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Difficult group goal improves serve reception of experienced volleyball players

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ABSTRACT

This study investigated the effects of group goals difficulty on volleyball jump topspin serve reception with 36 experienced volleyball players. The volunteers performed an initial evaluation, whose results were organized in accordance to the level of performance and then divided into three similar groups: no goal, 10% and 30% group goal difficulty. Volunteers performed 810 receptions divided in 10 sessions during acquisition phase whose performance was scored from zero to 14 points. On retention test, the 30% of goal difficulty showed higher performance accuracy than 10% or no goal at all. **Key words:** MOTOR SKILL, GOAL SETTING, GOAL DIFFICULTY, GROUP GOAL.

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INTRODUCTION

Goal setting is considered a motivational strategy that aims at keeping the attention of the performer and directing it to a certain goal to be achieved, thereby enhancing performance (Locke & Latham, 1985), which is largely used by professionals in sport. Recently, researchers in the areas of Sports Psychology and Motor Learning have been devoting more attention to this phenomenon (Burton & Naylor, 2002; Schmidt & Lee, 2005), since goal setting leads to stronger commitment to achieve the goal of the task, which can contribute to improve motor skill performance.

The effect of goal setting on motor skill acquisition was tested on goal specificity (Mitchell & Silver, 1990; Brawley, Carron & Widmeyer, 1992) or difficulty (Weingart, 1992; Mooney & Mutrie, 2000). Although some studies have not supported the proposal (Weinberg & Weingand, 1993; Kylo & Landers, 1995), specific and challenging goals have promoted better performance than moderate or no goal at all (Locke, Shaw, Saari & Latham, 1981), even in sports environment (Locke, 1991, 1994). In general, individual goals for sports skills ranged between 10 and 30% of increment of the initial performance (Locke, 1994; Hinsz, 1995; Souza & Klein, 1995).

Other studies investigated situation-involving group of individuals (O'leary-kelly, Martocchio & Frink, 1994; Hinsz, 1991), which was named group goal (Burton, 1994). A group goal is set to the whole group as a unit, rather than considered as individual contributions to goals (Widmeyer & Ducharme, 1997) and it can have the same impact on the performance of the group that individual goals have on individual performance (Widmeyer & Ducharme, 1997; Weldon & Weingart, 1993). Moreover, the group goal mechanisms involve effort, persistence, direction and development of the strategy (Locke & Latham, 1990).

The combination of difficulty of the goal and group goal with naïve subjects showed that difficult goals led to better performance than easy goals (Weingart, 1992) and some studies found a positive linear relation between group goal difficulty and performance (Locke & Latham, 1990; Durham, Knight & Locke, 1997) but others did not (Weldon & Weingart, 1993; Tenenbaum, Bar-eli & Yaaron, 1999). It shows that the effect of difficulty on group goal has not been clearly defined yet. Here it is important to point out that we did not find many studies investigating group goal with sports as well, these studies did not control the previous experience in the task to be performed although studies that used experienced subjects detected positive effect of goal setting on performance (Lee, 1988; Johnson, Ostrow, Perna & Etzel, 1997). Moreover, the task should require interactions between the members of the group to perform the task. The volleyball serve reception is an appropriate task to test this background because players have to interact to reach a good score.

Considering all these factors, the present study investigated the effects of the level of difficulty of group goal on the volleyball serve reception with experienced subjects. We tested the hypothesis that difficult goal will lead to better performance than easy goal or no goal at all.

MATERIALS AND METHODS

Sample

Thirty-six male volunteers, aged between 15.3 (+ 0.4) were volunteers in the study. All the volunteers were athletes at clubs in Brazil, had average experience of 3.0 years in volleyball with five practice sessions per week. The local Ethics Committee in Research approved the study and the participants had no financial benefits.

Task

The task comprised the performance of volleyball serve reception of the volleyball jump topspin serve. Two servers on top of wooden crates 60cm high were positioned on the end line on the side A of the court with the objective of simulating a jump topspin serve, situation adopted during practice. Three participants were positioned on the side B of the court to perform the reception of the serve (Figure 1). This task was specifically thought to test the proposed hypothesis because service reception is a group task and participants cannot think individually during practice to reach a specific group goal.

