deaf children generally suffer from oral communication disability, which will hinder the development of language skills. With the development of children's language, it is not surprising that the level of reading achievement for deaf children is far below that of normal children (Moores, 1987). Therefore, children who have multiple disorders, namely deaf and dumb, must be trained repeatedly to pronounce precise and clear word articulations. This repetitive method is also called the drill method (Atmaja, 2018). The drill method also has advantages and a positive influence on the achievement of letter, word and motion recognition (Ozdemir, 2015). The drill method is also used to hone individual abilities and

psychology to achieve the achievement (Widyaningsih, 2018).

Besides being taught about grammar, the deaf must also be introduced to sports to provide maximum social, cognitive and skill development (Malow, 2019). Learning sports with joy can foster self-confidence so that they do not feel isolated from the environment (Taringan, 1999; Wijayanti et al., 2012). Badminton is a sport that is in accordance with the development of individual physical disabilities (Yuksel, 2018). The early or young age sports can be fostered over a relatively long period, one of them is badminton (Alvindo, 2014; Pardiman et al., 2018). The sports' coaching in achieving maximum sports achievement requires sustainable stages (Sari et al., 2017). Badminton can be played alone or in pairs, either male, female or mix (Davis, 1997; Yuliawan, 2014). In badminton, achievement coaching is carried out systematically, planned and continuously (Santoso et al., 2017). The development process by calculating age, the badminton peak achievement can be achieved around the age of 18 to 23 years, and the beginning of exercise at the age of 10 to 11 (Bompa, 2009; Meiyanto et al., 2019).

The deaf physical condition is normal like normal children, so that any sport can be done and learned (Atmaja, 2018). The benefits of physical activity for deaf students are very important for the development of their bodies (Barboza et al., 2019). In addition to convey sign language, the drill method can also be used to practice accuracy (Krix Luther, 2020). The badminton smash is one of the accuracy exercises using the drill method (Sapta Kunta, 2010: 28). The drill method can be used to hone motor skills and one's skills to achieve effective and efficient movement (Singer, 2010; Wiliyanto et al., 2018). Skills are the ability to use reason, thought and creativity to make something more meaningful (Sutiyawan, 2015; Wahyudi et al., 2018).

To illustrate, delivering badminton smashes to deaf students must be accompanied by practice (Powers, 2002). Using game modifications can improve badminton smash results (Widiastuti et al., 2018). The strength is the main aspect and final quality of the smash (Li et al., 2016). The forehand smash is the strongest and fastest

offensive shot ever (El Gizawy, 2014). Apart from being hard and fast, the smash must be directed and have good accuracy, how to practice good accuracy is by doing repeated exercises from time to time (Krix Luther, 2020). This method of training is in accordance with the drill method for deaf children in increasing their potential (Atmaja, 2018). The smash practice method is to use direct bait to the testees (Pritama, et al., 2014).

In addition to accuracy for determining the results of badminton smashes, biomechanical analysis is ideal and suitable for conducting smash research methodology (Li et al., 2016). The biomechanics is the science of forces acting on the human body and the effects of its producing (Sudarmada, 2015: 2). To produce efficient motion, it is necessary to attain the correct technique because technique is the ability to take advantage of principles or theories in improving skills in an efficient way. The efficient smash is strongly influenced by the laws of motion mechanics or the laws that apply to physics (Muhtar, 2007). The coordination of the body, arm and wrist greatly affects the speed and accuracy of the shuttlecock (Tsai et al., 1998; Rusdiana, 2016). Therefore, improving the smash technique with a good method can increase the stages of the smash movement (James, 2006).

Based on the problem of badminton smash movement skills among deaf students who are still lacking, the researcher is interested in making a study to analyze badminton smash motion skills in deaf students, "the biomechanical analysis of movement's skills accuracy of smash in badminton of the deaf students".

## METHODS

This type used in this research is a survey that aims to get a systematic, factual and accurate picture of the facts and characteristics in making stroke and the accuracy of badminton smashes of the deaf students.

The populations in this study were 14 deaf students aged > 16 years who sat in class X to XII high school with disability category C (deaf) who took badminton extracurricular activities at SLB Negeri Wiradesa, Pekalongan Regency, consisting

of 8 male students and 6 female students. The sample in this study was the same as the total population, they are 14 deaf students aged > 16 years who took badminton extracurricular activities.

