

THE EFFECTS OF DIFFERENT FOCUS OF ATTENTION ON THROWING SKILLS AMONG AUTISTIC SPECTRUM DISORDER CHILDREN

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ABSTRACT

The aim of this study was to examine the effects of external focus (EF) of attention compared to internal focus (IF) of attention instructions on throwing *boules* in a modified-*petanque* game among the ASD children. Ten ASD children aged from seven to 10 participated in this study. They were randomly divided into two groups (i.e., EF and IF). The EF group were instructed to throw the boules so that it moved in a parabolic trajectory as if they were “creating a rainbow” while the IF group were instructed to throw according to conventional techniques, concentrating on the mechanics of the throwing arm during a two-week intervention. Repeated Measures ANOVA between groups and tests (pre and post) measuring the accuracy of the throws showed the EF group performed significantly better compared to the IF group in the post test. Simplified yet effective instructions could elicit effective learning among ASD children.

Keywords: Focus of attention; Autistic Spectrum Disorder; Petanque; Children

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1. INTRODUCTION

Physical Education is one of the subject included in the Special Education curriculum in Malaysia [1]. Learning fundamental motor skills involving gross and fine motor control are included in the Physical Education syllabus for Special Education. Special Education is a programme in the Malaysian government schools catering for students who have special educational needs due to severe learning difficulties, physical disabilities or behavioural problems, including children with autism [1]. Autistic Spectrum Disorder (ASD) is a developmental disability that affects verbal and nonverbal communication, social interaction and these symptoms are significant before the age of three years and affect the performance of the affected child's learning [2].

Motor learning is defined as a relatively permanent change in a person's ability to generate motor skills as a result of training [3]. However, the level of motor control skills varies among the individuals. Motor control is a complex process that encompasses the brain, muscles, limbs and most often associated with manipulating external objects [4]. Individuals with learning disabilities often show developmental delay and have difficulty in performing motor skills when compared with normal individuals [5].

It is estimated that one in every 600 children born in Malaysia is affected with autism and statistics showed that a total of 47,000 Malaysians are autistic [6]. It has been reported that 66.7% of children with autism exhibit problems in motor control compared to their normally developed peers [7-8]. Children with ASD show weakness in motor skills when compared to normal children and the components that showed significant difference from normal children are the object manipulation skills and visual-motor tasks [9-13].

Petanque is a sport that requires manipulative skill (throwing) and visual-object control where the players must toss the *boules* to land close to the *jack* for points [14]. ASD children are also found to be abnormal in two significant components which are the disability in collecting information from the environment and use it to plan for an effective motor control and interference between the input stimuli to the production of motor movement [15]. To plan a motor control movement, the individuals must utilise their cognitive skills in understanding the execution of a movement. Special education researchers suggested that motor control weaknesses among the ASD children was not caused by the autism factors alone but

influenced by the affected individual's cognitive abilities such as language proficiency of understanding verbal instructions given. ASD children with poor motor skills often showed significant weaknesses in social communication skills [12, 16]. Researcher suggested that more research be conducted on the motor skills of the ASD children in relation with their cognitive skills to give more understanding in relation to motor control [17].

External and internal focus of attention play an important role in learning motor skills and instructions for both focus are strongly associated with a person's cognitive level in order to understand the instructions. Attentional focus instruction is defined as directing an individual's attention to specific characteristics in a performance environment [18]. External focus of attention refers to the effects of a movement on the environment. For example, instructing the basketball player to shoot the basketball at the smaller rectangle on the basketball board is an external focus of attention instruction whilst an internal focus of attention refers to the focus on the movement of the body in producing a motor movement [19]. The example for internal focus of attention's instructions on the same shooting skill would be placing the shooting palm under the ball, with the other hand supporting the side of the ball, release the ball with straightening both arms and follow through towards the basket. The researchers conducted an experimental study of throwing darts by using the internal and external focus instructions. Participants with an external focus instructions were directed to focus on the dartboard and throw while another group directed with internal focus instructions aimed to focus on the movements of their throwing arm and wrist during the throw. The findings showed that the external focus instructions' group produced a more accurate performance in throwing darts and produce a stronger correlation between the body dimensions and the kinematic movement of the body. The part of the body involved which is the shoulder, elbow and the wrist positions including the velocities of the movement are in a manner consistent with the task kinematics when the external focus of attention are implemented. Other researchers also conducted a study that showed an increase in standing long jump performance more effective when using an external focus of instructions [20]. Previous study have reported that standing long jump performance was enhanced when participants focus their attention externally instead of their leg action but found no differences when examining peak force. Wu and colleagues [20] examined the kinetic and kinematic