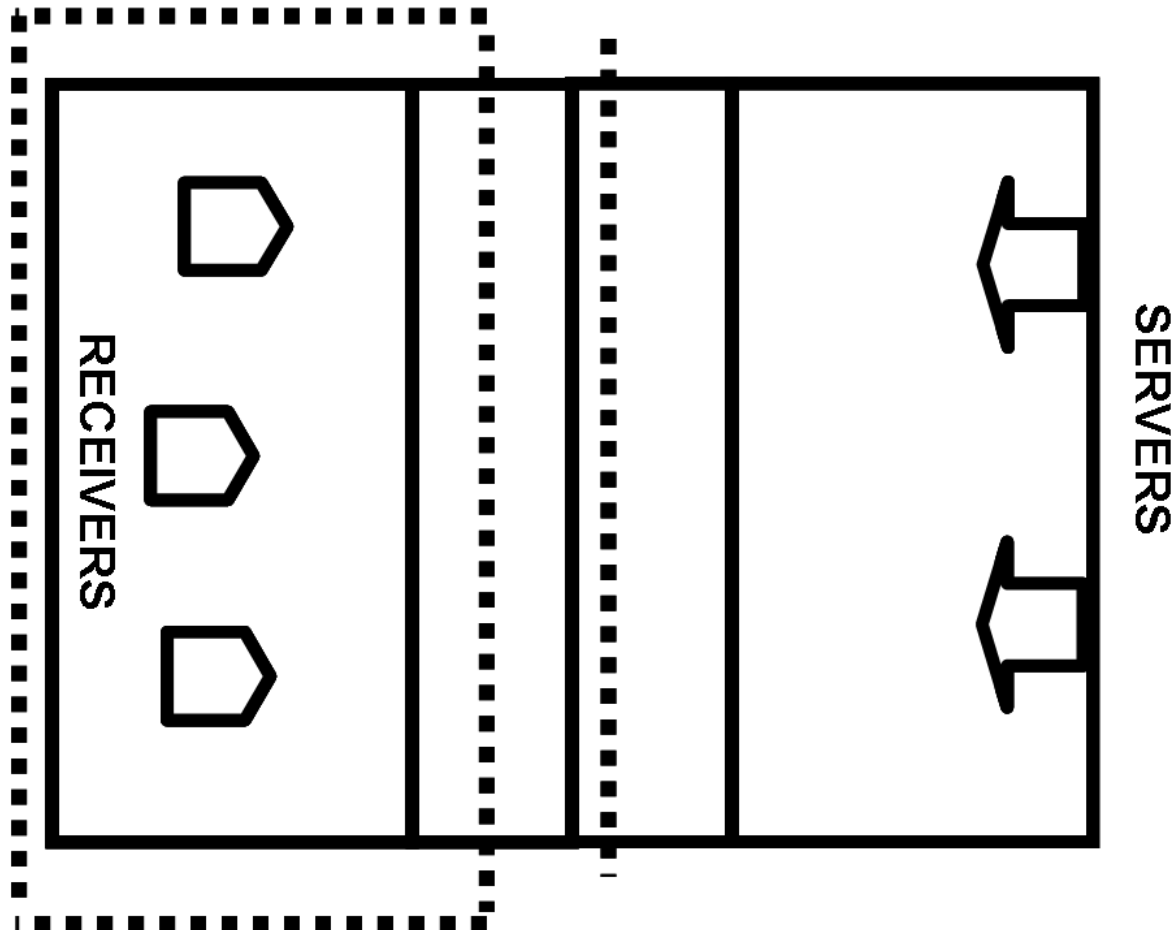


Figure 1. Illustration of the research environment.

Experimental Design

The study was carried out in three phases: 1) initial evaluation; 2) acquisition phase; 3) retention test. The initial evaluation was carried out on one day, with 27 trials for each volunteer. The acquisition phase comprised by 10 practice sessions, five days per week, with three blocks of 27 trials each, with a total of 810 trials. The retention test comprised by 27 trials and took place one week after the last practice session of the acquisition phase.

The thirty-six participants were randomly assigned to three groups ($n=12$): 1) specific goal with 10% of difficulty (G10); 2) specific goal with 30% of difficulty (G30) and 3) no goal - control group (CG). Each group was composed by four subgroups with three participants according to their individual performance in the initial evaluation.

