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Effects of different attentional focus on learning a motor skill in children

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When learning a new motor skill adults benefit more from external focus of attention than internal focus but the information about children are limited. Since learners in different ages use different strategies when learning new motor skills the aim of current study was to investigate effects of different intentional focus instructions (Internal and External) on learning of dart throwing in children 8-12 year. Participants enrolled in three different groups a) External focus of attention (EFA) b) Internal focus of attention (IFA) c) Control. Our results revealed that all groups improved their performance in acquisition phase but in retention test (24 hours after training) only EFA group had better performance than control group. These finding support previous studies that showed usefulness of external focus of attention instructions. Teachers and instructors who work with children should direct their student attention externally.

Keywords: Dart Throwing, Motor Learning, Acquisition

INTRODUCTION

Focus of attention explains where a person directs their attention to variety of tasks and settings. This concept has been studied from different viewpoints and can be categorized as either associative (focusing attention on body sensation) or dissociative (focusing attention outside the body; Morgan, 1978; Wulf, 2013). Focus of attention also categorized in terms of condition (internal vs. external) and width (broad vs. narrow; Moran, 2016; Wulf, 2013). In field of motor learning, the direction categorization has shown to be a crucial factor in influencing both the performance outcome and learning process (Wulf, 2013). Using external focus of attention as instruction or feedback, guides the person to focus on the outcomes or effects of their actions. However, an internal attention guides person to focus on their body movement (Peh, Chow, & Davids, 2011; Wulf, 2007).

Previous studies suggest that using an external focus of attention leads person to higher

performance level at a faster rate compared to an internal focus of attention (Peh et al., 2011; Wulf, 2007). Providing internal focus of attention to the learners is a common method for clinicians and coaches, although researches suggests that an external focus of attention is more beneficial (Chiviacowsky, Wulf, & Ávila, 2013; Peh et al., 2011). In adults, there is a constant evidence that an external focus of attention guides to better performance outcome and learning. In children, however, there is not consistent findings as to which type of attentional focus is most beneficial (Chiviacowsky et al., 2013; Chiviacowsky, Wulf, & Wally, 2010; Melanie Elizabeth Perreault, 2013). Children do not have the ability to utilize mature cognitive strategies and therefore are unable to process feedback as efficiently and quickly as adults. causing them perform skills less proficiently (J. Gallagher & Thomas, 1980, 1986; J. D. Gallagher & Thomas, 1984). The inconsistencies in the findings and differences in cognitive maturity make it important to better

understand how children process and utilize provided information to them. Two key factors in measuring skill levels in motor learning are efficiency and effectiveness (Magill & Anderson, 2014). Cueing focus of attention and feedback are a means by which both effectiveness and efficiency of a motor skill can be altered. Effectiveness in motor learning is viewed as the demonstration of consistent, accurate and reliable movements; efficiency id classified by the use of less mental and physical effort to carry out a movement pattern with increased automaticity and economy (Magill & Anderson, 2014; Wulf, 2013). There is large body of researches supporting the adaptation of an external focus of attention, that guides to decrease the time one needs to learn a new skill for different tasks such as balance (Chiviacowsky et al., 2010; Shea & Wulf, 1999), object control (Palmer, Matsuyama, Irwin, Porter, & Robinson, 2017), shuffleboard (Agar, Humphries, Naquin, Hebert, & Wood, 2016), target shooting (Raisbeck & Diekfuss, 2016), postural control (McNevin & Wulf, 2002; Wulf, McNevin, & Shea, 2001) and different sport skills (An, Wulf, & Kim, 2013; Bell & Hardy, 2009; Land, Frank, & Schack, 2014; Stoate & Wulf, 2011). Results of retention and transfer tests have been used as a means to support the idea that an external focus of attention is not only influential in improving both effectiveness and efficiency of a movement pattern throughout acquisition but has also a positive effect on the learning process (Wulf, 2013).

