

The Use of Observational Learning by Athletes

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The purpose of the present study was to examine the use of observational learning in male and female recreational and varsity athletes (N=642) participating in either individual or team sports. Athletes completed the Functions of Observational Learning Questionnaire (FOLQ; Cumming, Clark, Ste-Marie, McCullagh, & Hall, 2005) to assess their use of the three functions of observational learning: skill, strategy and performance. Overall results indicated that athletes used the skill function of observational learning the most, followed by the strategy and the performance functions, respectively. Results also revealed gender differences in the use of observational learning. More specifically, males used the performance function of observational learning significantly more than females. In addition, competitive level was a factor in athletes' use of observational learning with varsity athletes using all three functions more than recreational athletes. Finally, it was revealed that individual sport athletes used more of the skill function than team sport athletes, whereas team sport athletes used more of the strategy function than individual sport athletes.

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Visual demonstration has long been acknowledged as one of the most powerful means of transmitting patterns of thought and behavior (Bandura, 1986). According to Bandura's (1977) social cognitive approach, in order for learning to occur through observation, a four-stage process must take place that involves attention, retention, motor reproduction and motivation. First, an individual must perceive and attend to the significant features of the modeled behavior (attention). In order to reproduce the behavior, the individual must then code the information into long-term memory (retention). Different methods of coding and retaining information include imagery, the use of analogies, and the use of verbal repetition of main points (Weinberg & Gould, 2003). Once the behavior is learned through attention and retention, the observer must possess the physical capabilities to learn to produce the movement by coordinating their muscle actions and their thoughts (motor reproduction). Finally, the individual must possess the motivation to attend to, remember, and practice the modeled behavior. Motivation can be either internal or external but must be strong enough to drive the observer to reproduce the behavior (Bandura, 1986). Attention and retention account for the acquisition or learning of a model's behavior, whereas reproduction and motivation control the performance of behavior.

Observational learning can serve both a cognitive and motivational function in sport (Cumming, Clark, Ste-Marie, McCullagh, & Hall, 2005; Feltz & Landers, 1983; McCullagh, Weiss, & Ross, 1989). The majority of observational learning research has focused on the cognitive function, gaining information about the acquisition and performance of motor skills, strategies, game plans and routines (e.g., Christina, Barresi, & Shaffner, 1990; Downey, Neil, & Rapagna, 1996; Williams & Grant, 1999). For instance, information concerning both the movement pattern and the end goal of the movement to be achieved are conveyed through observing demonstrations (Ferrari, 1996; McCullagh & Weiss, 2001). Other research has shown that the observation of a model can lead to improvements in form (e.g., Sidaway & Hand, 1993; Whiting, Bijlard, & den Brinker, 1987), as well as other important aspects of performance such as movement pattern recall and error recognition (McCullagh, Burch, & Siegel, 1990), the symbolic coding of physical activities into memorable words and images (Carroll & Bandura, 1982, 1985, 1987, 1990), and the timing of movement sequences (Adams, 1986; McCullagh & Caird, 1990).

It is also recognized that observational learning can have an effect on psychological responses such as the motivation to change or perform a behavior, coping with fear and anxiety, and cognitions such as self-confidence and self-efficacy such that it may affect physical activity patterns (Feltz, Landers, & Raeder, 1979; McAuley, 1985; Schunk, 1987; Starek & McCullagh, 1999; Weiss, Ebbeck, & Wiese-Bjornstal, 1993). The majority of this research originates from Bandura's (1986, 1997) belief that observational learning is a major source of self-efficacy, either through mastery experiences (i.e., seeing yourself perform the desired skill)

or vicarious experiences (i.e., seeing others perform the desired skill). Enactive mastery experiences refer to actual information a person has about their ability to execute a particular behavior gathered from their prior experience with that task. With respect to vicarious experiences, Bandura (1986) noted that the closer the perceived similarity between the individual and the model, the greater the influence of the model on behavior. In a 1998 study, Weiss and colleagues (Weiss, McCullagh, Smith, & Berlant, 1998) found observational learning to be an effective technique for improving swimming skills, increasing self-efficacy, and regulating anxiety in children fearful of water. Moreover, research by Starek and McCullagh (1999) found that adult beginner swimmers reported increased self-efficacy beliefs when they viewed a model.

