

Breaststroke learning through the use of videotape feedback

Aprendizagem do nado peito através do fornecimento de feedback de vídeoteipe

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Abstract – People from all age groups and social backgrounds have always sought to learn swimming. However, the swimming learning process is usually considered repetitive and tiring, requiring the teacher to use methods that motivate students to join the practice without ignoring the need for improvement in their performance. This study assessed motivation during a breaststroke learning process in students who received videotape feedback, verbal feedback, and who did not receive any feedback during practice. Thirty-seven swimming inexperienced students were divided into three groups: Video (n=13), which received videotape feedback; Verbal (n=15), which received verbal feedback; and Control (n=9), which did not receive any feedback during experimental phases (pre-test, acquisition (5 days), post-test and retention). Participants completed a questionnaire based on Likert scale for motivation assessment. Scores were given to their performance by a swimming teacher to assess breaststroke learning during each experimental phase. Results of motivation assessment showed that students who received feedback (videotape or verbal) felt more motivated during practice than those who did not receive any feedback. Regarding the breaststroke learning, all participants improved their performance along experimental phases, but, during the retention one, Verbal group's performance was considered superior to the Control group's performance. This study concluded that the use of videotape and verbal feedback has motivational results on breaststroke learning, and that it is effective in the learning process.

Key words: Feedback; Videotape recording; Motivation; Swimming.

Resumo – Pessoas de todas as idades e contextos sociais sempre buscaram aprender a nadar. Porém, o processo de ensino da natação é frequentemente reconhecido como repetitivo e cansativo, exigindo do professor a aplicação de métodos que motivem os alunos a aderirem à prática sem desconsiderar melhorias no desempenho. Assim, este estudo avaliou a motivação e a aprendizagem do nado peito de participantes que receberam feedback de vídeoteipe, que receberam feedback verbal e que não receberam feedback durante a prática. Trinta e sete participantes inexperientes em natação foram divididos entre os grupos Vídeo (n=13) que recebeu feedback de vídeoteipe, Verbal (n=15) que recebeu feedback verbal e Controle (n=9) que não recebeu feedback durante as fases experimentais: pré-teste, aquisição (5 dias), pós-teste e retenção. Para avaliação da motivação, os participantes responderam um questionário baseado em escala Likert. Para avaliação da aprendizagem, foram atribuídas notas ao desempenho dos participantes nas fases experimentais por uma professora de natação. Os resultados referentes à avaliação da motivação mostraram que participantes que receberam feedback (vídeoteipe ou verbal) se sentiram mais motivados durante a prática do que os que não receberam. Quanto à avaliação da aprendizagem, todos os participantes melhoraram seu desempenho ao longo das fases experimentais, mas na fase de retenção o desempenho dos participantes do grupo Verbal foi considerado superior ao do grupo Controle. Pôde-se concluir que a utilização de feedback de vídeoteipe e verbal tem efeito motivacional na aprendizagem do nado peito quando comparada com ausência de fornecimento de feedback e é eficiente para aprendizagem.

Palavras-chave: Feedback; Gravação de vídeoteipe; Motivação; Natação.

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INTRODUCTION

Since the dawn of mankind, there are many reasons why humans seek to learn swimming, which is understood as locomotion, balance and ability to perform breathing cycles during propulsion in the water¹. Usually, swimming learning exceeds motor behavior goals and is supported by issues related to water safety, leisure, recreation, and physical and sports training².

One of the difficulties faced by swimming teachers is to establish motivational strategies for their students, considering that the movements used in the learning process are usually repetitive³ and that, many times, students are “obligated” to the practice by imposition of parents or under medical guidance⁴. Research in Sport Psychology considers motivation as a behavior directed toward a goal or the internal and emotional awakening interest in something, being willing to reach it⁵, and its importance is associated with adherence to physical practice, income, physical conditioning, fun, learning and living with friends, and success experience^{6,7}.

Studies on learning and motor control have not contributed much to the search for solutions related to students’ motivational problems during the swimming learning process^{3,8,9}. This aspect calls for a reorientation of the studies’ focus toward variables that affect motor learning, which, ultimately, are the factors addressed by professionals dealing with motor skills learning in a real situation of practice¹⁰.

