

# The Effect of Goal Setting on Throwing Skill Learning in 10-Year-Old Boys

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## Abstract

**Background:** Learning is a phenomenon that has interested humans for a long time. Research on the factors influencing learning has always interested psychologists and all those dealing with education, particularly sports coaches.

**Objectives:** This study aimed to investigate the impact of goal setting on learning a skill targeting 10-year-old boys.

**Patients and Methods:** For this purpose, forty 10-year-old male children were selected as the study sample and were assigned to one of two groups: goal-setting (n = 20) and non-goal setting (n = 20) groups. In the acquisition phase, each group participated in 8 sessions for 8 continuous days, and then participants in each group conducted 40 (4 blocks of 10 attempts per session) attempts separately. Finally, after 24 hours, the groups performed a retention test. The scores of each group at each phase were obtained and compared using ANOVAs and independent t-tests.

**Results:** The results of the statistical analysis did not show differences in the acquisition phase between the two groups ( $P > 0.05$ ). In the retention phase, there was a significant difference between the two groups, and this advantage was in favor of the goal-setting group ( $P < 0.05$ ).

**Conclusions:** In general, it is recommended that teachers and sports coaches use goal setting when teaching skills to children.

**Keywords:** Learning, Acquisition and Retention, Goal Setting, Children, Throwing Skills Over Shoulder

## 1. Background

Learning is a phenomenon that has interested humans for a long time. Research on the factors influencing learning is a topic that interests psychologists and all those who deal with education, particularly sport coaches. In this context, research on verbal learning and overall mental has been done and in the late twentieth century, many studies have been done on motor skills learning (1). Coaches and sports psychologists generally agree that motivation is important for learning and performance; therefore, they always trying to keep athletes in an appropriate level of arousal and control, aggravating and reducing factors that can affect the technical and tactical performance of athletes, thus developing the effectiveness of individuals' or groups' sports skills and performance (2). One of the motivation techniques that athletes and coaches know has a major effect on commitment, persistence, dedication, and long-term self-motivation is goal setting (3). Goal setting is an important motivational technique that learners are encouraged by and that determines performance targets. A goal is the intention, animus, and end point of a procedure. The purpose of sports, as defined by Locke

and colleagues, is to achieve a certain standard of proficiency in a task, usually within a limited time (4). Prior to 1985, many studies were not performed on goal setting in sports (5), but since then, several studies have been conducted on goal setting in various fields (6). Studies have shown goal setting's moderate to high effectiveness on exercise (7), based on which, in recent years, the target set as a motivational strategy has increased notably through academic and industrial positions. This method has been used frequently, particularly in industry, and has significant implications in learning sports and physical education. Thus, being committed to goal setting is very encouraging. Teachers should encourage students to set realistic goals that are attainable by practice and effort. If learners set a distant goal, they will lose their enthusiasm. In addition, goals that are easily achieved reduce motivation (1). Researchers who have conducted studies on goal setting have emphasized its advantages. For example, Weinberg (8) on the impact of goal setting noted that it has a significant impact on learning, and long-term goal setting has more advantages than short-term. Stoeber et al. (9, 10) studied the importance of goal setting and showed that

goal setting, alone or in combination with other training methods, has positive effects on improving performance. Wang and Haddleston (11) studied the psychological skills used by Chinese swimmers in 52 women and 54 men and found that over 50% of participants always used positive goal-setting techniques and performance analysis.

However, researchers had investigated the impact of goal setting on sports performance in older individuals; positive results have been achieved in this field, but research showing the effects of these factors on children's performance has not been done yet.

## 2. Objectives

With regard to the role of goal setting in motor learning, given that no research on children has been done, the present study aimed to investigate the impact of goal setting on learning a skill, targeting 10-year-old boys.

