Enhancing performance expectancies through visual illusions facilitates motor learning in children

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\textbf{ABSTRACT}

In a recent study by Chauvel, Wulf, and Maquestiaux (2015), golf putting performance was found to be affected by the Ebbinghaus illusion. Specifically, adult participants demonstrated more effective learning when they practiced with a hole that was surrounded by small circles, making it look larger, than when the hole was surrounded by large circles, making it look smaller. The present study examined whether this learning advantage would generalize to children who are assumed to be less sensitive to the visual illusion. Two groups of 10-year olds practiced putting golf balls from a distance of 2 m, with perceived larger or smaller holes resulting from the visual illusion. Self-efficacy was increased in the group with the perceived larger hole. The latter group also demonstrated more accurate putting performance during practice. Importantly, learning (i.e., delayed retention performance without the illusion) was enhanced in the group that practiced with the perceived larger hole. The findings replicate previous results with adult learners and are in line with the notion that enhanced performance expectancies are key to optimal motor learning (Wulf & Lewthwaite, 2016).

1. Introduction

Enhancing learners’ expectancies for future performance has been shown to be an important factor in motor skill learning, and enhanced expectancies are a key factor in the OPTIMAL theory of motor learning (Wulf & Lewthwaite, 2016). Learners’ expectancies (e.g., self-efficacy) can be enhanced in various ways. For instance, defining “good” performance liberally, thereby increasing individuals’ experience of success, has been demonstrated to facilitate learning (e.g., Palmer, Chiviacowsky, & Wulf, 2016; Trempe, Sabourin, & Proteau, 2012). In the study by Palmer et al., participants were asked to learn a golf-putting task. One group was informed that putting within the larger of two concentric circles surrounding the target would constitute good putts. Another group was told that balls coming to rest in the smaller circle would represent good performance. The group whose success was defined by the larger circle performed more accurately, with smaller error to the central target, during the practice phase. More importantly, that group also showed more effective learning, as measured by delayed retention and transfer tests with the circles removed. Thus, having experienced a higher percentage of successful putts during practice had lasting benefits. Furthermore, providing learners with positive feedback – for instance, feedback after relatively successful rather than unsuccessful trials – has been found to enhance their confidence in their ability to perform well in the future and facilitate learning (e.g., Chiviacowsky & Wulf, 2007; Clark & Ste-Marie, 2005).
2. Method

2.1. Participants

Thirty 10-year-old boys (\(M = 10.66 \text{ and } SD = 0.41\)) participated in the study at an Iranian university. A G*Power analysis showed that a total of 28 participants would be sufficient to correctly reject the null hypothesis (with \(\alpha = 0.05, 1-\beta = 0.90\)). None of the participants had prior experience with the task. They were naïve as to the purpose of the study, and they gave their assent before participation, and the parents/guardians provided informed consent. The study was approved by the university's institutional review board.
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