In any type of learning process, the organization of practice¹¹ and the use of feedback are essential factors for acquiring new motor skills¹². Feedback is information about the action and its environment for a comparison between the real state and that one determined by the action system¹³, allowing the correction of movements. Within sports, the feedback on students’ performance has a motivational function during practice, besides being a source of reinforcement and information¹². Initial studies showed that, when the feedback is provided during tedious, repetitive and long-term tasks, performers show immediate increase in proficiency, as if the feedback was acting as a stimulus to keep them moving forward, causing them to like more the task, try more, and be more willing to practice it for a longer period¹⁴⁻¹⁶.

Specifically, the use of videotape record has turned into a popular way of providing feedback. The videotape became available in the 1960’s, showing the dynamics of students’ movements in detail and providing feedback during the practice^{12,17,18}. Even so, the verbal feedback is still the most used during swimming learning process¹⁹. However, assuming that a visual instruction provided by an image can synthesize the quantity and quality of information compared to an instruction verbally provided²⁰, many studies have shown that feedback provided through videotape is effective in the learning process of different motor tasks, for example: pitches¹⁸, fencing attacks²¹, volleyball serves²², tennis fundamentals²³, swimming styles²⁴, and gymnastic jumps²⁵.

Despite the evidence, the videotape influence in the students’ motivation is not yet empirically consistent because previously cited studies

aimed to analyze the change in motor behavior and not the inner state and emotional awakening interest in something⁵ during learning tasks. There is a need for understanding videotape's motivational effects on motor learning. The hypothesis is that watching their performances on the videotape playbacks helps students to maintain focus of attention, recognize errors and increase efforts to improve their performance²⁶. The objectives of this study were: 1) to analyze the effect of motivational feedback provided via videotape on the breaststroke learning process, and 2) to identify which instructional method of feedback improves the breaststroke learning process – the videotape feedback and/or the verbal feedback given by the teacher. We chose the breaststroke learning process because this swimming style is considered a basic one and provides the individual a good body control in the water².

METHODOLOGICAL PROCEDURES

Sample

Forty-five swimming inexperienced college students participated of the study. The sample selection was based on responses to a questionnaire consisted of seven questions on the level of swimming learning, and on the evaluation of participants' experience in exercising in the water (Pre-test). Participants signed a consent form approved by the Ethics Committee of Universidade de Brasília (Case 026/2001).

At the end of the questionnaire and the experiment, participants were randomly divided into three groups: the Video group was filmed and received feedback through videotape during practice; the Verbal group received verbal feedback during practice; and the Control group did not receive any feedback during practice. During experimental phases, two participants from the Video group and six from the Control group failed to participate in the experiment for personal reasons and for feeling tired during practice, finalizing the composition of groups (Table 1).

Table 1. Descriptive data from experimental groups

Group	Gender (n)	Age (years)
Video (n=13)	F=7; M=6	19.9±1.8
Verbal (n=15)	F=9; M=6	20.2±1.9
Control (n=9)	F=1; M=9	20.4±1.9

Experimental procedures

Data collection was performed individually. When arriving to the pool area, each participant was wearing clothes suitable for the swimming practice and received, outside of the pool, in about 30 minutes, instructions on the motor patterns of breaststroke². Specifically, these instructions were highlighted:

Phases of leg cycle: Recovery and propulsive. In the recovery phase, you need to bend your knees simultaneously, performing dorsiflexion and eversion of feet, avoiding excessive flexion of the hip. In the propulsive phase, you must extend your knees, performing external rotation of them, joining legs with outstretched feet and not “pushing” the water.

Phases of arm cycle: Catch, Pull, Stroke and Recovery. In the catch phase, hands simultaneously face each other in the water to perform the pull. In the Pull phase, you need to perform a traction with your palms facing backwards, bending your elbows and aligning them with your shoulders. In the Stroke phase, forearms perform medial rotation, ensuring that palms are facing upwards, close to the trunk. In the Recovery phase, you need to push hands forward in a horizontal and aerodynamic manner.

Breathing occurs at every arm cycle in the early Pull phase and ends in the early Recovery phase. The arm cycle begins before the leg cycle, but both are finalized in a simultaneous gliding motion.

After instructions, data collection was conducted in five phases. At the end of each phase/day, a swimming teacher assigned scores from 1 to 5 to each participant’s performance (1-poor, 2-fair, 3-good, 4-very good, 5- excellent). We emphasize that the teacher had no knowledge about which group each of the participants belonged.