## 3. Patients and Methods

### 3.1. Participants

Forty 10-year old children (Mean = 10.4, SD = 0.36) participated (in two groups of 20 individuals) in the study. They were selected through available sampling from a group of individuals who were right-handed, had no disabilities in their performing hand, had no gross visual deficits, and were all novices in the skill (throwing balls). Then they were randomly divided into two groups: a goal-setting group (n=20) and a non-goal setting (n=20) group. All participants gave informed consent and their legal guardians also gave informed consent. The participants were recruited from primary schools in Ahvaz. The protocol was approved by the review board of Shahid Chamran University prior to participant recruitment, and all participants provided written informed consent before participating in the experimental procedures. The study was also approved by the ethics committee of Shahid Chamran University of Ahvaz.

### 3.2. Apparatus and Task

The task was similar to one used by Chiviacosky et al. (2008) (12) and required participants to throw a tennis ball at a distance of 3 m to a target consisting of a series of concentric rings on the floor. The target was similar to ones used in related studies (13-15). This specific style of target was selected because a variation of this target had been used by physical education teachers in the cooperating school to measure performance accuracy in a variety of motor skills (e.g., kicking, striking, underhand tossing).

Because of this prior experience, we felt children could easily interpret their performances as they practiced the prescribed task. In addition, the teacher was familiar with this style of target, which promoted the simple integration of the target into the active physical education class and facilitated accurate performance measurements by the cooperating teacher. The center of the target had a radius of 10 cm. Concentric rings with radii of 20, 30, 40, 50, 60, 70, 80, 90, and 100 cm were drawn around the center circle. These served as zones to assess the accuracy of the throws. If the tennis ball landed on the center target, 100 points were awarded. If the ball landed in one of the rings, or outside the marked target, 90, 80, 70, 60, 50, 40, 30, 20, 10, or 0 points, respectively, were recorded. If the ball landed on a line separating two rings, the participant was awarded the higher score. This method of scoring was consistent with previous assessment techniques used by the corporation physical education teacher.

### 3.3. Procedure

This study was a quasi-experimental research design with a pre-test and post-test and retention of the two experimental groups (goal setting and non-goal setting). In the first phase, to identify subjects who met the inclusion criteria, participants completed a demographic questionnaire. Then, to ensure the homogeneity of groups and gain basic points, a pre-test was performed to measure participants' skill in throwing a ball over their shoulder as an assignment criterion that included 20 attempts; based on these scores, subjects were divided into the two groups, goal setting and non-goal setting. According to previous studies by Getz and Rainey (16), the goals were determined for participants in each group quantitatively according to pre-test scores and the amount of progress that must be achieved during the experiment. The targets in the goal-setting group included:

Based on this classification, a 60% improvement in the last practice compared with the pre-test score was determined as the long-term goal to be established, and 10% progress in the first session of training, 20% for the second session of practice, and 30%, 40%, 50%, 60%, 70%, and 80%, respectively, for third to eighth training sessions compared to the pre-test score was determined as the short-term goal. For the control group (no goal-setting), goal setting was not determined. Then each group executed 8 sessions of training for 8 consecutive days including 40 attempts (4 blocks of 10 attempts per session; total throws made by each subject was 320 throws) over the shoulder in each group separately. Finally, a retention test was performed 24 hours after the last session. It should be noted that subjects rested for 30 seconds after 10 throws to avoid

tiring. The number of throws in the retention was similar to the pre-test phase.

3.4. Data Analysis

The statistical analyses used in this study were analysis of variance (ANOVA) with repeated measures and independent t-tests, and the Kolmogorov-Smirnov test was used to determine the normality. All analyses were performed using SPSS version 17. Data are expressed as mean ± standard deviation and a P value of 0.05 was considered significant.

4. Results

Before the data analysis, the Kolmogorov-Smirnov test was used to determine the normality of data, and the results showed that all data have a normal distribution. Afterward, the independent t-test was selected to compare scores between two groups in the pre-test phase.