Recently, in a series of three studies, Cumming et al. (2005) developed a questionnaire to measure the cognitive and motivational functions of observational learning used by athletes. Study 1 consisted of developing the Functions of Observational Learning Questionnaire (FOLQ). The instrument assesses two cognitive functions (skill and strategy) and a motivational function (performance). In Study 2, psychometric support for the FOLQ was generated through factor analytical techniques. Finally, Study 3 confirmed the concurrent validity and the test-retest reliability of the questionnaire. More specifically, intraclass correlations provided support for the temporal reliability of the instrument. In addition, while no differences were found across gender and sport type, Cumming et al. found that athletes used observational learning more for its cognitive function than for its motivational function. It was concluded that athletes use observational learning to gain information about the acquisition and performance of motor skills, strategies, game plans and routines, and to optimize performance through the regulation of arousal levels and mental states.

The purpose of the present study was to extend the research of Cumming et al. (2005) to determine if various groups of athletes differ in their use of the functions of observational learning as assessed by the FOLQ. Cumming et al. included male and female athletes competing at two levels (i.e., recreational and varsity) and found that neither gender nor competitive level influenced the use of observational learning. This finding for competitive level was surprising given that observational learning is an important means employed by athletes to improve their performance (McCullagh & Weiss, 2001) and higher-level athletes consistently have been found to use other psychological skills (e.g., imagery, self-talk) more than their lower-level counterparts (Hardy, Hall, & Hardy, 2004; Salmon, Hall, & Haslam, 1994). Therefore, the present study re-examined these two variables. It was hypothesized that males and females would use the functions of observational learning to about the same extent, thus confirming the findings of Cumming et al. (2005), while varsity athletes would use the functions of observational learning more than recreational athletes.

Cumming et al. (2005) also assessed the functions of observational learning in athletes competing in interactive sports and independent sports. Interactive sport athletes (e.g., wrestling, basketball) were defined as those where substantial physical interaction occurs with teammates and/or the opposition, while independent sport athletes (e.g., swimming, running) were defined as those where substantial physical interaction does not occur with teammates and/or the opposition. Although Cumming et al. (2005) categorized different sports into interactive and independent on the basis of physical interaction, other typologies have been advocated that might provide a useful way to examine opportunities available for observational learning. For example, Carron and Chelladurai (1981), drawing on the work of Turner and Lawrence (1965) from industrial psychology, suggested that types of sports could be differentiated on the basis of the degree to which members of a team engage in coordinative activity to achieve common (team) goals or engage in independent activities to achieve personal goals. Thus, in some sports, athletes must perform their actions to coordinate with the task actions of teammates (e.g., basketball); these are referred to here as *team sports*. In other sports, the rules of competition mandate that athletes carry out their actions independently. If a team score is required, the personal success of each team member is summed; these are referred to here as *individual sports*.

The present study also investigated whether team and individual sport athletes differ in their use of observational learning. It was expected that team sport athletes would use the functions to a greater extent than individual sport athletes simply because they have a greater opportunity to engage in observational learning. That is, team sport athletes typically have teammates to observe while practicing and competing.

Method

Participants

Recreational ($n = 312$) and varsity ($n = 330$) athletes were asked to complete the FOLQ. A total of 642 (male $n = 377$ and female $n = 265$) athletes were tested, competing in a variety of individual ($n = 96$) and team ($n = 546$) sports (refer to Table 1 for a summary of the grouping of athletes into analysis categories). The team sports included: hockey ($n = 74$), soccer ($n = 99$), rowing ($n = 33$), field hockey ($n = 7$), basketball ($n = 63$), volleyball ($n = 78$), ultimate ($n = 1$), baseball ($n = 56$), rugby ($n = 51$), broomball ($n = 1$), football ($n = 52$), lacrosse ($n = 19$), cheerleading ($n = 11$), and waterpolo ($n = 1$). The individual sports included track and field ($n = 20$), cross country ($n = 1$), tennis ($n = 13$), golf ($n = 9$), snowboarding ($n = 1$), badminton ($n = 8$), swimming ($n = 23$), diving ($n = 1$), squash ($n = 12$), figure skating ($n = 4$), triathlon ($n = 1$), cycling ($n = 1$), dance ($n = 1$), and alpine skiing ($n = 1$).

