

## INFLUENCES OF GENDER ON ATTENTION AND LEARNING OF MOTOR SKILLS

### INFLUÊNCIAS DO SEXO NA ATENÇÃO E NA APRENDIZAGEM DE HABILIDADES MOTORAS

Fábio Saraiva Flôres<sup>1</sup>, Karla Mendonça Menezes<sup>2</sup> e Juliana Izabel Katzer<sup>3</sup>

<sup>1</sup>Faculdade de Motricidade Humana, Lisboa, Portugal.

<sup>2</sup>Universidade Federal de Santa Maria, Santa Maria-RS, Brasil.

<sup>3</sup>Universidade Federal de Pelotas, Pelotas-RS, Brasil.

#### RESUMO

O estudo investigou a influência do foco de atenção na aprendizagem de crianças, em uma tarefa de equilíbrio dinâmico. Setenta e quatro crianças (38 meninas e 36 meninos) com média de idade de 8,03 anos participaram do estudo. A tarefa consistia no deslocamento do Pedalo<sup>®</sup> em um percurso de 7 metros, sem apoios. Os participantes foram divididos em três grupos, para cada sexo, em relação a instrução: Foco Externo Próximo (FP); Foco Externo Distante (FD); Controle (C). Os resultados mostraram que na aquisição, os meninos desempenharam melhor a tarefa ( $p=0,022$ ). Nas fases de transferências, apenas a fase T2 apresentou diferença significativa ( $p=0,014$ ), com desempenho melhor dos meninos e, em relação ao foco de atenção, o foco externo distante mostrou-se superior do que o grupo controle, em ambas as fases de transferência ( $p=0,034$ ;  $p=0,018$ ). Conclui-se que direcionar a atenção a certa distância do corpo, os meninos potencializam sua aprendizagem.

**Palavras-chave:** Atenção. Crianças. Equilíbrio postural.

#### ABSTRACT

The aim of this study was to investigate the influence of focus of attention in learning of boys and girls, in a balance task. Seventy-four children (38 girls and 36 boys) with a mean age of 8,03 years participated in the study. The task involved participants to ride a Pedalo, without support. The participants were divided in six groups, three for each sex, in relation to the instruction: Proximal External Focus (FP); Distal External Focus (FD); Control (C). The results showed that, in acquisition phase, boys outperformed girls ( $p=0,022$ ). In transfers tests, only T2 showed a significant difference ( $p=0,014$ ), with better performance of boys and, for the focus of attention, the distant external focus was higher than the control group in both transfers tests ( $p=0,034$ ;  $p=0,018$ ). Thus, directing the focus of attention externally, at a greater distance from the body, can enhance learning of boys.

**Keywords:** Attention. Children. Postural Balance.

#### Introduction

A complex question that intrigues researchers of Human Motor Behavior is how it would be possible to enhance the acquisition of motor skills? The acquisition of different skills occurs through internal changes, in which the learner evolves from rudimentary stages to more complex and specialized stages<sup>1-4</sup>.

Studies have showed that motor skills acquisition could be enhanced by instructions that direct the learner's attention in specific directions during the practice<sup>5-8</sup>. Specifically, learners can focus on the effects of their movements in the environment (external focus of attention), or focus on the learner's body (internal focus of attention)<sup>6,9</sup>.

Previous studies have showed that instructions inducing external focus of attention can benefit learning when compared to internal focus, in different populations and tasks<sup>10-14</sup>, however, studies with children are incipient. Several reasons can explain the lack of interest in

this population. Children and adults differ in multiple aspects, such as the amount of motor experiences and limitations on the skill repertory in children<sup>2,15-17</sup>. In addition, children have incomplete motor development, less capacity to process information and, consequently, higher difficulty in focusing attention<sup>2,18,17,9</sup>.

Even today, there are differences between the practical results of the direction of attention in childhood. Thorn<sup>19</sup> found higher learning for 9 to 12-year-old children who received external focus of attention while practicing a balance task on a static platform. Similar results were found in different tasks<sup>20-22</sup>. However, Emanuel, Jarus e Bart<sup>11</sup>, found no significant differences between external and internal focus of attention in 8 to 9-year-old children, while learning at a dart-throwing task.

Balance is one of the fundamental motor skills, which forms the basis for the future acquisition of complex motor skills<sup>23-24</sup>. Childhood is fundamental for the full development of balance and others motor skills. These skills will be the basis for sports, games and physical activities<sup>23,24,17</sup>, and they must be learned and developed in a proper time. The instructions directing the attention can enhance the learning of this tasks<sup>9</sup>.