Procedures

Every participant performed the initial evaluation individually in one session with nine serve receptions in all the three positions of the end line of volleyball court (Figure 1). Two servers were positioned on top of wooden crates performing serves alternately. The position of the receivers was changed on every nine trials. The servers received the following instruction: "Serve strongly to score the point, and aim the serve at the position the receiver is positioned". During acquisition phase all subgroups of three participants were informed about the goal they should reach, which was calculated by the mean of their initial score added the percentage of the experimental group they had been assigned to.

During acquisition phase each subgroup was instructed to position their selves in the back of the court B and perform three blocks of 27 trials and they changed positions after every block of trials but initial position was counterbalanced during all practice sessions. The same instructions were provided as regards the serve. However, the order of the serve was randomly established and all participants performed the same number of receptions, that is, 270 trials by all participants. Two researchers recorded the values on a specific spreadsheet during the initial evaluation, acquisition phase and retention test. Results pointed to an inter-evaluator agreement (objectivity) of 0.90, and an intra-evaluator agreement (reliability) of 0.85 and 0.88, which gives support to the procedure adopted in the study (Thomas, Nelson & Silverman, 2005).

Measures

The dependent variables adopted were the score on each serve reception and the commitment to the goal. Since volleyball games are analyzed in a scale of five grades (i.e., from 1 to 5), we organized a more accurate instrument that can show difference in performance. In order to obtain the measure of score, the volleyball court was divided into sectors and attributed values so as to create an ordinal scale based on volleyball game. The maximum score was 14 points adopted when the reception was directed to a within part of the offense zone and was high enough, since it is the place of the best serve reception, and therefore the sector that offers for the setter to use all the possibilities of set. The lowest score was when the serve touched directly on part of the court without touching any limbs of the participants, that is, ace. The other scores were divided between these two extremes, as explained below.

The score scale we used had the horizontal and the vertical axes as references. The horizontal axis was defined by the place where the ball hit the ground after reception of the serve, considering that the court was divided into sectors. The vertical axis, on the other hand, was defined in relation to the height the ball (Figure 2).

The final score was the combination of the sectors of the horizontal axis and the height of the ball during reception of the serve identified by a rubber band fixed in the court. It means that the sectors within the offense zone presented higher scores and became smaller as the ball touched the defense zone. Additionally, the ball that reached sectors above the rubber band received a higher score (e.g., within the offense zone, the score attributed would be: sector + high = 14) and below it received a lower score (e.g., within the offense zone, the score attributed would be: sector + low = 10).

We also measure the commitment to the goal. It was obtained by means of the inventory developed by Hollenbeck, Williams and Klein (1989), having also been used by Guthrie and Hollensbe (2004). This inventory is suggested as a measure of commitment to the goal (Locke & Latham, 1990), and aimed to check whether the participants were committed to the established goal.

