

## The Efficacy of Using Learning Cues to Teach Children Perform the Backhand

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### Abstract

Attention is very important for learning. Children are known for not paying much attention due to lack of selective attention resources. Selective attention is the ability to direct the attentional focus to a specific point in the environment, in order to pay attention to what is relevant (Ladewig et al, 2001). One way to assist children to pay more attention while teaching a task, is by using cues, that are one or two words, short phrases, with higher meaning to the learner. The objective of the current study was to test the efficacy of the cues, while school children performed the backhand. The statistical results of the retention test have shown, after 20 days rest without any practice, very high levels of significance in favor of the cue group, which was even able to increase the mean average from the post-test. On the other hand, children that did not receive cues had a decrease in performance in all six technical factors, from the post-test to the retention. In conclusion, the use of learning cues was very effective in assisting children to learn the backhand. Future research must continue to explore the use of cues, while teaching different motor skills in different contexts.

**Keywords:** Learning cues; school children; selective attention; tennis; backhand

### Introduction

The main objective of a PE teacher while teaching some skill or activity, is to make sure that the student will learn and will pay attention to the information given and be able to retain it in the long-term memory (LTM) to future use. Thus, paying attention means to direct the focus of attention consciously to focus their attention through explicit thoughts in an effort to execute a task (Benz, Winkelman, Porter & Nimphius, 2016). In this way, learning efficacy requires the student to focus at important aspects of the task, characteristic of the selective attention process, defined by Ladewig et al (2001) as the individual's ability to direct its attentional focus to a determined point in the environment, selecting relevant stimuli while ignoring the irrelevant ones.

Ross (1976) have proposed that selective attention develops in three stages: exclusive, inclusive and selective attention. In general, during the first stage, babies and young children attend mainly to one object, "*excluding*" the majority of stimulus surrounding them. Between ages 5 to 7 years, during the first years of regular school system, children are easily distracted by the great number of stimuli imbedded in the environment, "*including*" several stimuli in their attentional field, not being able to separate relevant from irrelevant information. During pre-adolescence, between 11-12 years of age, they reach the third stage, called selective attention, when they start to acquire the ability to direct their focus of attention to relevant aspects of the environment, ignoring irrelevant or distractive things. It is important to state here that these stages are not completely closed, age range may overlap depending upon some factors may affect the characteristics of each stage, such as type of education the parents exposed their child (to liberal or to restrict) or some type of syndrome such as attentional deficit disorder (ADD), for example. Portilho (2011) have pointed out that young children have difficulties in pay attention, suggesting that is important to develop strategies to facilitate the control and to direct young children's attentional focus.

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In the studies by Ladewig and colleges, the authors have indicated that one way to make this happen while teaching young children, is by giving learning cues to improve selective attention and consequently, ability and performance. Learning cues are short phrases, one or two words, with higher meaning to the child/learner, which will assist them to pay attention to the important aspect of the task, at the same time, helping them to ignore the irrelevant aspects, improving retention of the relevant information, thus demonstrating the importance of attention for learning and retention.

One example in swimming is when teaching children to move the arm in circular fashion, during backstroke swim, emphasizing the rotation of the recuperating arm, outside the water. The basic movement requires to take the arm/hand out the water with thumb up, and when it is straight up, with the arm at 90-degree angle, hand rotates, placing the small finger facing forward, to start to come down, entering in the water “pinkie” finger first. Any young child would have a hard time to understand all of this information, at the same time keeping the body afloat and moving forward. Thus, an example of a simple “learning cue” in this case is to teach the child to rotate the arm at the same time they say “*thumb, thumb, thumb, little, little, little*” in a nice rhythmic pace, and they will be able to perform the task much easier, improving the quality of the movement as they increase practice. This cue will make kids “to get the idea of the movement”!

Another example, while teaching basic soccer skills such as receiving and passing the ball to a partner. To pass and to receive are two very important fundamentals in soccer, and most of the times, young kids are insecure and anxious to play with friends that they do not pay attention to the way the ball is coming towards them, and as soon as the ball gets to their foot, they kick it immediately, resulting most of the times, in a really bad pass. Thus, in order to make the children pay attention to the ball and what to do with it, we can use the “*SSP*” cue, in other words, “*step, stop and pass*”. The child will follow the ball and will *step* over it, when it arrives into their foot, *stopping* the ball, and only after this, will *pass* it to their partner. Showing it to the children a couple times, they will be able “get the idea” and to perform the task easy. Hence, in both examples, the cues were able to direct the child’s attention to the major aspect of the performance, facilitating learning.