The throwing scores for the goal-setting and non-goal setting groups in the pre-test, acquisition (training sessions), and retention phases are shown in Table 1. As seen in Table 1, both groups showed relatively equal advances in their performance. Both showed a relative increase in their skill and performance in throwing a ball over their shoulder. But, as can be seen in the retention phase, the performance of the goal-setting group was better than the non-goal setting group. Thus, according to the above table, the mean data show that goal setting led to better performance in the retention phase in the goal-setting group. It should be noted that higher scores represent higher performances in each group.

Table 2 shows the results of the comparison between the goal-setting and non-goal setting groups' throwing performance in the pre-test phase.

According to Table 2, it can be stated that the performance of both groups was not significantly different in the pre-test phase ( $t = 0.73, P = 0.46$ ).

Table 3 shows the results of the repeated measures ANOVA between difference blocks in the acquisition phase for the two groups on the task of throwing a ball over the shoulder.

The results showed that the effect of the groups and effect of the interactions of groups and sessions is not significant; thus, there is no significant difference between groups in skill acquisition conditions. However, the training session effect is significant. In the acquisition phase, the ANOVA results showed significant within-group differences.

In Table 4, the mean scores in the retention phase are compared for the goal-setting and non-goal setting groups.

According to Table 4, there was a significant difference between the mean scores of the two groups in the retention phase. Therefore, the assumption is that the goal-setting group had better scores than the non-goal setting group in the retention phase. In the retention phase, the t-test results indicate a significant difference between the two groups ( $t = 5.28, P = 0.001$ ).

Based on the above results, it can be concluded that:

The two groups' execution of throwing a ball over their shoulder in the acquisition phase indicates that both groups improved their performance and advanced their scores by continuous training, and the training affected both groups' acquisition significantly; however, it did not affect the retention of the non-goal setting group.

To better illustrate this, the results of the groups in the pretest, acquisition (training sessions), and retention phases can be seen in Figure 1.

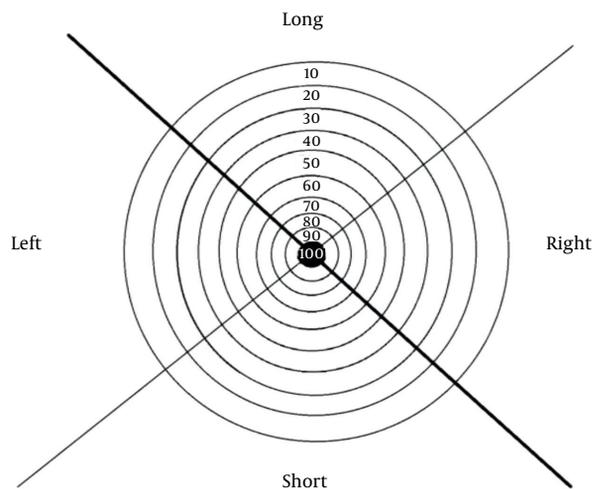


Figure 1. Study Task

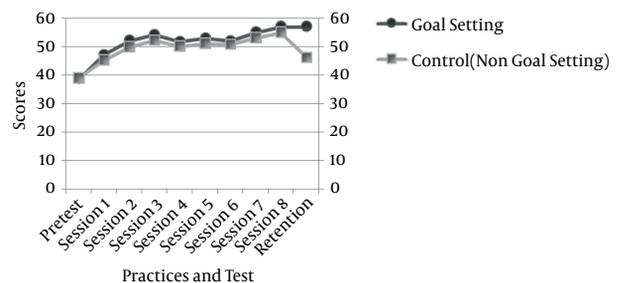


Figure 2. Performance Graph for the Pre-Test, Acquisition, Retention, and Transfer Phases in Two Groups of Children