- *Pre-test* – the swimming experience of each participant was assessed. Each participant performed once each exercise: leg movement coordinated with breathing, holding a plank; arm movement coordinated with breathing, using a float between legs; and coordination of arms, legs and breathing without courseware. The study included participants who were score 1 or 2;
- *Acquisition phase* – it consisted of five days of acquisition in which participants performed five trials of each exercise. Participants chose the days (Monday and Wednesdays or Tuesday and Thursdays) that experimental phases would be performed for the next three weeks. In the first week, participants underwent pre-test in one day and acquisition test in the other. In the other two weeks, they performed two days of acquisition, totaling five days. The number of days of the acquisition phase is related to the type of practice (constant), aiming to form a motor pattern²⁷ according to the method’s efficiency. Video group and Verbal group received feedback after each exercise trial on the first day of acquisition. In the other four days, they received feedback only after the first and fourth trial of each exercise in order to avoid dependence of this information¹²;
- *Post-test* – 30 minutes after the end of the fifth day of acquisition, participants performed one trial of each exercise without receiving feedback;
- *Retention* –10 days after the post-test, participants performed one trial of each exercise without receiving feedback. This test indicates the consistency of the learned motor pattern after the absence of practice, showing the method’s efficiency¹²;

- *Motivation assessment* – at the end of the Retention phase, participants completed a questionnaire on the learning process to which they were submitted, in the same place of data collection. The questionnaire was developed in this study based on a literature review, in view that no instrument has yet been academically developed and validated for this purpose.

Participants of the Video group were filmed by a person moving outside the pool while they were performing exercises in it. For receiving the feedback, each participant left the pool and watched only once his performance in the videotape and then returned to the pool to perform the next trial(s). Participants of the Verbal group received feedback according to a checklist of performance (based on motor patterns of breaststroke²) provided by the researcher in charge. Thus, only the following information was provided on the performance of Verbal group participants:

- *Body position*: position well below the surface; inclined body; leg flexion on the trunk.
- *Legs*: not performing the movement with knees turned inward; little bending at the knees; not performing the movement with dorsiflexion and eversion of feet.
- *Arms*: excessive opening of arms, and near the surface during the Pull phase; a stop occurs near the hip before performing the recovery.
- *General Coordination*: the extension of arms during the recovery phase is not coordinated with the extension of legs in the propulsive phase; the breathing phase anticipates the Pull phase.

Material used

The experimental phases were conducted in indoor pool, measuring 25m long, 12.5m wide and 1.5m deep, heated to 29° to 30°C. A VHS video camera, a 29-inch TV and a VCR were used to record the images and to provide feedback. The questionnaire to assess the motivation of the participants (Table 2) was drafted in Likert scale (A-strongly agree; B-agree in certain aspects; C-undecided; D-disagree in some aspects; E-strongly disagree).

Statistical treatment

It was made a descriptive analysis of the results of the questionnaire assessing motivation, and applied the nonparametric Wilcoxon test for paired data, in the intra-group analysis, verifying differences between the mean scores assigned to participants in different experimental phases and between Acquisition phase 1 (first day of the Acquisition phase) and Retention. The nonparametric Mann-Whitney test was performed to compare scores between groups in each experimental phase. In all analyzes, it was admitted a significance level of 5%. Moreover, the coefficient of variation (CV) of the scores was calculated.

RESULTS

Motivation assessment

The results are shown in Table 2, according to the percentage of answers marked by the participants in each group, using the Likert scale.

Table 2. Relative frequency (%) of the answers indicated by the participants, according to the Likert scale