properties associated with the standing long jump that may explain disparities between an internal and external focus of attention and the researchers hypothesised that the external focus condition would exhibit greater impulse values and a more optimal projection angle (45°) than the internal condition. The results showed that the participants in the external focus condition exhibited an average projection angle of 45.7° , compared with the internal focus of attention (49.5°) and baseline (49.0°) conditions.

The first study conducted on the throwing skills among children with learning disabilities was conducted by Chiviacowsky and colleagues [5]. They found that children with learning disabilities who have been instructed to focus on the movement of the bean bag (external focus of attention) have shown an effective motor skills learning compared to the children who were instructed to focus on the movement of their hand (internal focus of attention). Another study [21] replicated the same procedures used by [5] but the researchers used the participants among the children with Attention Deficit Hyperactivity Disorder (ADHD). The participants were divided into two groups. The external focus group was instructed to throw the bean bag so it land right on the bull's eye or the midpoint of the velcro strapped dartboard while the internal focus group was given instructions to focus on the position of the hands, elbows, feet and body while performing the throw. In the study, the researchers found that the external focus instructions indicated a more effective motor skill compared to internal focus instructions for the same participants in throwing skills. The question was whether the same effects would be experienced by people with disabilities such as individuals with autism? Few studies examined the internal focus and external focus of attentions on motor learning among children with learning disabilities [5, 21] but the effects of internal and external focus of attention on motor learning among ASD children are largely unknown. Therefore, this study aimed to investigate the effect of instructions that led to the external focus of attentions (the effect of movement) compared with internal focus of attentions (movement technique) in the boule throwing skills in a modified-Petanque game among children with Autism. The hypothesis of this study suggested that the group with the External Focus of Attention instructions (EF) would perform better in throwing skills compared to the Internal Focus of attention group (IF).

2. MATERIALS AND METHODS

2.1 Participants

The participants in this study were Autism Spectrum Disorder (ASD) boys aged from seven to ten years old from a Special Education government school located in middle-class communities in Penang, Malaysia. The participants were recruited by retrieving data from the schools on their statistics. All participants have mild and high-functioning Autism Spectrum Disorder (ASD) individuals as confirmed by the doctor's diagnosis. They were randomly divided into two groups, one group with the internal focus instructions (n=5) and another group with the external focus instructions (n=5). The permission to conduct the study was obtained from the relevant authorities and teachers of the school. Information on the research was forwarded to the parents and guardians of the participants before obtaining their consent. No objections were received and the participants voluntarily participated in the study.

2.2 Procedures

The Internal Focus of Attention Instructions group (n=5) performed the throwing movements (lobbing) boules according to the instructions that focus on the position of the body, arms and legs during the throw. A boule is the ball used in the game of Petanque. Boules are made of metal, with a diameter of three inches and weighing 1.5 pound [14] but as a modification for this intervention, the researcher used the Geologic 8 Plastic Petanque Boules (Geologic,UK) with the composition of 86.0% water base, 14.0% Polyethylene Low Density (LDPE) and a structure of 100.0% Polyethylene. This type of boules are the most suitable boules for beginners especially children above three years old. The instructions for Internal Focus group were "placing both legs in the circle, hold the boule with palms of dominant hand, grasp the boule and confronted hands down, align the dominant hand forward, straighten the elbow, bend your wrist forward and down until the boule touch on the inside of the wrist. Swing the hand holding the boule backward and forward like a pendulum towards the jack, release the boule with one hand comfortably and move naturally. During the release, roll your wrists up, open your fingers, toss the boule and then follow through.