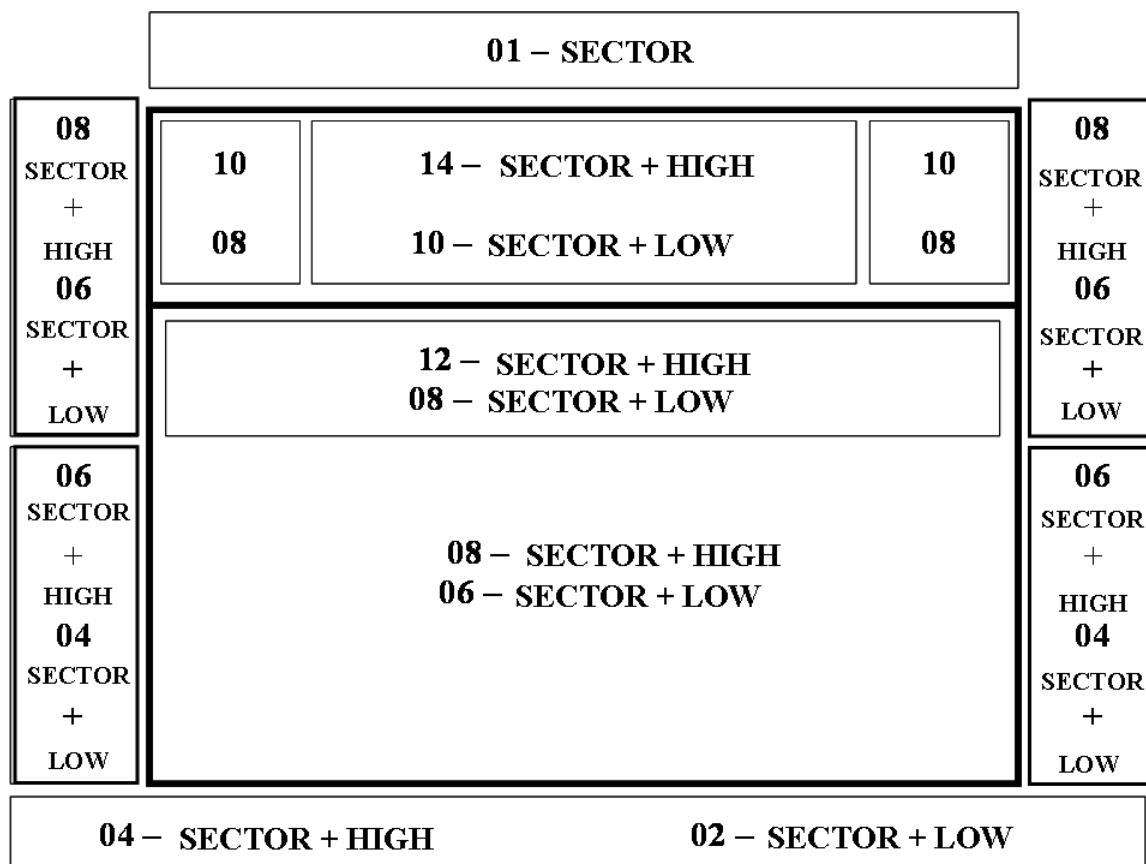


Figure 2. Instrument to measure performance during serve reception. The slashed lines represent different sectors and the highest scores were designated to high balls and lowest scores to low balls.

Data analyses

The sample was characterized by the mean and standard deviation of the score in blocks of 27 trials. The one-way ANOVA was carried out on the initial evaluation block to identify whether the groups were similar prior the experiment. A two-way ANOVA (3Groups x 27Blocks) was carried out on the first block of acquisition phase and retention test out to identify if the goal difficulty have any effect after the period of practice. A two-way ANOVA (3Groups x 2Blocks) was performed for the first block of the acquisition phase and the retention test, and another (3Groups x 27Blocks) for the last block of the acquisition phase and the retention test to assess whether the length of the interval between the end of acquisition and the retention test led to changes in performance. The Tukey test was adopted for pair comparisons and the level of significance set at $P < 0.05$. The Mann-Whitney's U test was used to identify possible intergroup differences in the measure of commitment to the goal. Before data analyses Shapiro-Wilk's test was used for us to assess the normality of the data, and the Levene test to detect homogeneity of the variance.

RESULTS

Means of the scores

The Figure 3 shows that in the initial evaluation the groups were very similar in accuracy, since the mean scores of the subgroups were very similar $F_{2, 33} = 0.00011$, $P = 0.999$. The analysis of the manipulated independent variable during the acquisition phase showed significant difference between groups $F_{2, 33} = 26.124$, $P = 0.001$, and Tukey test detected that G30% was more accurate than G10% ($P = 0.05$) and CG (P

= 0.05). There was also a significant difference between blocks $F_{29, 957} = 2.201$, $P = 0.001$ and Tukey test detected that the fourth block of trials had lower accuracy than the 23rd and 30th blocks ($p = .004$). No main interactions were identified $F_{58, 957} = 0.983$, $P = 0.512$.

The analysis of the first block of trials from acquisition phase and retention test identified significant differences between groups $F_{2, 33} = 4.815$, $P = 0.015$, with the G30% presenting higher accuracy than G10% and CG (Figure 3). Significant differences were also detected between blocks $F_{1, 33} = 5.586$, $P = 0.024$ and the participants increased performance accuracy from the beginning of practice to the retention test. We also detected a significant interactions $F_{2, 33} = 4.920$, $P = 0.013$, and Tukey test identified that G30% increased accuracy from the beginning of practice to retention test ($p = .006$) and during retention test G30 was more accurate than G10 and CG ($p = .006$).