ANSWERS	Video Group					Verbal Group					Control Group				
	A(%)	B(%)	C(%)	D(%)	E(%)	A(%)	B(%)	C(%)	D(%)	E(%)	A(%)	B(%)	C(%)	D(%)	E(%)
Swimming is a pleasure activity	15.4	53.8	15.4	7.7	7.7	13.3	60.0	20.0	0.0	6.7	11.1	66.7	0.0	11.1	11.1
I wished to learn swimming for a long time	46.2	46.2	7.7	0.0	0.0	66.7	33.3	0.0	0.0	0.0	33.3	33.3	33.3	0.0	0.0
The invitation to join the experiment was motivator for learning the breaststroke	76.9	23.1	0.0	0.0	0.0	86.7	13.3	0.0	0.0	0.0	55.6	33.3	11.1	0.0	0.0
I was able to perceive errors in breaststroke	92.3	7.7	0.0	0.0	0.0	86.7	13.3	0.0	0.0	0.0	77.8	0.0	11.1	11.1	0.0
I was able to correct errors in breaststroke	23.1	76.9	0.0	0.0	0.0	60.0	40.0	0.0	0.0	0.0	44.4	22.2	22.2	0.0	11.1
The teacher's information helped to learn the breaststroke						100.0	0.0	0.0	0.0	0.0					
The teacher's information helped to correct errors						100.0	0.0	0.0	0.0	0.0					
The teacher gave too much information at the same time						33.3	13.3	13.3	13.3	26.7					
The observation of the images on video helped to correct errors	76.9	23.1	0.0	0.0	0.0										
The images contributed to learning the breaststroke	84.6	7.7	0.0	7.7	0.0										
I had difficulty in analyzing errors by watching the video	7.7	23.1	0.0	7.7	61.5										
Breathing and coordinating movements is very important to breaststroke	100.0	0.0	0.0	0.0	0.0	93.3	6.7	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0
The method used in the experiment was adequate for learning the breaststroke	92.3	7.7	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	66.7	11.1	0.0	11.1	11.1
I believe that learning through this method makes swimming less tiring	92.3	7.7	0.0	0.0	0.0	93.3	6.7	0.0	0.0	0.0	55.6	22.2	11.1	11.1	0.0
My learning the breaststroke can be considered satisfactory	38.5	53.8	7.7	0.0	0.0	73.3	20.0	6.7	0.0	0.0	66.7	0.0	22.2	11.1	0.0

All participants, from Video and Verbal groups, affirmed they can perceive and correct errors with the method of providing specific feedback of their own group. However, 22.2% of the Control group participants said they were undecided or partially disagreeing with the ability to perceive and correct errors.

All participants – Video and Verbal groups – agreed, totally or partially, that the type of method used in learning the breaststroke was adequate, making it less tiring. However, 22.2% of the Control group participants disagreed with this statement completely or partially.

Specific results from the Video group showed that all participants agreed, totally or partially, that the observation of the images in the video helps in correcting errors. Only 7.7% of the participants, in this group, partially disagreed that the observation of the images in the video helped them to learn the breaststroke. Although these data prove the importance of providing feedback to videotape, 30.8% of the participants experienced difficulty in analyzing errors watching the video.

Specific results of the Verbal group showed that all participants totally agreed that the information provided by the researcher helped in learning and error correction. On the other hand, 46.7% of the participants completely or partially said also that the researcher provided too much information at the same time.

As to the assertion that learning the breaststroke was satisfactory, only 7.7% of the Video group, 6.7% of the Verbal group and 22.2% of the Control group were undecided. Still, 11.1% of the participants, in the Control group, disagreed partially with this statement. Thus, the rest of the participants, from all groups, affirmed, totally or partially, that learning the breaststroke was considered acceptable.

Learning assessment

The results showed that the averages of students' scores increased in each experimental phase, regardless of group (Figure 1).