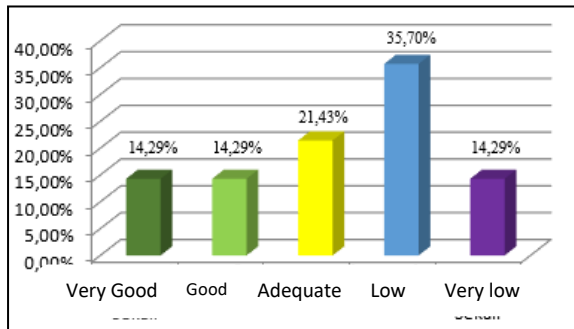
The sampling technique in this study uses total sampling; it is the total of 14 deaf students > 16 years of age who took badminton extracurricular activities at SLB Negeri Wiradesa, Pekalongan Regency in 2020, consisting of 8 male and 6 female. The total students (14 students) will test the shuttlecock with a forehand smash 12 times. When hitting the shuttlecock, the smash movements made by deaf students were recorded using 4 cameras with a resolution of 64 Mega Pixels (MP) located on the front, back, right and left sides and there were 2 assessors, namely from the extracurricular badminton trainer, SLB Negeri Wiradesa Regency, Pekalongan.

The data collection techniques in this study used the test method. The test method here uses 2 test models. The first model uses the smash accuracy test developed by Sapta Kunta in 2010. The second test model is when deaf students hit a smash; there are 4 cameras with 64 Mega Pixel (MP) resolution to record smash movements made by deaf students and use instruments of smash motion skills. The smash is carried out by using a forehand smash for 12 times. Then, the data obtained from this study will be analyzed by using quantitative descriptive data.

## RESULTS AND DISCUSSION

Based on the results of the smash accuracy test that is done by 14 deaf students who age > 16 years in badminton extracurricular activities in 2020 by using interval calculations to calculate the smash accuracy test with the assessment norms by Saifudin Azwar (2001). The results of the smash accuracy test of the deaf students who age > 16 years in badminton extracurricular activities in 2020 are summed up as follow. There are 2 students (14.29%) are in the very good category; 2 students (14.29%) are in the good category; 3 students (21.43%) are in the adequate category; 5 students (35.70%) are in the low category; and 2 students (14.29%) are in the very low category. The

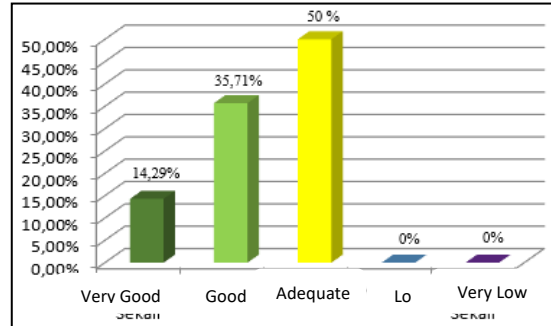
percentage of the all results of the smash accuracy test can be seen in the diagram below.



**Figure 1.1** the Badminton Smash Accuracy Test Result Diagram

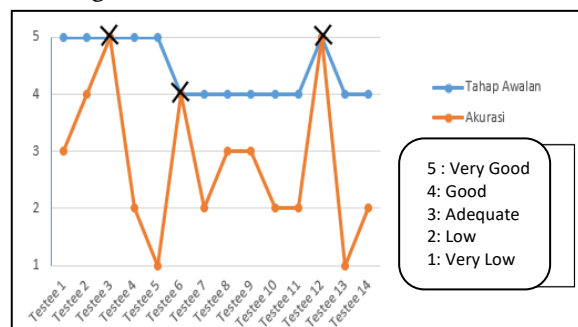
The 14 deaf students aged > 16 years who tested the accuracy of the smash, divided into 6 deaf female students, there were still many shortcomings and the average smash accuracy was in the category of low and very low, while the 8 deaf male students had the average smash accuracy test falls into the good and adequate category. From the data obtained, it can be seen that the results of the badminton smash accuracy research conducted by 14 deaf students aged > 16 years are in the low category.

Two experts assessed the smash movement skills using biomechanical principles, namely the extracurricular badminton trainer at SLB Negeri Wiradesa, Pekalongan Regency, then averaged into one, then analyzed using quantitative descriptions. The result of the smash movement skills test conducted by deaf students aged > 16 years in badminton extracurricular activities in 2020 were 2 students (14.29%) who were in the very good category. Then, 5 students (35.71%) were in the good category, and 7 students (50%) are in the enough category. There are no students in the low and very low category. The results of the smash movement skills test are a combination of several smash stages. The badminton smash stages consist of three stages, namely: the initial stage, the strike stage and the advanced motion stage. In the assessment of the three stages of the smash, it is divided into 5 assessment indicators. The overall results of the research on badminton smash movement skills on deaf students aged > 16 years were in the moderate category.