As the students can “remember any given cues” during practice, the next day or even after several days, consequently the major objective of the task, teacher will gain some time, and will not need to taking precious minutes explaining in detail all the instructions from previous classes. He can go straight to the point, moving forward, adding more details and level of complexity to the task, as well as adding new cues. Thus, to be effective, cues must be meaningful to the child! It must work as a marker in memory, highlighting the important aspect of what you want them to pay attention and learn. If the information given does not have much meaning, it will disappear from memory.

At the Brazilian physical education area, the use of learning cues as a tool to direct attention and teach subjects to learn several different tasks, is consolidated by more than 20 years of research, including studies with special need population, such as: Cidade, Ladewig, Tavares & Leitão (1998), with Down Syndrome children performing backhand and forehand in tennis; Pasetto, Araújo & Corrêa (2006), studying the effects of visual cues on learning the front crawl by deaf students; Bertoldi, Ladewig & Israel (2007) observing the development of body awareness in children with motor deficiencies; Medina, Marques, Ladewig & Rodacki (2008) with ADD children learning forward rolls; and Reis & Ladewig (2013) with Down Syndrome children learning adapted free throw.

On the other hand, research have also used “typical” population were conducted by Ladewig (1994) using school children while playing an special computer game; Caçola & Ladewig (2007) to teach a rhythm gymnastics skill, by parts and as a whole; Silveira, Basso, Freudenhein, Correa, Ferreira & Tani (2013) investigating the use of learning cues as a teaching content; Spessato & Valentin (2013) to teach dance; Ferreira, Bastos, Pasetto, Torriani-Pasin & Corrêa (2016) studying self-talk and the effects on transfer and retention in the tennis forehand; Benz, Winkelman, Porter & Nimphius (2016) to improve sprinting performance and Bruin, Dunlosky & Cavalcanti (2017) studied the use of predictive cues in med school. All these studies have one way or another demonstrated the use of cues while teaching some type of task or motor skill.

More recently, Boel, Yamaguchi, Ladewig, Spinelli & Franz (2017) developed a study aiming to investigate the use of cues while teaching the tennis forehand for school children classified as having characteristics of ADD. The authors selected 45 students, age ranging from 7 to 11 years (average 8,66 years  $\pm$  SD 0,87 years), from two municipal schools, in the city of Curitiba. Students were selected by the teachers considering those with low school performance, and then by applying the DSM-IV (Diagnostic and Statistical Manual of Mental Disorders), in teachers and parents, to detect those children with characteristics of ADD.

All children selected for the study went through a screening test, to make sure that they did not have previous experiences with tennis, and were placed into four groups: Group 1) ADD+Cues (n= 9); Group 2) ADD/No Cues (n= 9); Group 3) No ADD+Cues (n= 12); and Group 4) No ADD/No Cues (n=15). Pre-test was conducted in all children before practice started. The objective of the study was to teach the forehand, during 6 sessions of practice in which all children received basic instructions and those in the cue group, received extra information in form of cues: for holding the racket, positioning in the court, looking the ball, etc. Right after the end of last practice session, post-test was conducted. Twenty days after the pos-test, retention test was administered. In all tests, 20 balls were served by the instructor, and results recorded and filmed for evaluation.

The results have shown positive statistical results for group without ADD characteristics that received cues, although data have shown some improvements in all groups. In some technical factors, such as holding the racket, no significant differences were found between groups, maybe due to easy assimilation of the task and lack of variation during execution (BOELL et al, 2017). However, the authors pointed out that for the technical factor “visualization” or to maintain the eye on the ball all times, was extreme difficult for groups with ADD characteristics, even for the ADD+Cues group. Probably these results are due to the task requirements, and the great amount of attention necessary to keep the visual track at the ball, what appears to be very hard for children with ADD characteristics (RODHDE & BENCZIC, 1999).

Considering these results, the objective of the current study was to continue working with tennis as the medium to test the efficacy of the use of learning cues, while performing the backhand, with school children without previous experiences with the game. It was hypothesized that: 1) there would be no differences among the groups, during pre-test; 2) children in the cue group would have the best performance on post-test and retention, when compared with those that did not receive cues.