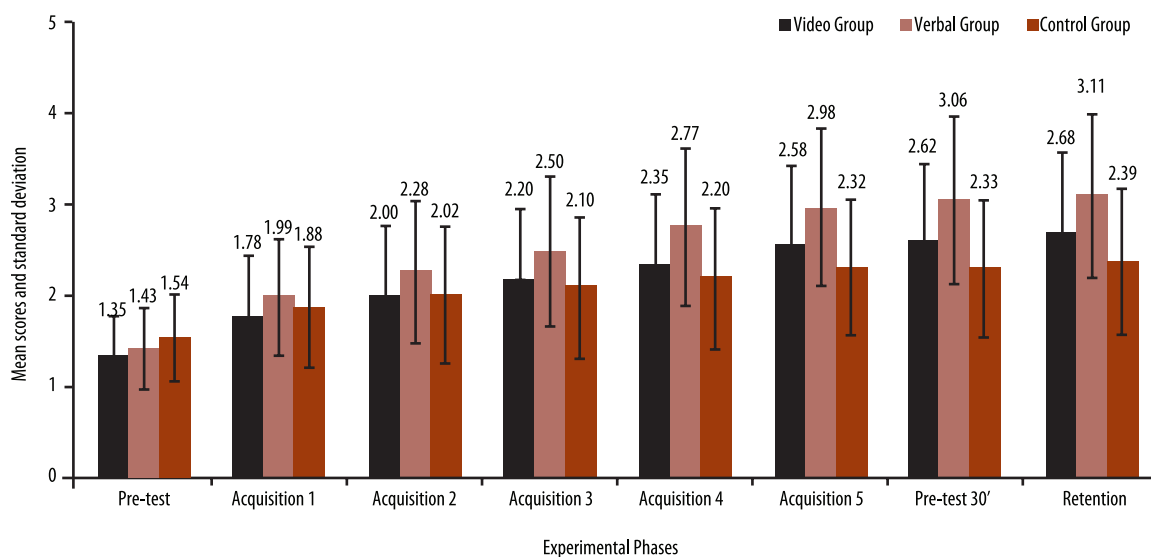


Figure 1. Mean and standard deviation of the scores assigned to each group of participants in each experimental phase

Regarding the intra-group analysis, the results showed that the scores of the Video group participants improved from an experimental phase to another, $p < 0.05$. Only there was no significant improvement in the average scores of the participants from the Acquisition 5 phase to Posttest. So, it was also evidenced a significant improvement of the average scores from Acquisition 1 to Retention, $p < 0.01$. The Verbal group also presented significantly better scores from one phase to the next, $p < 0.05$ and, thus, significant improvement between the average scores from the Acquisition 1 phase to Retention, $p < 0.001$.

Scores of the Control group participants also improved significantly from one phase to another, $p < 0.05$, except for the comparison between the scores in Acquisition 5 and in the Posttest, and between the scores in the Posttest and Retention. There was also a significant improvement in the average scores from Acquisition 1 to Retention, $p < 0.001$.

Regarding the analysis between groups, the results showed that, except for Retention, the scores of the three experimental groups in the other phases were not significantly different. In Retention, the scores obtained by the Verbal group were significantly higher than those obtained by the Control group, $p < 0.05$. However, the scores of the Video group were not significantly different from the scores of the other groups in Retention.

The results for the coefficient of variation showed that this variation, in the Verbal group scores, is always smaller than the other groups (Figure 2). Moreover, the variation of scores of the participants, from all groups, decreased phase to phase, what indicates a homogenization due to learning.

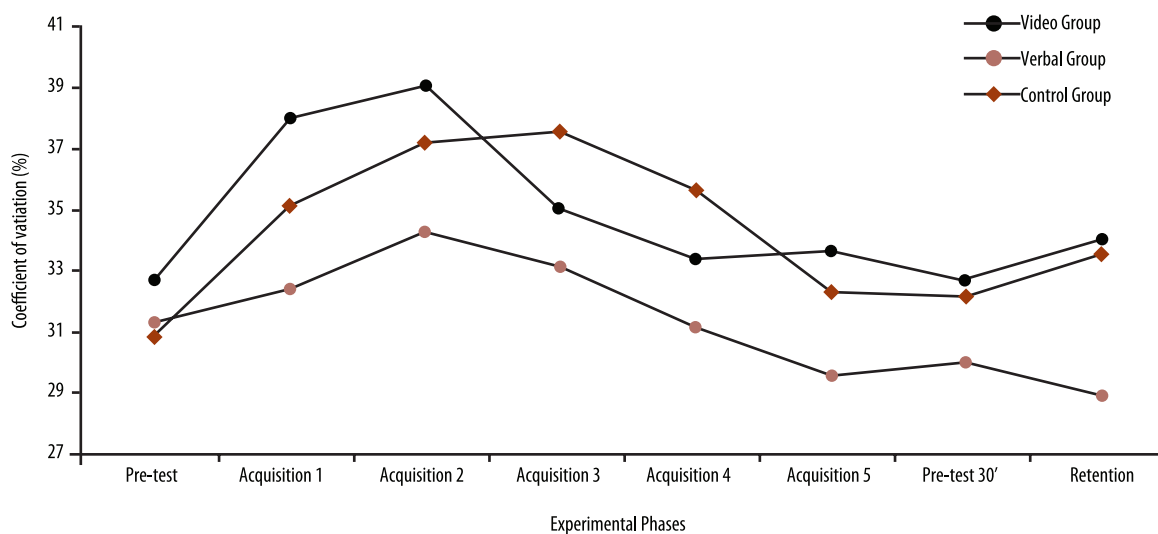


Figure 2. Coefficient of variation (CV) of the scores given to the participants in each experimental phase

DISCUSSION

Assuming that swimming learning can involve exhaustive and repetitive practice, and that teachers need to establish effective strategies for students to remain motivated, this study intends to verify if the use of feedback – provided via videotape – during learning the breaststroke is an efficient

instrument to ensure motivation, as well as to generate significant changes in participants' motor behavior.