**Table 1.** Means and SDs for the Two Groups in the Pre-Test, Acquisition, and Retention Phases

Group	Pre-Test	Acquisition								Retention
		Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8	
Goal setting	38.70 (8.13)	44.15 (7.32)	48.65 (5.75)	49.65 (5.98)	50.50 (6.12)	53.80 (5.79)	56.70 (4.80)	45.58 (4.32)	60.30 (4.25)	54.25 (3.82)
Non-goal setting	38.95 (7.63)	43.85 (5.93)	46.85 (4.00)	48.45 (4.13)	50.60 (5.15)	52.90 (4.63)	56 (3.40)	57.30 (3.60)	59.60 (3.47)	48.90 (2.42)
Total	38.82 (7.78)	44.00 (6.57)	47.75 (4.97)	49.05 (5.11)	50.55 (5.58)	53.35 (5.19)	56.35 (4.12)	57.87 (3.96)	59.95 (3.84)	51.57 (4.16)

**Table 2.** Results of the Independent T-Test Comparing the Two Groups' Pre-Test Results

	Goal Setting	Non-Goal Setting	T-Test		
			df	t	P Value
Pre-Test	39.5 (6.40)	37.60 (6.11)	38	0.73	0.46

**Table 3.** ANOVA Results With Repeated Measures in the Acquisition Stage

	Sum of Squares	df	Mean of Squares	F Value	P Value
Session	8411.89	7	1201.70	189.83	0.001 <sup>a</sup>
Session Group <sup>a</sup>	23.64	7	3.37	0.53	0.83
Error (Session)	1683.83	266	6.33		
Group	55.27	1	55.27	0.34	0.55
Error (Group)	6037.01	38	158.86		

<sup>a</sup>Statistically significant.

**Table 4.** Results of the Independent T-Test in the Post-Test Phase (Retention)

	Goal Setting	Non-Goal Setting	T-Test		
			df	t	P Value
Retention	54.25 (3.82)	48.90 (2.42)	38	5.28	0.001 <sup>a</sup>

<sup>a</sup>Statistically significant.

## 5. Discussion

This study aimed to investigate the effects of goal setting on the learning of a motor task in 10-year-old boys in Ahwaz. As the results of the statistical analysis indicate, there was no significant difference between both groups in the acquisition phase. This means that both groups showed equally significant improvements in performing the task of throwing a ball over their shoulder toward a target at this stage. But according to the survey results, in the retention phase, the group who used goal setting during the training program demonstrated superior learning than other group in the retention stage. Thus, these results indicated that goal setting has a considerable impact on the learning of this skill. In addition, the results showed that training with and without goal setting had significant effects on the children's throwing skills. The results

of this study confirm the results of previous research on the influence of goal setting. It is notable that, unfortunately, research on goal setting is limited, particularly on children; therefore, further research is necessary. According to the results obtained in the acquisition phase, it can be seen how progress of two groups of participants during the eight training session. As was noted previously, the survey results showed that participants in both groups learned how to throw the ball over their shoulder toward a target at the same level in this phase. Thus, there is no difference between the groups in the acquisition phase. In the initial sessions of the acquisition phase, development was relatively fast in both groups. This result is consistent with the power law of practice proposed by Snoddy (1926). According to this law, primary training is identified by a considerable amount of progress. However, after this rapid progress, more practice results in a lower rate