The analysis of the last block from acquisition phase and retention test identified significant differences between groups $F_{2, 33} = 17.005$, $P = 0.001$ and the G30% showed higher accuracy than G10% ($p = .001$) and CG ($p = .0001$). No significant effect was detected for blocks $F_{1, 33} = 0.123$, $P = 0.728$ or interactions $F_{2, 33} = 1.289$, $P = 0.289$.

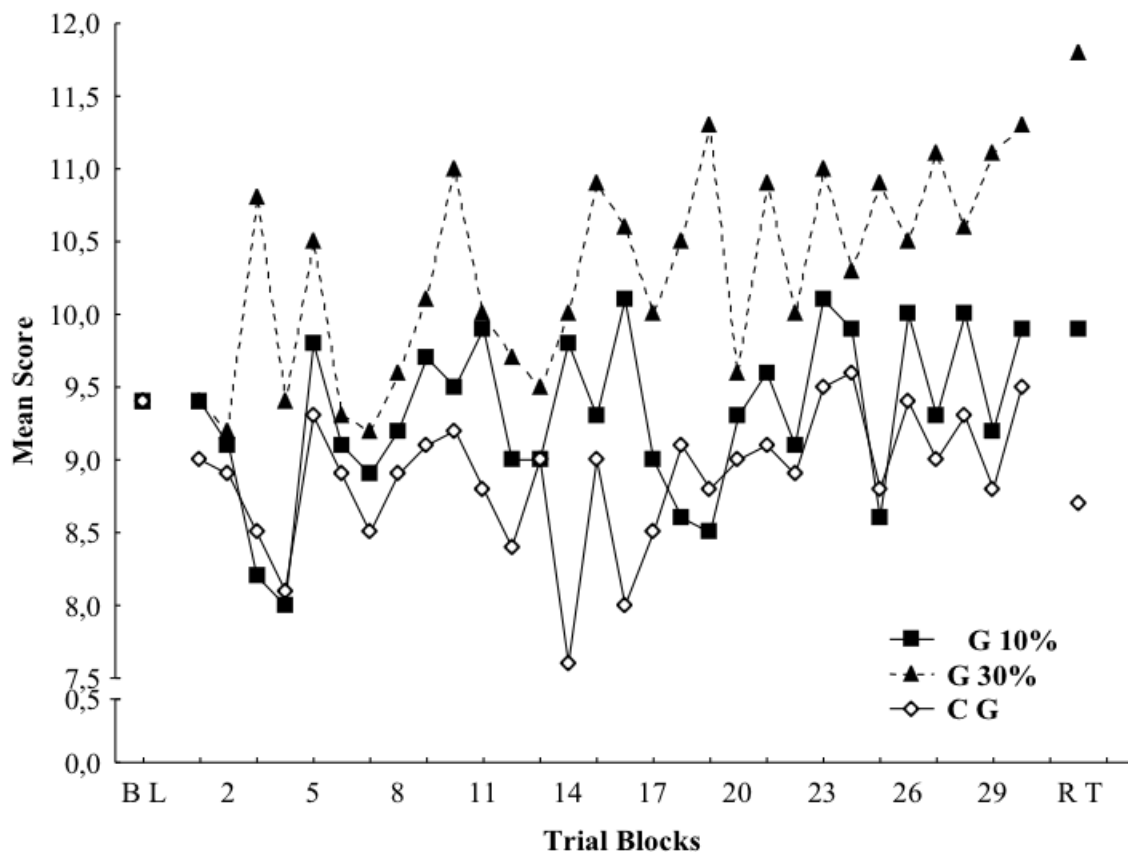


Figure 3. Mean of the scores in the initial evaluation, in the acquisition phase and in the retention test.

Standard deviations of the scores

The analysis of standard deviation was not carried out on initial evaluation because it indicates performance consistency, which is not necessary to separate the subgroups. The analysis from acquisition phase (Figure 4) detected significant differences between groups $F_{2, 33} = 3.228$, $P = 0.052$ and G30% was more accurate

than the G10% ($P = 0.05$) and the CG ($P = 0.05$). No significant effects were detected for blocks $F_{29, 957} = 1.463$, $P = 0.055$ or significant interactions $F_{58, 957} = 1.022$, $P = 0.432$.