Motivation assessment

In general, the motivational effect of providing videotape feedback in learning the breaststroke was evidenced in the analysis of the questionnaire assessing motivation. This effect was attributed to the observation that participants felt good watching their own performance on video, that they could identify their mistakes and attribute importance to the videotape feedback to the process of learning the breaststroke. Participants also considered learning satisfactory. The same effect could be found in the use of verbal information as a source of feedback in learning the breaststroke. Both sources of feedback were considered motivating, since the participants of Verbal and Video groups had enough information that satisfied the requirements of the performer's relationship with his/her goal^{3,9}.

It was not clear that the videotape feedback has a motivational effect superior to the verbal feedback. However, due to some participants, in the Control group, have considered learning the breaststroke tiring and were not satisfied with it, we evidenced, as well as in initial researches¹⁶⁻¹⁸, that the use of feedback has a superior motivational effect than the situation in which it is not provided¹². Another important aspect was that six participants of the Control group failed to participate in the experiment without any justification, raising the question about their motivational states to practice without providing feedback.

Even achieving these results, it is suggested the conduction of more researches about the motivational effect of different types of feedback in learning to swim. The questionnaire developed to assess motivation was not efficient for the designation of the participant's positive feelings about the practice, for example, if he/she feels fine when performing movements, as well as being filmed, and if there are other factors that can motivate him/her. We need to identify a behavior that is directed toward a goal, or a internal and emotional state to motivate the interest in something⁵, without only prioritizing the correction of errors.

Learning assessment

Analyzing the average score in the Acquisition 1 and the Retention phases, the Video group participants had approximately a 50.4% increase in scores; the Verbal group participants, approximately 56.3% increase in scores; and the Control group participants, approximately 26.9% increase in scores. So, even without the use of feedback, changes in motor behavior were observed. For this purpose, it should be considered that the practise¹¹ during the Acquisition phase was essential to improve the participants' performance, regardless of the experimental group. According to the study objectives, there was the formation of a motor pattern²⁷ and its consistency was indicated in the Retention test.

Assuming the use of a feedback, the increase observed in the scores of the Verbal and the Video groups is approximately two times bigger

than the Control group one. This result confirms earlier studies, when providing feedback on the error movement generated corrections on the next move, approximating the movement to the goal task and improving performance^{17,21-25}. Analyzing the mean and the coefficient of variation of the scores in Retention, we observed that the Verbal group learning was superior to the Control group learning. This confirms that the use of verbal feedback facilitates the acquisition of skills in swimming¹⁹.

Although the Video and Verbal groups presented a higher performance than the Control group, the efficiency of the use of one type of feedback on the use of another was not statistically proven. Even knowing that an image can synthesize the quantity and quality of information, when compared to an instruction verbally provided²⁰, the results that were found guide us to reflect on the influence of the type of information provided to learners at different stages of learning. Magill¹², for example, says that the video has a lot of information so that a beginner does not know how to extract feedback. Ennes and collaborators²⁰ showed that the verbal instruction, in the early stages of learning, directs the attention of learners to focus specific performance, whereas the perception and use of feedback (of any kind) tends to be more efficient after practice periods.

Based on the limits of the capacity of attention, it was expected that the participant presented difficulties in paying attention to more than one or two pieces of information about what should be done and, thus, he/she had to divide attention between remembering the information and performing the task¹². Due to the fact that the Video group participants were experiencing new situations (factors involving video and the learning of swimming), it is suggested that they were paying attention to other details that were unrelated to the feedback, as their exposure on video. Anyway, the use of feedback videotape was more efficient for learning when compared to the absence of feedback and, so, it may be an additional teaching method.

CONCLUSIONS

It was concluded that videotape feedback and verbal feedback can be used as additional strategy to motivate people during learning the breaststroke. In addition to motivating more during practice, making it less tiring and more satisfactory, the methods of providing feedback that were investigated may be used by teachers of swimming to ensure significant improvements in students' performance and adherence to the learning process.

To use videotape efficiently, we need to identify the most relevant information from the learning phase, in which the person finds himself/herself, in order to avoid information excess that should be considered to improve performance.

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