of progress. In this study, the participants in both groups improved relatively quickly in the initial training sessions, but then they less experienced the velocity and acceleration of progress. Thus, both groups achieved acquisition as defined. Both groups underwent changes in their ability to perform a perceptual motor skill as a result of practice and experience in the acquisition phase. In addition, similar to the general features of performance while learning a skill described by Magill, in this graph, progression in skill acquisition was seen in both groups. This is a general characteristic of progress and refers to the improved performance over time that was observed in the present study in both groups. This means that the exercises in both goal-setting and non-goal setting conditions over time led to progress in task acquisition. In addition, what is known as the plateau of learning and performance volatility during acquisition tasks in the learning literature, and motor control as parallel performance with motor learning tasks were also observed in the present study, which is consistent with it (17, 18). Our findings showed that in the retention phase, subjects who had used the goal-setting strategy in the acquisition phase had better performance than those without an objective. Thus, referring to and Table 1, we found that the average scores in the retention phase showed that goal-setting factors led to learning in children, and the assumption that goal setting influences children's learning was confirmed. Based on the findings, the goal-setting condition was more effective than the non-goal setting condition (in performance on the retention test). The results are consistent with the findings of many of researchers, such as Nelson (18), Galvan (19), Filby et al. (20), Mellalieu et al. (5), Locke and Latham (7), Boyce et al. (21), and Schmidt and Wineberg (17), are inconsistent with those of Annesi (22), Miller and McAuley (23), and Wang and Haddleston (11). The reason for this inconsistency could be the differences in research community, training protocols, subjects' ability and age differences, and the type of handled goal setting. Another possible reason for the lower level of performance of the non-goal setting group and the significant improvement in the goal-setting group in the retention phase could be explained by the arousal viewpoint models. Based on the reverse U theory of Yerkes and Dodson (1908) (24), there is an optimal level of arousal for learning each task. Subjects' performance is neither better at a peak level nor a low level of arousal; rather, at a median level of arousal, they exhibit the best performance. In addition, the significantly lower performance at the retention phase in the non-goal setting group can be interpreted by the Disaster theory of Fazy and Hardy (1988) (25). They noted that when athletes' anxiety is high in competitions, if their arousal exceeds the optimum level, their performance will drop sharply, which they referred to as

confrontation (26). Thus, according to this theory, being faced with a new condition, the children who did not set goals experienced a high level of anxiety, which led to a reduction in their performance.

In general, the present findings, similar to previous studies, confirm the positive effects of goal setting on task learning. Thus, it is recommended that coaches and exercise trainers apply this condition in their training programs and in competitions to elevate their approaches to teaching children. It should be noted that this is, to our knowledge, the first study carried out on children; therefore, other researchers should extend this research to assessing other motor skills or conduct additional studies to clarify the importance and role of goal setting on skill learning.

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### Footnotes

**Authors' Contribution:** Study concept and design: Mohamad Hossein Zamani, Rouholah Fatemi; acquisition of the data: Mohamad Hossein Zamani, Elahe Sasani Sravestani; analysis and interpretation of the data: Mohamad Hossein Zamani, Rouholah Fatemi; drafting of the manuscript: Mohamad Hossein Zamani, Rouholah Fatemi; critical revision of the manuscript for important intellectual content: Rouholah Fatemi, Mohamad Hossein Zamani; statistical analysis: Mohamad Hossein Zamani, Rouholah Fatemi; administrative, technical, and material support: Rouholah Fatemi, Elahe Sasani Sravestani; study supervision: Mohamad Hossein Zamani, Rouholah Fatemi.

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### References

- Schmidt RA, Lee TD. *Motor Control and Learning: A Behavioral Emphasis*. 4 ed. Champaign: Human Kinetics; 2005. p. 537.
- Ward P, Carnes M. Effects of posting self-set goals on collegiate football players' skill execution during practice and games. *J Appl Behav Anal*. 2002;35(1):1-12. doi: 10.1901/jaba.2002.35-1. [PubMed: 11936542].
- Orlick T, Partington J. Mental links to excellence. *Sport Psychol*. 1988;2(2):105-30.
- Locke EA, Latham GP. *A Theory of Goal Setting and Task Performance*. Englewood Cliffs: Prentice Hall; 1990. p. 413.