**Figure 1.2** the Result of Smash Skill Test Diagram

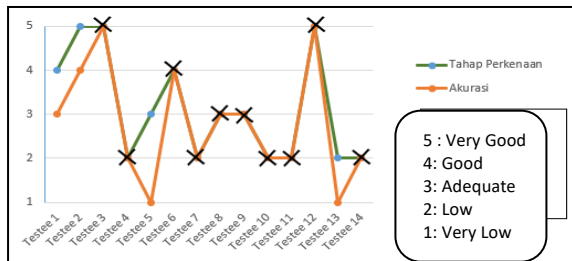
In the pre-stage of badminton smash skills, there are 5 assessment indicators, namely body position, leg position, arm position, upward repulsion and a view towards the shuttlecock. The results of the pre-stage smash skills test conducted by deaf students aged > 16 years in badminton extracurricular activities in 2020 were 6 students (42.86%) which were in the very good category, 8 students (57.14%) were in the good category and there were no student who is into the category adequate, low and very low. The pre-stage of the badminton smash motion carried out by deaf students affects 21% of the smash accuracy results, with 3 similarities in the categories of 14 testes carried out in the initial stage of the badminton smash skill test with the overall test results of the smash accuracy. The test results can be seen in the line diagram below.



**Figure 1.3** the Influence of Pre-stage on Smash Accuracy Result Diagram

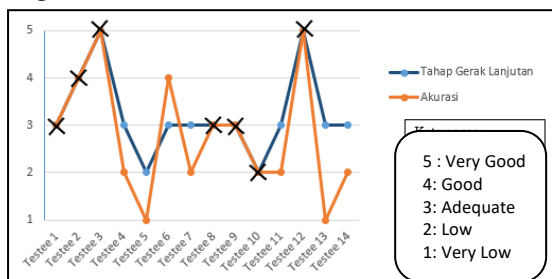
In the badminton smash skill, there are 5 assessment indicators, namely arm swing, racket impact with shuttlecock, forearm and wrist rotation, leg movement and rod rotation. The results of the smash skills test at the modeling stage conducted by deaf students aged > 16 years in badminton extracurricular activities in 2020, there

were 3 students (21.42%) who were in the very good category. Then, there were 2 students (14.30%) were in the good category. Then, 3 students (21.42%) is in the adequate category, 6 students (42.86%) are in the poor category and no students are in the very poor category. The stage regarding the badminton smash motion carried out by deaf students affects 71% of the smash accuracy results, with 10 similarities of the 14 testees carried out in the badminton smash skill test, the related stage with the overall test results of the smash accuracy.



**Figure 1.4** the Influence of Strike on Smash Accuracy Diagram

In the advanced motion stage badminton smash skills there are 5 assessment indicators, namely racket position, body weight, leg position, hip trunk rotation and landing balance. The results of the advanced motion stage smash skills test carried out by deaf students aged > 16 years in badminton extracurricular in 2020, there were 2 students (14.29%) includes in the very good category. Then, 1 student (7.14%) was in the good category, 9 students (64.28%) is in the adequate category, 2 students (14.29%) are in the low category and no student is in the very low category. The advanced motion stage of the badminton smash motion carried out by deaf students affects 50% of the smash accuracy results, with 7 similarities of the 14 testees carried out in the badminton smash skill test in the advanced motion stage with the all test results of the smash accuracy.



**Figure 1.5** the Influence of Advance Follow-up Movement Stage on Smash Accuracy

The results show that the average level of smash accuracy made by deaf students aged > 16 years in badminton extracurricular activities in 2020 is in the low category (35.70%), while the smash skills of badminton are in the moderate category (50%). In smash movement skills, there are three stages that affect the accuracy of the badminton smash that are called pre-stage, strike and follow-up movement.

### CONCLUSIONS

According to the results of the research and discussion of the biomechanical analysis of motion skills, the accuracy of badminton smash of the deaf students, can be concluded that the average accuracy of badminton smash is the low category; and all the result of motion skills is the adequate category. In the pre-stage of badminton skills, the average level is the good category. It affects 21% of the accuracy of the smash. The average motion stage is in the low category; and it affects 71% of the accuracy of the smash and the advanced motion stage with an average of including in good category. It affects 50% of the accuracy of the smash. The conclusion from this research is that the stage of exposure affects the results of the accuracy of badminton smashes more, so it is necessary to teach more drill exercises and variations of drill smashes to deaf students in order to produce good smash accuracy.

The suggestions that are stated by the researcher can relate with the results of the research as follows. 1) For the trainer, always improve the quality of the smash movement skills, which have a low category and vary the drill method on smash accuracy training according to the needs of deaf's motion. 2) For the teacher, evaluating materials to improve the development of badminton smash movements for deaf students. 3) For deaf students, improving shuttlecock practice with a racket and the correct way of swinging advanced motion to produce good smash accuracy.

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