The External Focus of Attention group (n=5) were instructed to lob the boule so that it moved in a parabolic trajectory by imagining they were creating 'a rainbow' over an imaginary wall,

and control the strength of the throw so that it falls near the jack. The target of both groups was to throw the boule and aim to land closest to the jack for points. A jack is a small ball with a diameter of about one inch and a bright colour such as red or yellow and serves as a marker or target on each throw [14]. Boules measured closest to the jack was considered as the winner. Intervention was conducted for two weeks excluding the pre-test which was held one day before the intervention and the post-test, a day after the intervention. The distance between the jack and the boules was measured at each toss to determine the score of each participant. Each participant performed 10 throws in one set of intervention and finished the interventions with 60 throws in two weeks. The best three throws measurement in each set of interventions were taken for improvements observations. Pre and post tests were performed with five throws and the score was taken for data analysis.

2.3 Data Analysis

In this study, the scores were calculated by measuring the distance between the jack and the boules in centimetres (cm). The data was analysed by the Statistical Package for the Social Science (SPSS) software. Repeated Measured ANOVA between group (EF vs IF) and test (pre, post) with repeated measures on the second factor was utilised. All significant values were set at $\alpha \leq .05$.

3. RESULTS AND DISCUSSION

There was a main effect for tests $F(1,2) = 107,026, p = .01$ and there was a significant interaction between the tests and groups $F(1,2) = 18,684, p < .05$. There was no significant differences in the pre-test between both groups ($p = 0.66$). However, the average score for the External Focus (EF) group ($M = 74.8\text{cm}; SD = 16.7$) was significantly lower than the Internal Focus (IF) group ($M = 148.8\text{cm}; SD = 13.3$) in the post-test (Figure 1). The results clearly proved that the group with the External Focus of Attention Instructions showed more improvements by producing a smaller distance between the boules and the jack which indicated better performance in petanque compared to the group with Internal Focus of Attention Instructions.