5. Mellalieu SD, Hanton S, O'Brien M. The effects of goal setting on rugby performance. *J Appl Behav Anal.* 2006;**39**(2):257-61. [PubMed: [16813049](#)].
6. Weinberg RS. Goal setting and performance in sport and exercise settings: a synthesis and critique. *Med Sci Sports Exerc.* 1994;**26**(4):469-77. [PubMed: [8201904](#)].
7. Latham GP, Locke EA. New developments in and directions for goal-setting research. *European Psychol.* 2007;**12**(4):290-300. doi: [10.1027/1016-9040.12.4.290](#).
8. Weinberg R. Making goals effective: A primer for coaches. *J Sport Psychol Action.* 2010;**1**(2):57-65. doi: [10.1080/21520704.2010.513411](#).
9. Stoeber J, Stoll O, Pescheck E, Otto K. Perfectionism and achievement goals in athletes: Relations with approach and avoidance orientations in mastery and performance goals. *Psychol Sport Exerc.* 2008;**9**(2):102-21. doi: [10.1016/j.psychsport.2007.02.002](#).
10. Stoeber J, Uphill MA, Hotham S. Predicting race performance in triathlon: the role of perfectionism, achievement goals, and personal goal setting. *J Sport Exerc Psychol.* 2009;**31**(2):211-45. [PubMed: [19454772](#)].
11. Wang L, Haddleston SS. Psychological skill use by expert swimmers. *Int Sport J.* 2003;**7**:48-55.
12. Chiviakowsky S, Wulf G, de Medeiros FL, Kaefer A, Tani G. Learning benefits of self-controlled knowledge of results in 10-year-old children. *Res Q Exerc Sport.* 2008;**79**(3):405-10. doi: [10.1080/02701367.2008.10599505](#). [PubMed: [18816953](#)].
13. Guadagnoli MA, Holcomb WR, Weber TJ. The relationship between contextual interference effects and performer expertise on the learning of a putting task. *Journal of Human Movement Stu.* 1999;**37**(1):19-36.
14. Porter J, Landin D, Hebert E, Baum B. The effects of three levels of contextual interference on performance outcomes and movement patterns in golf skills. *Int J Sports Sci Coach.* 2007;**2**(3):243-55.
15. Porter JM, Magill RA. Systematically increasing contextual interference is beneficial for learning sport skills. *J Sports Sci.* 2010;**28**(12):1277-85. doi: [10.1080/02640414.2010.502946](#). [PubMed: [20845219](#)].
16. Getz GE, Rainey DW. Flexible short-term goals and basketball shooting performance. *J Sport Behav.* 2001;**24**(1):31.
17. Schmidt RA, Wrisberg CA. Motor learning and performance: A Situation-based Learning Approach. 4 ed. Champaign: Human Kinetics; 2008. p. 395.
18. Nelson JK. Motivating effects of the use of norms and goals with endurance testing. *Res Q.* 1978;**49**(3):317-21. [PubMed: [725300](#)].
19. Galvan ZJ, Ward P. Effects of public posting on inappropriate on-court behaviors by collegiate tennis players. *Sport Psychol.* 1998;**12**:419-26.
20. Filby WCD, Maynard IW, Graydon JK. The effect of multiple goal erceptual on performance outcome in training and competition. *J appl sport psychol.* 1999;**11**(2):230-46.
21. Boyce BA, Johnston T, Wayda VK, Bunker LK, Eliot J. The effects of three types of goal setting conditions on tennis performance: a field-based study. *J Teach Physic Edu.* 2001;**20**(2):188-200.
22. Annesi JJ. Goal-setting protocol in adherence to exercise by Italian adults. *Percept Mot Skills.* 2002;**94**(2):453-8. doi: [10.2466/pms.2002.94.2.453](#). [PubMed: [12027338](#)].
23. Miller JT, McAuley E. Effect of goal setting training program on basketball free-Throw self-efficacy and performance. *Sports psychol.* 1987;**1**:103-13.
24. Yerkes RM, Dodson JD. The relation of strength of stimulus to rapidity of habit-formation. *J compar neurol psychol.* 1908;**18**(5):459-82. doi: [10.1002/cne.920180503](#).
25. Fazey J, Hardy L. The Inverted-U Hypothesis: A Catastrophe for Sport Psychology. Great Britain: British Association of Sports Sciences and the National Coaching Foundation; 1988. p. 24.
26. Movahedi A, Sheikh M, Bagherzadeh F, Hemayattalab R, Ashayeri H. A practice-specificity-based model of arousal for achieving peak performance. *J Mot Behav.* 2007;**39**(6):457-62. doi: [10.3200/JMBR.39.6.457-462](#). [PubMed: [18055352](#)].