Current literature on attentional focus in children is limited. Few number of available researches focused on the performance effects of attentional focus among children (Melanie Elizabeth Perreault, 2013; Wulf, Chiviacowsky, Schiller, & Avila, 2010). A gap in the research lies in examining how younger children respond to the instructions of attentional focus (Abdollahipour, Nieto, Psotta, & Wulf, 2017). It is important to study attentional focus in children because studies have shown that their cognitive development is not as mature as older children and adults, which could significantly affect how they utilize and interpret attentional focus instruction (J. Gallagher & Thomas, 1980, 1986; J. D. Gallagher & Thomas, 1984). The purpose of the current study was to examine the effects of different instructions of attentional focus on skill accuracy of children.

MATERIALS AND METHODS

Participants

Forty-five 8 to 12-year-old with no physical or intellectual deficits were recruited from elementary schools of Mashhad, Iran. Participants were randomly assigned to an external focus of attention (EFA) and internal focus of attention (IFA) and control groups. All participants hadn't previous experience in the task (dart throwing). The study was approved by Ferdowsi university of Mashhad.

Apparatus and Task

The task was a dart throwing (Lohse, Sherwood, & Healy, 2010). A commercially available bristle dart board was used to regulation height (110 cm of the ground) and distance (2 m from throwing line). The participants had to throw regulation steel tip darts that weighted 22g. The linear distance from the center of the dart board was measured as radial error. To eliminate previous experience of participants we asked them to throw with their non-dominant hand.

Procedure

All participants were asked to throw two darts at the beginning of the experiment, one under each condition. Participants in the IFA group were instructed to focus onto the movements that they carrying out during each throw and use the following instructions: 1) feel the weight of the dart in their hand; 2) think about bending the elbow 3) feel the dart while left finger tips. The participants in the EFA were instructed to focus on the outcome of the task and use following instruction: 1) focus on the center of the dart board 2) slowly begin to expand upon perspective of the dart board 3) throw the dart to the target. Participants in the control group instructed to throw the dart as they can.

After administration of their instructions, each participant performed 10 throws using their particular strategy as practice. The practice was 60 throws in 6 blocks. After one day participants entered to retention-test.

Data and statistical analysis

The mean score of each block of 10 throws was used as a measure of accuracy during the task, resulting in 6 consecutive scores. A Group (3) × Blocks (6) repeated measure ANOVA was carried out to analysis the acquisition phase. A one-way ANOVA was used to compare between groups in the retention-test.



Figure 1. Comparison of means and standard errors for all groups

RESULTS

Acquisition

A main effect of block was revealed (F (5,210)=27.93, p<.001, $\eta^2=.38$), but no significant interaction was found between Block and Groups (F(10,210)=.80, p=.55), however the main effect of Group was significant (F(1,42)=3.68, p=.034, $\eta^2=.14$). The EFA participants had significantly better performance than the control group (p=.006) but not EFA group (p=.335). These differences are available in the fig 1.

Retention

Results of one-way ANOVA revealed that there was a significant effect of groups (F(2,42)=6.74, p=.003, η^2 =.24). The EFA group had significantly lower error than the control group in the retention test (p<.05).

DISCUSSION

The purpose of current study was to examine the effects of focus of attention on learning of motor skill in children. In the current study, we hypothesized that children who received externally focused instruction would learn better Dart throwing with less errors compared to internally focused instruction. This hypothesis was supported. The current literature supports the use of an external focus of attention, which improves both performance and learning during acquisition, retention and transfer (Wulf, 2013; Wulf et al., 2010; Wulf et al., 2001). However, among children, there appears to be mixed results (Chiviacowsky et al., 2013; Emanuel, Jarus, & Bart, 2008; Melanie Elizabeth Perreault, 2013; Thorn, 2006). Results indicated that there was a significant difference in error scores during acquisition and retention blocks between EFA and control group and the performance of the IFA group was not significant with control and EFA

groups.

This study is supporting previous studies that compared external and internal focus of attention and suggested using an external focus of attention is more beneficial than internal focus but this study in agreement with some other studies (Black, 2004; Emanuel et al., 2008).

