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Research Paper: The Effect of Positive Social-Comparative Feedback on Learning a Throwing Skill in Adolescents with ADHD

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Abstract

The present study was designed to investigate the effects of positive social-comparative feedback on motor learning and self-efficacy of a throwing motor skill in individuals with ADHD. The subjects were 44 adolescents with ADHD in the age range of 15 to 18 years old and were randomly and equally divided into two groups: positive social-comparative feedback and control group. Motor task consisted of throwing bean bags with the non-dominant arm at a target on the ground. The participants completed the pretest (10 trials), an acquisition phase including 6 blocks of 10 trials, and a retention test consisting of 10 trials. The participants in the positive social comparison feedback group were informed that their throws on the previous block were, on average, better than the throws of the other participants in this group. Prior to pretest, each block, and before the retention test, all participants completed the self-efficacy scale. Dependent measures were throwing accuracy scores and self-efficacy. Independent t-test and analysis of variance (ANOVA) with repeated measures were employed to analyze the data. Positive social comparison feedback group throwed the bean bags significantly better in the acquisition phase and the retention test compared to the control group. In addition, positive social comparison feedback group reported significantly higher self-efficacy scores in the acquisition phase and the retention test in comparison to the control group. Our findings indicated that enhanced expectancies benefited individuals with ADHD to enhance their performance and learn a novel motor skill.

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1. Introduction

In the literature, a number of cognitive strategies are theoretically and practically employed for teaching new motor skills to novices. These are included but no limited to action observation (Baniasad et al, 2022; Mokhtari et al., 2007; Ghorbani & Bund, 2014; Ghorbani et al. 2020), motor imagery (Afsanepourak et al. 2012), self-talk (Baniasad et al., 2022), and attentional focus (Ghorbani et al., 2020; Baniasadi., 2018, 2019). However, a recent theory, i.e., the OPTIMAL (optimizing performance through intrinsic motivation and attention for learning) theory (Wulf & Lewthwaite, 2016), emphasized on motivational and attentional variables in the optimal performance and learning of motor skills and proposed that there are three influential variables which can be sued to enhance performance and learning of new motor skills. These are consisted of a) enhancing expectancies for future performance, b) supporting learners' autonomy and (c) promoting an external focus of attention (Wulf & Lewthwaite, 2016). In the present study, we focused on the effects of enhancing expectancies on motor performance and leaning. Based on the OPTIMAL theory, past performance achievements provide a basis for self-confidence or self-efficacy, and past positive outcomes provide positive expectations for future outcomes in similar situations (Wulf & Lewthwaite, 2016; Seyedi Asl et al. 2013). Effects of enhanced expectancies on performance and learning of new motor skills were investigated by previous studies in a variety of motor tasks and across a range of age groups (Abdoshahi et al. 2022, Avila et al., 2012; Chiviacowsky & Wulf, 2007; Chiviacowsky et al. 2009; Ghorbani & Bund, 2020; Lewthwaite, & Wulf, 2010; Wulf et al. 2014, 2017). In addition, the OPTIMAL theory postulated that au enhanced expectancies are associated with increasing the sense of self-efficacy in the performers. Self-efficacy is a construct referring to one's belief in one's ability to succeed in particular situations or to perform a given duty (Bandura, 1977; Dana et al., 2017). Nevertheless, the enhanced expectancies have got less considerations in the attention deficit hyperactivity disorder (ADHD) population. Hence, the effects of enhanced expectancies on the performance of learning of new motor skills in individuals with ADHD have rarely been examined. ADHD is a common neurodevelopment disorders among children that can persist into adolescence and adulthood. It is associated with an ongoing pattern of inattention, hyperactivity, and/or impulsivity. Symptoms of ADHD can interfere with daily activities and relationships. It is also associated with a high rate of psychiatric problems such as mood and anxiety disorders, and cigarette and substance use disorders (Dana et al., 2018; Eskandarnejad et al., 2015; Farhangnia et al., 2020). Some previous evidence indicates that people with ADHD often have challenges with learning novel motor skills. Thus, due to the lack of research data on the use of enhanced expectancies in enhancing the motor performance and learning of people with ADHD, it seems necessary to investigate whether enhanced expectancies can be generalized for individuals with ADHD. Hence, this study was designed to investigate the effects of enhanced expectancies (i.e., in the form of positive social-comparative feedback) on motor performance and learning of a throwing skill in adolescents with ADHD. In the literature, Ávila, et al. (2012) found that the