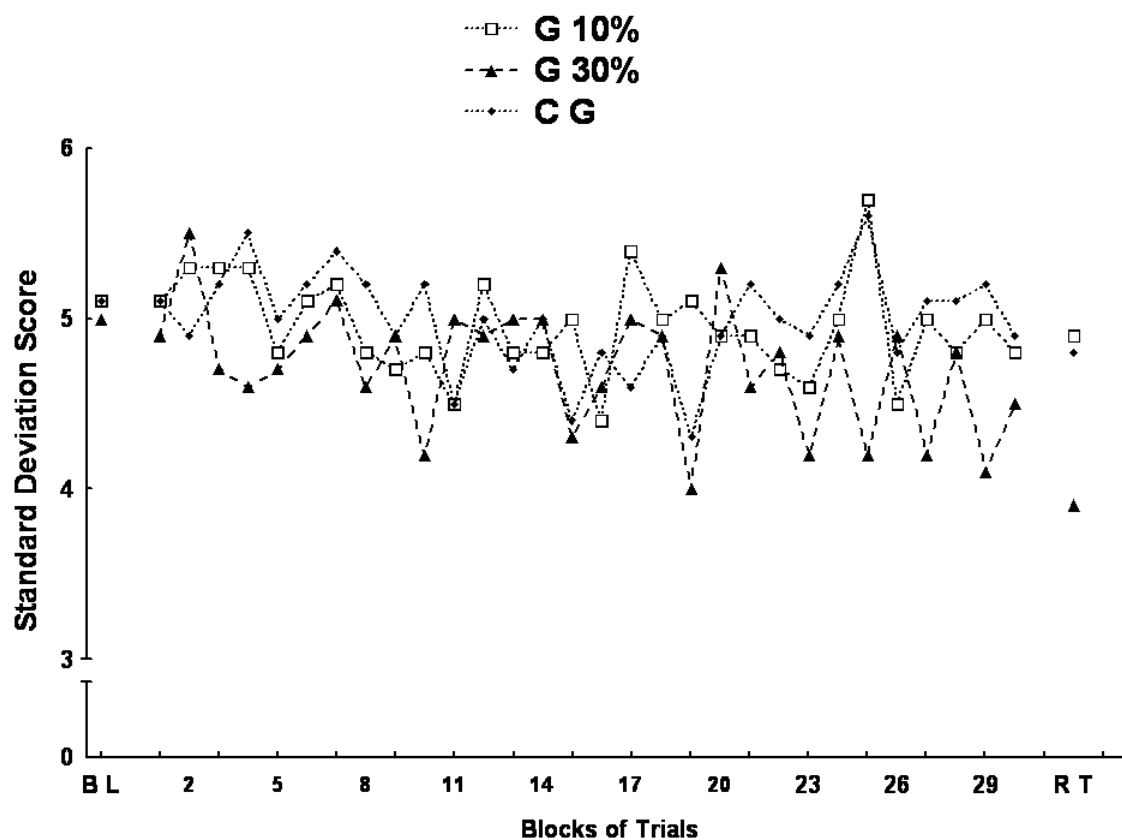


Figure 4. Mean of the standard deviations of the score in the initial evaluation, in the acquisition phase and in the retention test.

The analysis of the first block of trials from acquisition phase and retention test identified no significant effects for groups $F_{2, 33} = 1.153$, $P = 0.328$, blocks $F_{1, 33} = 0.008$, $P = 0.928$ or interactions $F_{2, 33} = 0.577$, $P = 0.567$. The analysis of the last block from acquisition phase and retention test identified no significant effects groups $F_{2, 33} = 0.830$, $P = 0.445$, blocks $F_{1, 33} = 1.456$, $P = 0.236$ or interactions $F_{2, 33} = 0.537$, $P = 0.589$.

Commitment to the goal

The comparison of the adapted inventory between the two experimental groups (the researcher had not set a goal for the CG) showed that the G10% and the G30% had the same commitment to the goal ($P > 0.05$). Moreover, the groups had a score of 5 for most of the questions, which represents the maximum value of commitment to the goal on this test, indicating that the participants accepted the goal established and were committed to the goal enough to improve their performance.