## Methods

A quasi-experimental design with pre-test, post-test and retention was used to test cue efficacy.

## Subjects

A total of 26 school children, without previous experiences with the game of tennis, regularly registered at a Municipal School in the city of Curitiba, ages between 9 and 10 years (9.7 years of age  $\pm$  6 months), were selected to participate. In order to facilitate instructions, all 26 participants were right-handed.

Parents received an informed consent with all information about the study, what was expected from their child, right to withdraw, etc., which was signed and returned to the researcher. All procedures of the study were approved by the Federal University of Curitiba Ethical Committee.

## Procedures

A questionnaire was used to make sure subjects had no previous experiences with the game of tennis. Following the questionnaire, children were then divided randomly into two groups, Cue Group (n=13) and Non-Cue Group (n=13). The design was set as follows: A Pre-test; followed by 6 practical classes; a Pos-test, 20 days of rest and a Retention test. All tests were conducted the same way, with the students hitting 10 balls each played by the instructor.

The pre-test was used to make sure that both groups had no previous knowledge and skills of the game. Following it, all children went through six 30 minutes classes, three times a week, for 2 weeks, with the main objective of learning the backhand. This skill was chosen due to the level of complexity and difficulty for novice players.

All children received the same basic instructions and one demonstration from the instructor in how to hit the ball with a backhand: 1) Racquet grip: palm of your hand behind the grip, arm naturally straight, and left hand close to the head of the racket; 2) Trunk rotation: rotate your trunk, hitting the ball with your body sideways to the net (lateral); 3) Ball contact: hitting the ball with racket perpendicular to the ground, sending the ball forward over the net; 4) Body position: feet apart, knees semi flexed, body a bit inclined forward, left hand touching the racket body; 5) Court position: after hitting the ball, always return to the middle of the court. All children had a chance to hit approximately 50 balls, during each class, directed about to the same spot on the court, by the instructor. Besides these basic instructions, children in the cue group received 6 cues, one for each technical factor. The respective objective of the cues was to direct the child's attention to the important aspects of each technical factors, according with Table 1.

**Table 1: Technical factors and the respective cues given to the Cue Group**

<b>TECHNICAL FACTORS</b>	<b>CUES</b>
1) Holding the racquet	“Handshake”
2) To view/following the ball	“Eye on the ball”
3) Positioning the body to hit the ball	“Shoulder pointing at the ball”
4) Positioning the racquet to hit the ball	“Racquet face” facing the net
5) Waiting position / body position	“Goalie position”
6) Waiting position in the court	“Always in the middle”

Children in the Non-cue group had six classes as well, however receiving only the basic instruction, given always at the beginning of the class by the instructor. After the instructions, the instructor asked the children to repeat the information and started the respective class. No other information was given to the students, besides “remember what you have to do”, when questioned by them. For children in the Cue group, the instructor passed the same basic instructions, asked them to repeat, and then passed the respective cues, asked them to repeat it. During classes, if there were any questions by the students in the cue-group, the instructor only replied, “remember the cues I gave to you. Think about the cue and you will be able to do it”. They were supposed to repeat it and no more information was passed. No information was given during the pre-test, post-test and the retention. All children in both groups were informed only to hit the backhand back to the other side of the net.

### Instruments

All three tests were filmed and recorded using NIKON Cool Pix L110 camera to facilitate evaluation. The camera was positioned on a tripod and was operated by a graduate assistant. Three instructors with more than 10 years of experience in teaching tennis, analyzed the videos based on four items, according to Table 2 below.

**Table 2: Scores to evaluate video performance on three phases**

<b>0 Point</b>	Subject did not execute the skill
<b>1 Point</b>	Subject did execute the skill in rudimentary manner
<b>2 Points</b>	Subject did execute the skill inconsistently
<b>3 Points</b>	Subject did execute the skill in a good way
<b>4 Points</b>	Subject did execute the skill with correct technique

A scoring sheet for each student in each test phase was used to evaluate the backhand performance. The maximum possible points considering six technical factors, were 24, for each of the evaluator. Total points from each evaluator, on each technical factor, was used for statistical calculations. All videos were submitted to the evaluators in a random order, without any identification of type of test (Pre, Post or Retention), of the subject. Children were ID by a number.