positive social-comparative feedback resulted in greater throwing accuracy and higher perceived competence in comparison to the control group. Additionally, Chiviacowsky, Harter, Gonçalves and Cardozo (2019) showed that positive temporal-comparative feedback led to better motor performance and perceived competence relative to the control group. The above-mentioned findings reveal that positive social-comparative feedback affects the performance of motor skills and highlight the important motivational role of feedback in motor performance. However, to the best of our knowledge, no single study has investigated the effects of enhanced expectancies in form of positive social-comparative feedback on motor performance and learning in individuals with ADHD. To fill the gap the present study was designed to investigate the effects of positive social-comparative feedback on motor learning and self-efficacy of a throwing motor skill in individuals with ADHD. In the present study, it was hypothesized that positive social-comparative feedback would lead to greater motor performance and learning as well as higher self-efficacy than control condition among adolescents with ADHD.

2. Method

The present study used a causal-comparative design. The subjects of this study were 44 adolescents with ADHD in the age range of 15 to 18 years and were randomly and equally divided into two groups: positive social-comparative feedback and control.

Motor task: Motor task in the present study included to throw beanbags with the non-dominant arm at a target on the ground. At the center of the target, there was a circle with a radius of 10 cm. The distance between the participant and the center of the target was three meters. Around the center of the target there were concentric circles with radiuses of 20, 30, 40, 50, 60, 70, 80, 90, and 100 cm. These circles were used to determine the accuracy of the throws. If the beanbag landed in the center of the target, then the score was 100. If it landed in one of the other circles, then the score was 90, 80, 70, 60, 50, 40, 30, 20, or 10 points, respectively. Finally, if it landed outside the circle, then a score of 0 was recorded.

Procedure: Participants were tested individually on two consecutive days. Prior to data collection, participants were given general information about the experimental procedure and asked to complete a questionnaire regarding information such as age, laterality, and previous experiences with motor task. Finally, participants were given brief instructions about the beanbag throwing task, which consisted of holding the beanbag with the non-dominant hand and throwing it at the target. To perform the protocol, the participants first executed the pretest, including 10 trials. During the acquisition phase, participants performed 6 blocks of 10 trials each, and one day later, they completed the retention test, consisting of 10 trials each without knowledge of result (KR). The participants were allowed to look at the target before each block, but during the pretest, practice, and retention phases they were prevented from viewing the outcomes by wearing opaque swimming goggles. To add enhanced expectancies in the protocol, the subjects in the positive social comparison feedback group were informed that they would receive feedback about their performance

relative to other subjects in this group at the end of each training block. The feedback informed them that their throws on the previous block were, on average, better than the throws of the other subjects in this group. Subjects in the control group did not receive any feedback. The participants were given six seconds to execute each throw. Time was measured with a digital chronometer. Prior to pretest, each block, and before the retention test, all participants completed the self-efficacy scale, in which they were asked to rate how confident they were, on a scale ranging from 10 (*not confident*) to 100 (*absolutely confident*), that they would be able to throw the beanbag at a target (i.e., a score of 100) on one of the following trials.

Data analysis: In the present study, the dependent variable included throw accuracy and self-efficacy in pre-test, acquisition phase, and retention test. Independent t test was used to analyze the research variables in pre-test and retention test. Analysis of variance (ANOVA) with repeated measures was used to analyze the data in the acquisition phase. The level of statistical significance was used at P <0.05.