It seems that beginners in the begging stages of learning may benefited from advantages of internal focus of attention. Regardless of attentional focus our results indicated that children may significantly improve at a new motor skill when provided task related instructions and given practice opportunity.

Our results support constrained action hypothesis (CAH) by Wulf et al. (2001). According to CAH, an internal focus of attention induces control of movement production consciously, causing person to constrain their motor system by disrupting its automatic (non-conscious) control processes. However, an external focus of attention promotes a more automatic mode of control by using fast, unconscious and reflexive control processes (Wulf et al., 2001). In accordance with predictions of CAH using an EFA has been shown to extract greater automaticity and increased attentional resources (Kal, Van der Kamp, & Houdijk, 2013). Similar results found in a study be Melanie E Perreault and French (2015) that showed children who received EFA instructions reported using more irrelevant contents than who received IFA instructions. Although finding in the literature suggest that novices benefit from online control and conscious awareness of motor processes, as execution of a new skill is primarily a task that is naturally online (Beilock, Carr, MacMahon, & Starkes, 2002). However, finding of current study doesn't support the latter. Our findings suggest that explicitly instructing low-skilled persons to direct their attention to the result of the practiced action resulted in better motor performance in comparison to instructions that directed the attentional focus internally or away from the primary practiced movement (Russell, Porter, & Campbell, 2014).

Findings of this study posit that an EFA allows the motor system to use learned motor representations to optimize performance. In the other word, EFA could use learned motor representation to their highest effect, because of an EFA relies less on explicit, working memory dependent resources (Wulf et al., 2001) allows implicitly learned, procedural information to control the execution of the motor skill (Wulf, 2013).

CONCLUSION

Current study adds to the limited researches examining the effect of instructions of attentional focus on learning motor skill in children. Notwithstanding finding no significant differences between groups (EFA and IFA) difference between EFA and control suggest that using some form of EFA in practice could have played a role in participants' error scores in retention. Future studies should continue to test effects of attentional focus in children and adolescents in order to fully understand how physical education teacher and coaches can effectively utilize this type of instruction content.

CONFLICT OF INTEREST

There is no conflict of interest to declare.

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AUTHOR CONTRIBUTIONS

Add contribution of each author (with abbreviated All authors contributed equally in all parts of this study.

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REFERENCES

- Abdollahipour, R., Nieto, M. P., Psotta, R., & Wulf, G. (2017). External focus of attention and autonomy support have additive benefits for motor performance in children. *Psychology of Sport and Exercise*.
- Agar, C., Humphries, C. A., Naquin, M., Hebert, E., & Wood, R. (2016). Does Varying Attentional Focus Affect Skill Acquisition in Children? A Comparison of Internal and External Focus Instructions and Feedback. *Physical Educator, 73*(4), 639.

- An, J., Wulf, G., & Kim, S. (2013). Increased carry distance and X-factor stretch in golf through an external focus of attention. *Journal of Motor Learning and Development*, 1(1), 2-11.
- Beilock, S. L., Carr, T. H., MacMahon, C., & Starkes, J. L. (2002). When paying attention becomes counterproductive: impact of divided versus skill-focused attention on novice and experienced performance of sensorimotor skills. *Journal of Experimental Psychology: Applied, 8*(1), 6.
- Bell, J. J., & Hardy, J. (2009). Effects of attentional focus on skilled performance in golf. *Journal of Applied Sport Psychology*, 21(2), 163-177.
- Black, C. (2004). Internal focus of attention is superior to external focus when training is extended to several weeks. Paper presented at the Journal of Sport & Exercise Psychology.
- Chiviacowsky, S., Wulf, G., & Ávila, L. (2013). An external focus of attention enhances motor learning in children with intellectual disabilities. *Journal of Intellectual Disability Research*, *57*(7), 627-634.
- Chiviacowsky, S., Wulf, G., & Wally, R. (2010). An external focus of attention enhances balance learning in older adults. *Gait & posture, 32*(4), 572-575.
- Emanuel, M., Jarus, T., & Bart, O. (2008). Effect of focus of attention and age on motor acquisition, retention, and transfer: a randomized trial. *Physical Therapy*, *88*(2), 251.
- Gallagher, J., & Thomas, J. R. (1980). Effects of varying post-KR intervals upon children's motor performance. *Journal of Motor Behavior, 12*(1), 41-46.
- Gallagher, J., & Thomas, J. R. (1986). Developmental effects of grouping and recoding on learning a movement series. *Research Quarterly for Exercise and Sport, 57*(2), 117-127.
- Gallagher, J. D., & Thomas, J. R. (1984). Rehearsal strategy effects on developmental differences for recall of a movement series. *Research Quarterly for Exercise and Sport,* 55(2), 123-128.
- Kal, E., Van der Kamp, J., & Houdijk, H. (2013).
 External attentional focus enhances movement automatization: A comprehensive test of the constrained action hypothesis. *Human Movement Science*, *32*(4), 527-539.
- Land, W. M., Frank, C., & Schack, T. (2014). The influence of attentional focus on the