Table 1. *Summary Table for the Grouping of Athletes into Analysis Categories*

	Male <i>n</i>	Female <i>n</i>
<u>Gender</u>	377	265
<u>Competitive Level</u>		
Recreational (<i>n</i> =312)	198	114
Varsity (<i>n</i> =330)	179	151
<u>Sport Type</u>		
Individual (<i>n</i> =96)	49	47
Team (<i>n</i> =546)	328	232

Measures

The athletes' use of observational learning was evaluated using the FOLQ (Cumming et al., 2005). This 17-item questionnaire assesses the extent to which athletes employ both the cognitive and motivational functions of observational learning (OL). The skill items ($n = 6$) assess the use of observational learning for the acquisition of skill development, whereas the strategy items ($n = 5$) assess the tendency to use observational learning for the acquisition of strategies and tactics. An example of a skill item is "I use OL to change how I perform a skill," whereas an example of a strategy item is "I use OL to determine how a strategy will work in an event/game." Performance items ($n = 6$) assess the use of observational learning for motivational purposes. An example of a performance item is "I use OL to understand what it takes to be mentally tough." The participants were asked to rate their use of observational learning on a 7-point scale (1 = *rarely* and 7 = *often*).

In addition to the FOLQ, participants were asked to provide demographic information including age, gender, sport, and level of competition. As mentioned previously, research by Cumming et al. (2005) has shown that the FOLQ possesses good reliability and validity. In the present study, Cronbach's alphas were acceptable for all three subscales: skill = .79, strategy = .77, and performance = .88.

Procedure

After obtaining ethics approval for the study, coaches of both recreational and varsity teams were contacted directly by the researchers to request permission to meet with their athletes immediately prior to or following a practice. Participants were provided with a Letter of Information and a description of the study, informed that participation was voluntary and that they could withdraw from the study at any time, and asked to complete the FOLQ. The questionnaire took approximately 10 minutes to complete. Completion of the questionnaire indicated consent, and participants returned the questionnaire immediately to the researchers.

Results

Factor Analysis

As the FOLQ is a relatively new questionnaire and has received limited testing, a confirmatory factor analysis (CFA) was conducted to ensure that the proposed factor structure of the FOLQ was supported in the current study. The chi-square statistic was significant, suggesting that the model was not of adequate fit to the data ($\chi^2(116) = 386.22, p < .0001$) and the χ^2/df ratio was 3.33, above the 2.0 cut-off; however, chi-square is sensitive to large sample sizes (greater than 200) and significant results are often found in empirical research (Hayduck, 1996). Therefore, other fit indices were considered as better measures of model fit. The Tucker-Lewin Index (TLI; Bollen, 1989) and Comparative Fit Index (CFI; Bentler, 1990) both met the recommended criteria of .90 or higher (Hu & Bentler, 1999; TLI = .921, CFI = .920) and the Root Mean Square Error of Approximation (RMSEA) met the criteria of less than or equal to .06 (Hu & Bentler, 1999; RMSEA = .06). The standardized factor loadings were all between .410 and .775, suggesting that each item contributed meaningfully to its respective scale. Taken together, these values indicate that the model was an adequate fit to the data and that the factor structure of the FOLQ was maintained with this sample. Therefore, it was deemed appropriate to proceed with the analysis.

Table 2. Means and Standard Deviations for the Functions of Observational Learning Questionnaire (FOLQ)

FOLQ Subscales	<u>Gender</u>		<u>Competitive Level</u>		<u>Sport Type</u>	
	<u>Male</u> <i>M (SD)</i>	<u>Female</u> <i>M (SD)</i>	<u>Recreational</u> <i>M (SD)</i>	<u>Varsity</u> <i>M (SD)</i>	<u>Individual</u> <i>M (SD)</i>	<u>Team</u> <i>M (SD)</i>
Skill	5.09 (1.39)	5.40 (1.06)	4.76 (1.26)	5.64 (1.13)	5.53 (0.98)	5.16 (1.31)
Strategy	4.39 (1.30)	4.29 (1.41)	3.89 (1.40)	4.78 (1.14)	3.97 (1.26)	4.42 (1.35)
Performance	3.37 (1.40)	3.01 (1.31)	2.85 (1.21)	3.57 (1.42)	3.26 (1.27)	3.22 (1.39)

Observational Learning Use

Descriptive statistics were calculated for each of the three subscales of the FOLQ. A repeated measures ANOVA revealed significant differences in the extent to which athletes used the three functions of observational learning, $F(2, 1280) = 535.90, p < .01$. Further Tukey post hoc tests ($p < .05$) revealed that athletes used the skill ($M = 5.22, SD = 1.27$) function of observational learning the most, followed by the strategy ($M = 4.35, SD = 1.35$) and the performance ($M = 3.22, SD = 1.37$) functions, respectively.