3. Results

Figure 1 presents the accuracy scores across the pretest, acquisition phase, and the retention test.

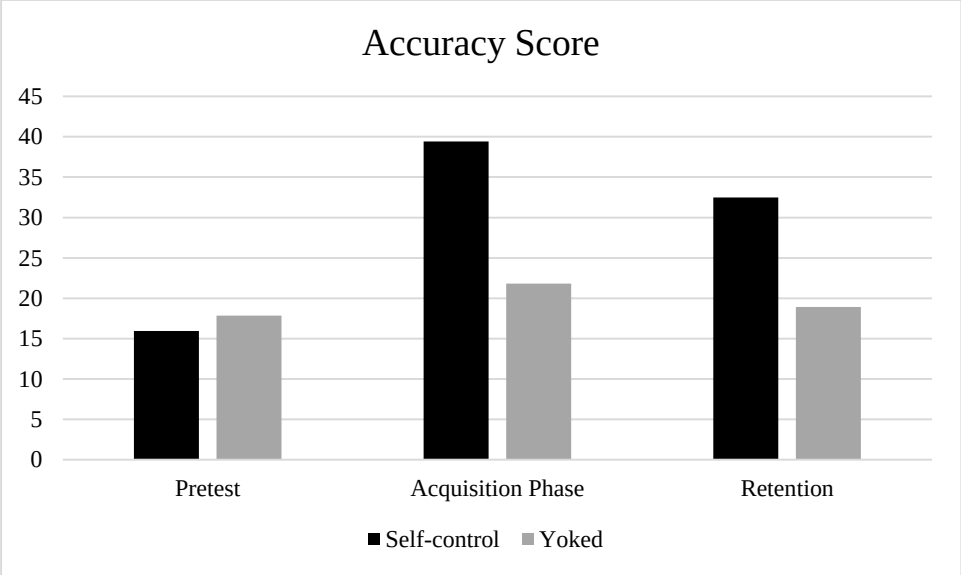

Figure 1. Accuracy scores across the pretest, acquisition phase, and the retention test.

The analysis of the pretest showed no significant differences between groups, t = 0.55, p = 0.67. This shows that both groups had identical condition before engaging in the protocol. During the acquisition phase, the performances of both groups improved significantly, F = 7.26, p = 0.000, η^2 = 0.16. Moreover, positive social comparison feedback group performed significantly better than control group, F = 8.82, p = 0.000, η^2 = 0.26. Finally, the data from the retention test indicated that positive social comparison feedback group performed significantly better than control group, t = 8.18, p = 0.000.

Figure 2 shows the self-efficacy scores across the pretest, acquisition phase and the retention test.