development of skill representation in a complex action. *Psychology of Sport and Exercise*, *15*(1), 30-38.

- Lohse, K. R., Sherwood, D. E., & Healy, A. F. (2010). How changing the focus of attention affects performance, kinematics, and electromyography in dart throwing. *Human Movement Science, 29*(4), 542-555.
- Magill, R. A., & Anderson, D. (2014). *Motor learning and control: Concepts and applications* (Vol. 11): McGraw-Hill New York.
- McNevin, N. H., & Wulf, G. (2002). Attentional focus on supra-postural tasks affects postural control. *Human Movement Science*, 21(2), 187-202.
- Moran, A. P. (2016). The psychology of concentration in sport performers: A cognitive analysis: Psychology Press.
- Morgan, W. P. (1978). The mind of the marathoner. *Psychology Today*, *11*, 38-49.
- Palmer, K. K., Matsuyama, A. L., Irwin, J. M., Porter, J. M., & Robinson, L. E. (2017). The effect of attentional focus cues on object control performance in elementary children. *Physical Education and Sport Pedagogy*, 1-9.
- Peh, S. Y.-C., Chow, J. Y., & Davids, K. (2011). Focus of attention and its impact on movement behaviour. *Journal of Science and Medicine in Sport, 14*(1), 70-78.
- Perreault, M. E. (2013). The effects of attentional focus cues and feedback on motor skill learning in children.
- Perreault, M. E., & French, K. E. (2015). Externalfocus feedback benefits free-throw learning in children. *Research Quarterly for Exercise and Sport, 86*(4), 422-427.
- Raisbeck, L. D., & Diekfuss, J. A. (2016). Verbal Cues and Attentional Focus: A Simulated Target-Shooting Experiment. *Journal of Motor Learning and Development*, 1-22.
- Russell, R., Porter, J., & Campbell, O. (2014). An external skill focus is necessary to enhance performance. *Journal of Motor Learning and Development*, *2*(2), 37-46.
- Shea, C. H., & Wulf, G. (1999). Enhancing motor learning through external-focus instructions and feedback. *Human Movement Science*, *18*(4), 553-571.
- Stoate, I., & Wulf, G. (2011). Does the attentional focus adopted by swimmers affect their performance? *International Journal of Sports Science & Coaching, 6*(1), 99-108.
- Thorn, J. E. (2006). Using attentional strategies for balance performance and learning in nine through 12 year olds.

- Wulf, G. (2007). *Attention and motor skill learning*: Human Kinetics.
- Wulf, G. (2013). Attentional focus and motor learning: a review of 15 years. *International Review of Sport and Exercise Psychology*, *6*(1), 77-104.
- Wulf, G., Chiviacowsky, S., Schiller, E., & Ávila, L. T. G. (2010). Frequent external focus feedback enhances motor learning. *Frontiers in Psychology*, 1, 190.
- Wulf, G., McNevin, N., & Shea, C. H. (2001). The automaticity of complex motor skill learning as a function of attentional focus. *The Quarterly Journal of Experimental Psychology: Section A, 54*(4), 1143-1154.