### Data Analyses

The Mann-Whitney U test (one tailed) was used to test the efficacy of using learning cues, when compared to a non-cue group, while children performed the tennis “backhand”. Alpha level was set at  $p < 0,05$  for significant purposes. All calculations were performed using the SPSS software, version 24.

### Results

Analyzing the pre-test, there were no significant differences between the Cue group and the Non-Cue group in all six technical factors, as shown at Table 3. These results support the hypothesis 1, which expected no differences among the groups at the pre-test, thus demonstrating that all subjects in both groups had no previous experiences executing the backhand, allowing us to infer the all subjects had the same level of performance before the start of the six training classes.

**Table 3: Results of the PRE-TEST Mann-Whitney U test, comparing Cue Group versus No Cue Group performing the Backhand**

TECHNICAL FACTORS	CUES	NO CUES	LEVEL OF SIGNIFICANCE
1) Holding the racquet	(MR=13.69)	(MR=13.31)	U=82.000, p=.920
2) To view/follow the ball	(MR=14.19)	(MR=12.81)	U=75.500, p=.650
3) Positioning the body to hit the ball	(MR=15.00)	(MR=12.00)	U=65.000, p=.336
4) Positioning the racquet to hit the ball	(MR=14.04)	(MR=12.96)	U=77.500, p=.724
5) Waiting position / body position	(MR=13.65)	(MR=13.35)	U=82.500, p=.920
6) Waiting position in the court	(MR=14.42)	(MR=12.58)	U=72.500, p=.545

- Obs. 1) n = 13 in each group.  
2) Level of sig. set at  $p < 0.05$  (one tailed)

Observing Table 4, the results have indicated no significant differences for first four technical factors (Holding the racquet; To view/follow the ball; Positioning the body to hit the ball and Positioning the racquet to hit the ball), demonstrating that cues did not help children in the cue group outperform those children that did not receive cues, while executing this four specific backhand technical factors. However, when looking into the last two technical factors (#5 and #6), the statistical analysis has indicated significant results. For the waiting position/body position technical factor (5), the Mann-Whitney U test have indicated that children could benefit from learning cues to position themselves to wait for the ball, before executing the backhand. The group that received cues scored significantly higher at technical factor 5 (MR = 18.77) compared to the group that did not receive cues (MR = 8.23);  $U = 36.000, p = .000$ .

Reviewing technical factor 6, the data also has shown extremely high scores. The Mann-Whitney U test have indicated that cue given allowed children to find the right position in court after hitting the ball back to the instructor. The cue group had a higher score at factor 6 (MR = 17.65) when compared to the non-cue group (MR = 9.35);  $U = 30.500, p = .004$ .

**Table 4: Results of the POST-TEST Mann-Whitney U test, comparing Cue Group versus No Cue Group performing the Backhand.**

TECHNICAL FACTORS	CUES	NO CUES	LEVEL OF SIGNIFICANCE
1) Holding the racquet	(MR=13.69)	(MR=10.65)	U=47.500, p=.057
2) To view/follow the ball	(MR=14.92)	(MR=12.08)	U=66.000, p=.362
3) Positioning the body to hit the ball	(MR=15.04)	(MR=11.96)	U=64.500, p=.311
4) Positioning the racquet to hit the ball	(MR=16.35)	(MR=10.65)	U=47.500, p=.057
5) Waiting position / body position	(MR=18.77)	(MR=8.23)	U=16.000, p=.000*
6) Waiting position in the court	(MR=17.65)	(MR=9.35)	U=30.500, p=.004*

- Obs. 1) n = 13 in each group.  
2) Level of sig. set at  $p < 0.05$  (one tailed)

After the post-test, children in both groups did not have any contact with the game of tennis for twenty days. Reviewing the retention results, the differences are clear in favor of the Cue group. The use of cues affected positively the results of children that did received cue, showing significant results in all six technical factors, according with Table 5.