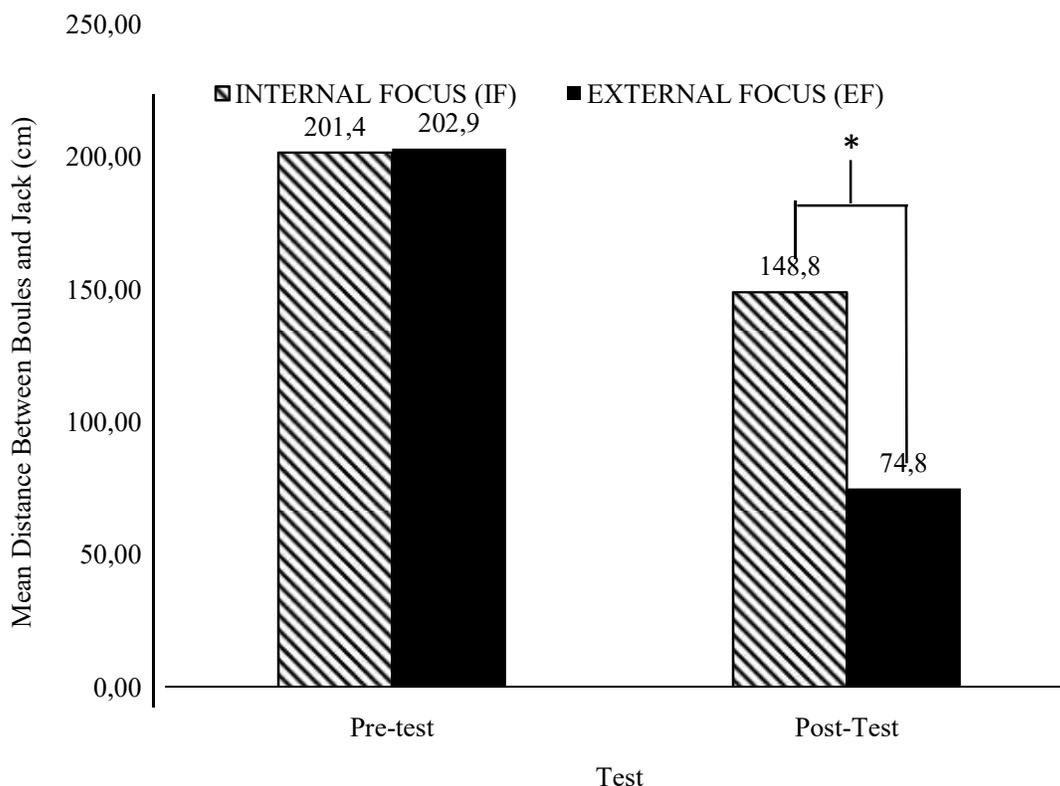


Fig.1. The mean distance between the boules and the jack during the Pre-Test and Post-Test between Internal (IF) and External focus (EF) group

This study was conducted to investigate the effect of using internal and external focus of attentions instructions on throwing boules skills among children with autism. As reported in past studies, external focus of attention approach was better for learning compared to internal focus of attentions [5, 19, 20-21]. The findings of this study supported the findings of earlier studies in which EF instructions produced significantly better performance than IF instructions. Initially during the pre test, the ASD children showed difficulties in understanding and following each step and most of them just held the boule and threw it. The IF of attention instructions were lengthy. This resulted in causing unnecessary pressure and made them upset as Autism Spectrum Disorder (ASD) children have several uncontrollable behaviour such as tantrum and ignoring instructions when they were under pressure [22]. Based on the events occurred during the intervention such as tantrum and excessive

aggression, the researcher realised that most of the participants stopped listening to the instructions once they were upset and just threw the boules. The researcher allowed the children to rest and do other fun activities for a while like singing and then persuade them to continue the test. The main researcher also prepared some tokens to get their attention such as stickers and colour pencils as a booster for their mood and to control their behaviour. The main researcher's experience as a Special Education teacher managed control the participants' mood and abled to guide their attentions during the intervention. It has been suggested that interventions should focus on improving and supporting the development of sensori-motor skills and interventions long instructions are not helpful and should be avoided [23].

Staples and Reid [11] suggested that children with ASD usually did not benefit by observing other people in the same view as they may focus on the ball or just the arm during the movement rather than the sequences on the entire action. This is crucial as was proven in this study that it was more effective to use the EF instructions which the children only focused on the effects of the movement of the boules compared to the IF instructions which the children had to focus on the numerous steps and sequences. By using the EF instructions, the ASD children seemed happier and used their imagination while learning motor skills and they felt more comfortable to follow the instructions in making a "rainbow" and adjusted their strength of the throw implicitly in placing the boules near to the jack. The researchers suggested that was the main reason why the EF group scored significantly better than IF group.

The researchers admitted that the low number of participants may have influenced the findings. These limitation was caused by the number of ASD enrolled in the special education school. Logistic constraints such as the distance from another such school constrained the researchers from recruiting them. The researchers suggested that future studies on motor skills among children with Autism should be conducted with more participants for a better results. The researchers also suggested that future research could examine the effects of focus of attentions on other skills in motor learning among children with autism such as catching and jumping skills. Future research could also examine the impact of different focus of attention on learning more complex sport skills among ASD children such as swimming and football.

4. CONCLUSION

In conclusion, the findings of this study indicated that the use of the External Focus instructions was better than the use of the Internal Focus instructions in motor learning among the children with autism, similar with the findings of earlier studies on the other category of intellectual disabilities participants and normal participants [5, 19, 20-21]. The impairment of ASD children's motor control are influenced by the child's cognitive abilities such as language proficiency of understanding verbal instructions given [12]. Instructions should be simple, clearly stated and the language must be appropriate to the functional level of the learners [2].

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