Even if the previous results did not demonstrate consensus about which strategy is predominant in this age group, some studies have showed that increasing the distance between the focus of attention and body movement (distal external focus of attention) can positively influence the process of acquisition of motor skills<sup>26-27,21</sup>. In turn, studies that investigate the relationship between gender and attention during the motor skills acquisition were not found in the literature.

The aim of this study was to investigate the influence of focus of attention in learning of boys and girls, in a dynamic balance task. Specifically, it was sought to verify whether the increased distance of attention enhance children's learning, compared to the proximal external focus of attention.

## Methods

### *Participants*

Seventy-four children (38 girls and 36 boys), with a mean age of  $8,03 \pm 2,10$  years, were selected. The participants agreed orally and their parents/guardians gave a written consent before the beginning of the experiment. The study was approved by the university's ethics committee (number 16880913.0.0000.5313). Boys and girls around six and ten years old were included on the research, and the participants who presented visual, cognitive, physical and hearing disturbances or injuries were excluded. None of the participants had prior experience with the task, and also none of them were aware of the purpose of the experiment.

### *Apparatus and Task*

The dynamic balance task required children to ride a Pedalo<sup>®28</sup>, without support, along a distance of 7m, marked by two lines. Pedalo<sup>®</sup> is a device that has two platforms with dimensions of 30 x 14, 5 cm, and the wheels had a diameter of 21, 5 cm (see Totsika and Wulf<sup>28</sup> for further information). The trials started with the Pedalo<sup>®</sup> behind the starting line, ending when the front wheels crossed the finish line. The trials started with the children's right foot on the upper platform. It was used the same blinded evaluator for all the phases. A timer was used to measure the time among the lines.

### Procedures

The research was conducted individually, in a closed gymnasium, without external interference. Data collection was performed on two consecutive days to each child. Participants were informed that they had to complete a route of 7m using the Pedalo<sup>®</sup>. Three groups for each gender were organized in relation to instruction: Proximal External Focus (PF); Distal External Focus (DF); Control (C). The participants in PF groups were told to focus on pushing the platforms forward. Those in DF groups were instructed to focus on a marker positioned after the finish line. Children in C groups were not given specific instructions regarding the focus of attention.

The pre-test was composed by one trial. The acquisition phase consists of 20 trials. Feedback was given after all trials, in both phases. In addition, all children were instructed to perform the task at their own pace (during pre-test and acquisition). One day after the pre and acquisition phases, transfer phases were conducted, each one with five trials and no attentional focus/feedback. In transfer 1 (T1), children were instructed to riding the Pedalo<sup>®</sup> as fast as possible. In transfer 2 (T2), they should ride as fast as they could, with both hands touching their heads.

### Data Analysis

In order to characterize the data, it was used the descriptive statistics. The data normality was tested by Kolmogorov-Smirnov test. For group comparisons, it was used ANOVA. It was used Tukey's post-hoc test for follow-up analysis and the Software Statistical Package for Social Sciences<sup>™</sup> (SPSS 20.0). In all analysis, the Alpha level for significance was set at 05.