DISCUSSION AND CONCLUSIONS

Previous studies showed positive effects of group goals setting upon performance (Weingart, 1992; Widmeyer & Ducharme, 1997) because it improved mechanism such as persistence, commitment and development of strategy (Locke & Latham, 1990) and others did not (Weldon & Weingart, 1993; Tenenbaum,

Bar-eli & Yaaron, 1999). When we think about collective sports like volleyball, it is still important to identify the effect of group goal setting in sport training. This study tested the effects of the level of difficulty of group goals on volleyball serve reception with experienced subjects with 10% and 30% of the goal difficulty and a control group with no goal at all. The hypothesis was that, after the period of practice, difficult specific goals (G30%) would lead to better performance than moderate specific goals (G10%) and no goal at all (CG). The results confirmed the hypothesis.

It is important to point out that the performance of all groups was very similar on initial evaluation, which means that the effects reported are resultant from our independent variable. During acquisition phase only difficult goal increased performance accuracy with practice although in absolute values, G10% reached its goal and G30% did not. However, only G30% increased significantly performance accuracy with practice. This result has two implications: the amount of practice during acquisition phase was enough to improve performance; and the difficulty of group goal affects motor performance.

These finds extend those of Weingart (1992) and Durham, Knight and Locke (1997) confirming that difficulty of group goal led to better performance than easy goals not only with naïve subjects but also with experienced ones. However, achieving difficult goal requires commitment and enough amount of practice. This experiment required to the participants to perform more than 800 trials for each subgroup; moreover, they were required to interact in every trial for trying to reach the goal. Whether group goal is not the addition of individual goals (Locke & Latham, 1990), this task has the necessary characteristics to test the effects of group goal and its results give support to the proposal that difficult specific goal led to better performance when compared with the moderately difficult specific goal and no goal at all (Locke & Latham, 1985). Additionally, considering only two levels of goal difficulty was a limitation of our study, we also detected a linear relation between goal difficulty and performance (Locke & Latham, 1990). While some studies presented similar results (Weldon, Jehn & Pradhan, 1991; Weingart, 1992) others rejected this hypothesis (Weldon & Weingart, 1993; Tenenbaum, Bar-eli & Yaaron, 1999). Such conflict of results shows that this is a promising field for investigation.

The analysis of performance consistency showed that difficult goal resulted in lower variability than moderate or even no goal during acquisition phase but that result did not remain in the retention test. These results show that goal setting improves performance accuracy, rather than reduces its variability. Similar results were found previous studies (Corrêa, Souza Junior & Santos, 2006) and probably because goal setting results in stronger commitment to the task established (Locke & Latham, 1990), not exerting any influence on its consistency. This position was observed in previous studies (e.g., Lee, 1988) with similar characteristic to ours, that is: experienced subjects, group goal and experimental sport situation.

During retention test difficult goal had better performance accuracy than moderate or no goal. The results show that the changes observed due to the setting of goals are lasting ones, and therefore can be considered important factors in the process of skill acquisition (Schmidt & Lee, 2005).

The moderate goal was not enough to improve performance in spite of the amount of practice (810 trials), similarly to the no goal at all showing that the moderate goal does not lead to a sufficient increment on task commitment and consequent performance improvement. Opposite results are presented by difficult goal, which had higher performance accuracy during retention test. The results taken together suggest that different goal percentages lead to different performances.

Another important aspect is the interaction between the difficulty of the goal and the commitment to the goal as variables that might have enhanced performance (Weldon & Weingart, 1993). The inventory used to measure goal commitment showed that the groups were similarly and highly committed during the experiment indicating that difficult goal and moderate goal channel efforts in different ways (Weinberg, 2001). Finally, the effect of the goal established might result from the interaction between goal difficulty and level of learning, since it is adamant that the subject masters the task when the product goal is used (Correa, Souza Junior & Santos, 2006). In the present study, the subjects already were experienced athletes who participated in state championships and managed to use the goal established to motivate and focus their behavior. Therefore, studies with different quantitative goals and different levels of skill emerge as important variables for the investigation of the phenomenon analyzed here.

In general, the results give one step forward showing that difficult group goal leads to higher performance improvement on sport skills and that, as regards quantitative (specific) goals, the higher the goal, the better the performance, as long as there is enough skill and commitment. At last, our results provide support for training of collective sports.

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