**Table 5: Results of the RETENTION TEST Mann-Whitney U test, comparing Cue Group versus No Cue Group performing the Backhand.**

TECHNICAL FACTORS	CUES	NO CUES	LEVEL OF SIGNIFICANCE
1) Holding the racquet	(MR=17.23)	(MR=9.77)	U=36.000, p=.012*
2) To view/follow the ball	(MR=16.54)	(MR=10.46)	U=45.000, p=.044*
3) Positioning the body to hit the ball	(MR=18.12)	(MR=8.88)	U=24.500, p=.001*
4) Positioning the racquet to hit the ball	(MR=17.54)	(MR=9.46)	U=32.000, p=.006*
5) Waiting position / body position	(MR=19.19)	(MR=7.81)	U=10.500, p=.000*
6) Waiting position in the court	(MR=19.13)	(MR=7.77)	U=10.000, p=.000*

- Obs. 1) n = 13 in each group.  
2) Level of sig. set at  $p < 0.05$  (one tailed)

## Discussion

Previous studies have demonstrated the positive effects of cues on learning and performance. However, the results found in the present study were very positive and statistically significant. According to hypothesis one, it was expected no significant differences among the groups at the pre-test and the results have demonstrated exact that, meaning that both groups had no previous experiences with the tennis when they started the training classes.

Now, considering the activities up to the post-test, that all children had six practical classes, received the basic information in how to hit the backhand, thus having a good opportunity to experiment the new task, keeping the information fresh in their minds, observing their partners, and were able to have a reasonable performance in many of the technical aspects, what canceled the majority of the significant differences among both groups.

The cues did not make difference in assisting students to hold the racquet (1), to keep the eye on the ball (2), to position the body to hit the ball (3) and to maintain the racquet positioned to hit the ball (4). According to Boell et al (2017), maybe these results were due the “easy assimilation of these tasks”. We may also infer that maybe due to “training effect” starting with the pre-test, followed by six classes of practice, students were able to “get the idea” of the movement by trying and error, observing one another and figuring out a way to execute these four technical factors. However, it worth to mention that on factor 1 and factor 4, the results have demonstrated a “tendency” for a positive cue effect, since the p value of 0.057 was close to a significant value of 0.050.

After the post-test, all children went through a twenty-day retention period without any contact with the game of tennis and that was the turning point where the cues had a major impact on the backhand performance. By the significant results of the cue group on retention, we may say that relevant information regarding the execution of the backhand was stored at the long-term memory of the children and were easily retrieved to the short-term memory when they had to perform the retention test. By the level significance in all six technical factors, we can confirm the efficacy of the learning cues to teach the backhand, when compared with subjects in the non-cue group. As Table 5 have indicated, the positive effect of the cues was very high, allowing us to infer that learning has occurred after 20 days without any practice. According to Schmidt et al (2018) learning is defined as a series of processes associated to practice or experience which tend to cause permanent changes in motor capacity.

Besides assisting the maintenance of information in the student’s memory during retention, after many days without practice, cues had also assisted children to increase the mean average points in all six technical factors, from the post-test to retention, where the cue group practically doubled the results, while the no-cue group decreased the results bellow the post-test scores, clearly losing quality in performance.

In summary, cues assisted children in the cue group, to direct their attention to the important aspects of the backhand performance, demonstrating a positive influence on learning. That means, cues provided some type of “relevant label, or a mark” on memory to store the important backhand information, facilitating retrieving, confirming what the Kofka thesis have mentioned more than 80 years ago, that memory traces would go through auto destruction if memory inputs had some type of lack of cohesion, cues appear to provide enough strength and support, enabling subjects to store and retain information for long periods of time in an organized manner facilitating recall (Katona, 1940).

The cues used seems to have a high meaning to the children, since it helped them to increase performance after a long period without any practice. Hence, these results agree with Ladewig et all (2001) that everyone can learn a movement through practice, by try and error, however the role of cues is to increase the meaning of the task in order facilitate learning rapidly and efficiently.

It is important to have in mind that when teaching young children a new skill, it is vital to provide basic cues to direct their attention to the most important aspect(s) of the task. These cues will allow them to acquire the basic concepts of the task faster, consequently, they will be able to perform better and feel successful, increasing motivation. After they have developed the basic skills, in other words, got the "big picture", they may pass to another level of the learning process and be exposed to higher levels of complexity without being overload by all environmental information available.

Future research should keep investing at the use of learning cues to assist children to direct their attention to relevant aspects of different tasks, in order to improve learning at contents from regular classes as well as PE activities, such as sports and movement skills.

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