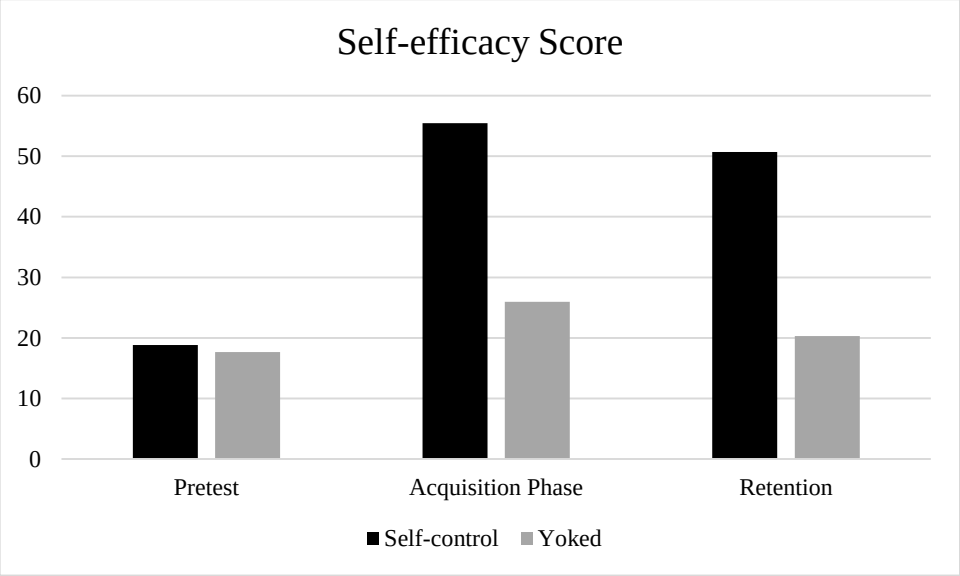

Figure 2. Self-efficacy scores across the pretest, acquisition phase and the retention test.

The analysis of the pretest showed no significant differences between groups, t = 0.61, p = 0.62. This shows that both groups had identical condition before engaging in the protocol. During the acquisition phase, the self-efficacy scores of both groups improved significantly, F = 4.48, p = 0.000, η^2 = 0.09. Moreover, positive social comparison feedback group reported significantly higher scores than control group, F = 8.69, p = 0.000, η^2 = 0.26. Finally, the data from the retention test indicated that positive social comparison feedback group reported significantly higher scores than control group, t = 10.18, p = 0.000.

4. Discussion

The enhanced expectancies, as a motivational factor in the OPTIMAL theory of motor learning, have got less considerations in the attention deficit hyperactivity disorder (ADHD) population. To fill the gap, the present study was designed to investigate the effects of positive social-comparative feedback on motor learning and self-efficacy of a throwing motor skill in individuals with ADHD. In the present study, it was hypothesized that positive social-comparative feedback would lead to greater motor performance and learning as well as higher self-efficacy than control condition among adolescents with ADHD. As hypothesized, our findings showed that positive social-comparative feedback resulted in significantly higher throwing accuracy scores in the training practice and the retention phase than the control group. That is, exposing individuals with ADHD to positive feedback led to higher motor performance and learning in comparison to control group. These findings support our hypothesis and are in line with those of previous studies on healthy individuals (Avila, et al., 2012; Chiviacowsky & Wulf, 2007; Chiviacowsky et al. 2009; Ghorbani & Bund, 2020; Lewthwaite, & Wulf, 2010; Wulf et al. 2014, 2017) indicating that enhanced expectancies were clearly useful for enhancing motor performance and learning in individuals with ADHD. Feedback frequency may effect on motor

learning in children with special needs (Kordi et al. 2017), so its frequency should be considered in optimized level.

Another interesting finding in the present study was that positive social-comparative feedback resulted in higher levels of self-efficacy in comparison to control condition, as the participants in the positive social-comparative feedback group reported significantly higher self-efficacy scores in the acquisition phase, and retention test compared with the control group. Based on these findings, it can be stated that prediction of the OPTIMAL theory regarding the enhanced expectancies can be generalized to individuals with ADHD (Wulf & Lewthwaite, 2016). These findings are also in line with the results of previous studies (Avila, et al., 2012; Ghorbani & Bund, 2020; Lewthwaite, & Wulf, 2010; Wulf et al. 2014, 2017). Our study clearly shows that enhanced expectancies results in increased motivation during training phase and it also stayed high in the retention phase, while that is not happened for yoked group. Wulf & Lewthwaite, (2016) proposed that enhanced expectancies optimize motor performance and learning by making dopamine available for memory consolidation and neural pathway development and contribute to efficient goal-action coupling by preparing the motor system for task execution.

5. Conclusion

Finally, our results can have practical implications, too. For example, due to the positive effects of enhanced expectancies for increasing motivation and motor learning, it can be employed as a useful strategy for teaching new motor skills to novices with ADHD. Based on the OPTIMAL theory, enhanced intrinsic motivation and motor learning can be expected for individuals who were given positive feedbacks regarding their performances.

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Conflict of interest

The Authors declare that there is no conflict of interest with any organization.

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