In order to determine whether gender, competitive level (recreational, varsity), and sport type (individual, team) influenced athletes' use of observational learning, a 2 (gender) X 2 (competitive level) X 2 (sport type) MANOVA was conducted with the three subscales of the FOLQ serving as the dependent variables. Means and standard deviations are presented in Table 2. The results revealed that the assumption of homogeneity of the variance-covariance matrices was violated, therefore, we adopted the suggestion made by Olson (1976) to report Pillai's Trace criterion, which is considered to be robust to violations of the assumption.

A significant multivariate effect was found for gender, Pillai's Trace = .04, $F(3, 631) = 8.03, p < .01, \eta_p^2 = .04$. Using a bonferroni correction to control for Type I errors when using multivariate comparisons ($p < .02$), the only significant univariate effect found was for the performance subscale, $F(1, 633) = 15.25, p < .02, \eta_p^2 = .03$. This finding indicated that males used the performance function of observational learning significantly more than females. In contrast, males and females used the skill function and the strategy function to about the same extent.

A significant multivariate effect was also found for competitive level, Pillai's Trace = .07, $F(3, 631) = 15.93, p < .01, \eta_p^2 = .07$. Again, using a bonferroni correction ($p < .02$), significant univariate effects were found for the skill function, $F(1, 633) = 28.99, p < .02, \eta_p^2 = .04$, strategy function, $F(1, 633) = 23.67, p < .02, \eta_p^2 = .04$, and performance function, $F(1, 633) = 17.24, p < .02, \eta_p^2 = .03$. These findings indicated that recreational and varsity athletes differed in their use of all three functions of observational learning. Specifically, varsity athletes used more skill, strategy, and performance observational learning than recreational athletes.

Finally, a significant multivariate effect was found for sport type, Pillai's Trace = .04, $F(3, 631) = 8.13, p < .01, \eta_p^2 = .04$. Using a bonferroni correction ($p < .02$), significant univariate effects were found for the skill, $F(1, 633) = 7.38, p < .02, \eta_p^2 = .01$, and strategy, $F(1, 633) = 9.86, p < .02, \eta_p^2 = .02$ subscales of the FOLQ. Individual sport athletes used more of the skill function than team sport athletes, whereas team sport athletes used more of the strategy function than individual sport athletes. None of the interactions involving gender, competitive level, and sport type proved to be significant ($p > .05$).

Discussion

Observational learning serves two cognitive functions (skill and strategy) and one motivational function (performance) (Cumming et al., 2005). The purpose of the present study was to determine if various groups of athletes differed in their use of the functions of observational learning. It was hypothesized that males and females would use the functions of observational learning to about the same extent, while varsity athletes would use observational learning more than recreational athletes. It was also expected that team sport athletes would use the functions to a greater extent than individual sport athletes. Prior to examining these hypotheses a CFA was conducted on the data since the FOLQ is a new instrument and has received limited psychometric testing. Support for the factor structure of the instrument was found, indicating athletes use observation learning for cognitive (skill and strategy) and motivation (performance) functions.

Overall, results demonstrated that athletes used observational learning for its cognitive functions more than its motivational function. Specifically, the skill function was used the most, followed by the strategy function, while the performance function was used the least. These findings were consistent with previous research (Cumming et al., 2005) and were expected. Demonstrations are most often used by coaches and instructors to help athletes improve specific skills, and to a lesser extent game strategies. Observational learning is not usually promoted by coaches and instructors as a way to help athletes cope with arousal and other mental and emotional factors related to performance. However, previous research (Gould

& Weiss, 1981; Starek & McCullagh, 1999) has shown that observational learning can also be an effective means for modifying psychological responses to skill acquisition. Therefore, we propose that observational learning should not only be promoted as a technique for skill and strategy acquisition, but also as a technique for improving psychological responses (e.g., coping with anxiety, staying positive in tough situations). By promoting the use of observational learning for development of both cognitive and motivational functions, it may be that observational learning will have a greater impact on overall performance.