### Results

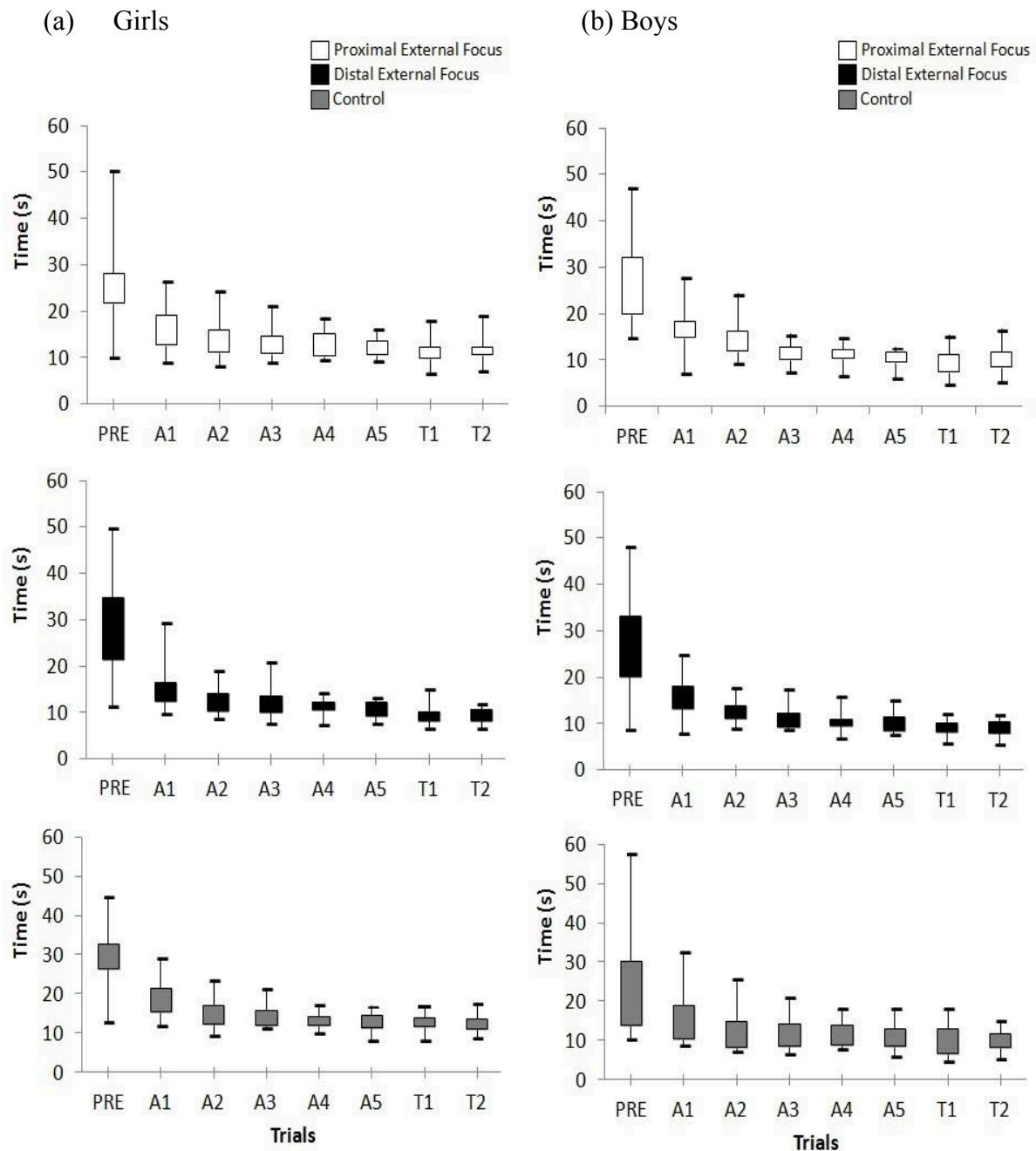
Table 1 shows the time to complete the task. Mean and standard deviation are described separately in each phase.

**Table 1.** Mean and standard deviation values, regarding time.

Gender	Group	Time (s)		
		Pre-test	Acquisition	Transfers
Girls	PF	26,25±11,34	13,84±4,05	11,43±2,85
	DF	28,06±11,09	12,50±3,95	9,59±2,01
	Control	28,3±9,11	14,65±3,74	12,41±2,39
Boys	PF	27,14±10,82	12,79±3,97	9,97±3,07
	DF	27,12±11,76	12,16±3,64	8,88±1,82
	Control	25,59±15,48	12,75±5,58	10,29±3,77

\*Note: PF – Proximal External Focus; DF – Distal External Focus.

Figure 1 shows the time to perform the task, in pre, acquisition and transfer tests, for all groups respectively. Regardless the instruction, both groups decreased the time of the task's performance, by means of practice.



**Figure 1.** Girls and boys' movement time in pre-test, acquisition trials and transfer phases.

#### *Pre-test*

The pre-test showed no significant differences between the gender ( $F=0,701$ ,  $p=0,405$ ). Also, no differences between the groups were found ( $F=0,306$ ,  $p=0,737$ ).

#### *Acquisition*

Concerning gender, there was a statistically significant difference between the A3 blocks of trial ( $F=4,755$ ,  $p=0,032$ ), A4 ( $F=6,309$ ,  $p=0,014$ ) and A5 ( $F=5,465$ ,  $p=0,022$ ). Boys outperformed girls. Regarding the type of focus of attention, there was no difference between the block trials.

### Transfers

When in comparison of gender, only T2 showed a significant difference ( $F=6,383$ ,  $p=0,014$ ) with boys outperforming girls. Differences in both transfer phases, regarding attention T1 ( $F=3,260$ ,  $p=0,044$ ) and T2 ( $F=4,431$ ,  $p=0,015$ ) were found. Tukey's post hoc identified significant differences between the DF and control, T1( $p=0,034$ ) and T2 ( $p=0,018$ ), with DF outperformed the other groups.