Cumming et al. (2005) found that males and females employed the three functions of observational learning to about the same extent. In contrast, the present findings indicated that males used the performance function of observational learning significantly more than females, whereas male and female athletes used the skill and strategy functions of observational learning to about the same extent. A possible explanation for the discrepancy between the two studies may be that the present study had a much larger sample size than the Cumming et al. (2005) study and was, therefore, able to detect the small effect (i.e., the effect size for gender in the present study was .04). However, given this small effect size some caution must be exercised when considering gender differences for observational learning as they may have limited practical significance.

Results from the present study indicated that recreational and varsity athletes differed in their use of all three functions of observational learning. As expected, varsity athletes used all three functions of observational learning more than recreational athletes. A plausible explanation for these findings is that since recreational athletes do not routinely engage in regular practice sessions concerned with improving their overall skill level, as do varsity athletes, it follows that these athletes use less observational learning than varsity athletes. Varsity athletes focus their preparation and practice sessions on improving their overall level of play and performance in terms of skills, strategies, and other performance factors. They do so, in part, through observing coaches and/or teammates, as well as through the use of video analysis and observation. As a result, varsity athletes are likely to use more of the various functions of observational learning than recreational athletes.

The findings in the present study indicated that the use of observational learning by athletes also differed based on sport type. It was hypothesised that team sport athletes would use the functions to a greater extent than individual sport athletes simply because they have a greater opportunity to engage in observational learning. However, this proved not to be the case. Individual sport athletes used observational learning more for skill learning than team sport athletes, whereas team sport athletes used observational learning more for learning strategies than individual sport athletes. The two groups did not differ in their use of the performance function.

Why did individual athletes use more of the skill function? One possible explanation is based on the individual sports that were examined in the present study. Individual athletes were competing sports such as golf, tennis, figure skating and swimming and usually in these sports there are a number of athletes practicing at the same time. Thus, there is considerable opportunity to observe others perform. Moreover, these sports place a great emphasis on proper form and this is one aspect of performance that can be readily acquired by watching others (Sidaway & Hand, 1993; Whiting et al., 1987).

With respect to the strategy function of observational learning, many of the individual sport athletes examined in the present study participated in closed sports (e.g., golf, figure skating, track and field); therefore, game/competition strategies may not be used very often or may be less apparent to these athletes. It would follow that these athletes would report using observational learning for strategy acquisition and development less than team sport athletes (e.g., basketball, volleyball, rugby), where game strategies are very important to success. This, in combination with the fact that team sport athletes also spend a great deal of time analyzing their opponents plays through video analysis may explain their higher reported use of the strategy function of observational learning.

That team sport athletes did not use the performance function of observational learning more than individual athletes is likely the result of a combination of factors. As noted above, most of individual and team sport athletes in the present sample had ample opportunities to observe others while practicing. However, the performance function of observational learning is not promoted by significant others (e.g., coaches), and athletes report using this function considerably less than the other two functions. Again some caution needs to be exercised when accepting these explanations for the differences between team and individual sport athletes since the effect size was small.

A few limitations in the present study need to be mentioned. To begin with, only recreational and varsity athletes were included in the study sample. In future research a wider variety of competitive level athletes should be examined (e.g., provincial, national, and international level athletes). In addition, we did not control for the types of sports sampled other than by comparing team and individual sports. As alluded to above, another possible comparison would be closed versus open sports. Future research might also consider such variables as time of season and years playing the sport. For some varsity sports, such as lacrosse, players may be relative newcomers to that sport however still be on the varsity team, having transferred from a similar sport such as ice hockey. Depending on the sample, these additional variables might help to explain the differences in observational learning use across sport types.

In conclusion, this study revealed that gender, competitive level, and sport type influence the use of observational learning by athletes. While further research is needed to clarify why these differences exist, these results indicate that athletes may not be employing observational learning in all situations where it may be beneficial to their performance. Studies have shown that observational learning can positively impact psychological variables, such as self-efficacy and anxiety, as well as physical performance variables (McCullagh & Weiss, 2001); however, this research indicates that athletes use the performance function of observational learning the least. It may be that athletes are not aware that observational learning can be used for this function. Coaches, sport psychologists, and athletes may need to be educated about the different functions that observational learning can serve and how these functions may impact their sport preparation and performance. Athletes of all levels should be encouraged to use observational learning for all three of its functions (skill, strategy, and performance) to help them optimize their sport performance.

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