### Discussion

This study aimed to investigate the effects of increasing distance of external focus of attention in learning of boys and girls, in a dynamic balance task. Children who performed the task using instructions directing distal external focus outperformed children who did not receive specific attentional instructions in T1 ( $p=0,034$ ) and T2 ( $p=0,18$ ). Moreover, boys had higher levels of learning when compared to girls, in both external focus groups, regardless the distance ( $p=0,014$ ). The results are in accordance to the literature<sup>29,9</sup>.

The benefits of the external focus of attention have been the subject of many studies in different tasks and populations<sup>30-35</sup>. From this perspective, Porter et al.<sup>36</sup> found benefits in inducing adult's focus on attention in a Sprint task. McNevin, Shea e Wulf<sup>37</sup> and McKay e Wulf<sup>27</sup> observed advantages in increasing distance from the external focus of attention, in adults, in different types of tasks. However, there are few studies verifying the effects of attention on the children's learning.

Hadler<sup>22</sup> examined the effects caused by the direction of attention in tennis learning in children's. Results showed that external focus group had higher levels of learning compared to groups of no instruction (control) or internal focus. Chiviacowsky, Wulf e Ávila<sup>33</sup> investigated the benefits of external focus in children with intellectual disabilities. The study showed that instructions inducing external focus of attention can increase the learning of children with disabilities.

Thorn<sup>19</sup> examined the influence of instructions directing the attention of children from different ages in learning and in the performance of a dynamic balance task. Results showed that children, despite their age (nine to 10, and 11 to 12 years) had higher levels of learning and performance using external focus of attention. Considering this perspective, our results extend the literature findings in relation to the benefits of focus on movements. They show that boys can receive benefit from the use of distal external focus of attention, compared to their pairs in a dynamic balance task.

When compared DF regarding gender, boys outperformed girls in T1 and T2 phases. There are many differences for those reasons. Barreiros e Neto<sup>38</sup> explains that the maturation of the nervous system during childhood is fast and can potentiate the acquisition of motor skills. Moreover, according to the authors, there are typical morphological and functional differences of each gender, which results in greater strength, speed, longer segments and more robust joint structures in boys. Thus, actions such as jumping, throwing, running and cycling (similar to the task used in this study) are usually better performed by boys. Furthermore, it is believed that the combination of these factors may help explain our findings.

According to Gallahue, Ozmun e Goodway<sup>17</sup>, the variation in proficiency found among genders may be motivated by maturity, physical development, and experience, opportunities for engagement in physical activity, sports, and hereditary factors. For Thomas, Nelson e Church<sup>39</sup>, boys are more likely to practice more intense physical activities. Butterfield et al.<sup>4</sup> enlighten that boys have advantages in throwing tasks, which require more

speed and strength in their performances. These results appear to be generalized to a dynamic balance task, due to the complex characteristics necessary for its realization.

The superiority of external focus in comparison to internal focus is well described in the specialized literature. The Constrained Action Hypothesis<sup>5-6,36</sup> shows that when learner focuses their attention on the body movements, they restrict the motor system, interfering with automatic motor control processes. Whereas, when they focus attention on the effects of their movements (enhance the distance from the body), the motor system can operate normally, without interferences caused by conscious control. In other words, distal focus of attention provides fluid movements, resulting in more effective learning and performance.

In accordance with the literature, the results of this research indicate that the instructions inducing distal external focus of attention enhances the learning in a dynamic balance task in children; as well as boys had higher levels of learning compared to girls, indicating that they can use better the instructions inducing external focus.

## Conclusion

Directing the focus of attention at a distance from the body enhances motor learning in a dynamic balance task in children, especially in boys. The results can help teachers on how to provide better instructions, which can improve the learning dynamic balance tasks using distal external focus of attention. Nevertheless, there is a need for further studies investigating the effects of different focus of attention in learning and performance in children in different types of tasks. Also, different contexts and levels of complexity could be explored.

Fundamental motor skills such as balance are considered basics for the acquisition specialized motor skills. Besides, the focalization in a higher distance from the body can help in this process, mostly in boys. The results of this study can improve the understanding of the role of attention in the acquisition of motor skills.

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**Autor para correspondência:** Fábio Saraiva Flôres. Calçada Conde de Tomar, 31, 3 Esquerdo, CEP: 1495-201, Cruz Quebrada, Oeiras/Lisboa, Portugal. E-mail: flores.saraiva@gmail.com