The creation of a superstitious belief regarding putters in a laboratory-based golfing task

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The objective was to determine the extent to which it was possible to induce superstitious behaviour and beliefs in a golf putting task in a laboratory. Participants (\(N = 28\)) took part in a putting task using three identical clubs in which visual feedback regarding performance was restricted. Participants were provided with verbal feedback of their performance, which was honest when they used one putter, negative with a second putter (they did better than they were told) and positive with a third (they did worse than they were told). After this initial acquisition phase, a competition was announced and participants were asked to select a putter they would like to use. The participants were then asked to rate various qualities of the putters. Significantly more participants selected the “positive” putter for the competition (\(N = 22\)) compared to the “negative” putter (\(N = 1\), \(p < .001\). In addition, participants claimed that the positive putter had a better weight, was more comfortable and easier to use than the negative putter (all \(p < .001\)). Overall, this evidence can be taken to show that a superstitious belief can be formed in a short amount of time within a laboratory setting and that it can affect both the perceptions and choices of an individual.

Keywords: superstition; superstitious behaviour; putting; golf; operant conditioning

Introduction

It is clear that superstitious behaviours are commonplace in sport, with many amateur and professional sportspeople engaging in a range of apparently bizarre behaviours that can range from wearing “lucky” items of clothing to engaging in specific rituals before competition (Bleak & Frederick, 1998). It has also been suggested that sportspeople may be more prone to developing these beliefs (Vyse, 1997). These practices may appear to be innocuous for the most part, but may be deleterious to an athlete on occasion, “I didn’t tie my laces right and I didn’t bounce the ball five times and I didn’t bring my shower sandals to the court with me. I didn’t have my extra dress. I just knew it was fate; it wasn’t going to happen”. (Serena Williams explaining her exit in the French Open (Syed, 2009)). A superstition can be defined as acting as though there is, or believing there is, a connection between a cause and an effect where there is no rational direct association. Given the potential influence of superstitions on sporting performance, it is surprising that there is not more research about them; yet, there are not many sporting studies that indicate how these irrational beliefs and behaviours develop and how they might affect an individual’s behaviour.

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The primary explanation for how people might acquire superstitious behaviours can be found in the work of Skinner (Skinner, 1948). In lecture demonstrations, he would place a pigeon into a Skinner box and by the end of the lecture would have created a “superstitious” pigeon that produced apparently random behaviours (e.g. thrusting its head into the corner of the cage, turning in circles, etc.). Skinner proposed that the pigeon would learn these behaviours via accidental operant conditioning, “The bird happens to be executing some response as the hopper appears; as a result it tends to repeat this response” (Skinner, 1948, p. 168). That is, the pigeon appeared to associate its irrelevant behaviour with the food’s appearance and then proceeded to initiate the irrelevant behaviour in an attempt to elicit more food.

It might be tempting to assume that pigeons are not analogous to humans in this regard except several comparable studies have revealed similar findings using human participants (e.g. Ono, 1987; Rudski, 2001). In Ono’s study (1987), participants were asked to achieve as high a score as possible in a task involving moving three levers. Participants developed a range of beliefs about how the levers caused the score to “increase”; yet, just as with Skinner’s pigeons, the behaviour produced by the participants had no influence on the reward; the score simply increased on an arbitrary schedule. Yet, it felt to participants that there was a relationship of some sort.

It should be noted that Skinner himself saw the parallels of the “superstitious pigeon” in the development of sporting superstitions. He suggested that 10-pin bowlers who roll the ball down the lane can often be observed to continue twisting their hands after the ball is released in an apparent attempt to influence the spin of the ball (Skinner, 1948). Whilst some element of this could be argued to represent a normal follow-through action, the superstitious action referred to by Skinner can be taken to refer to an extended action, beyond a period where a natural follow through could feasibly operate and be of benefit. Skinner would see these types of behaviours as superstitious based on reinforcement after previous attempts to “help” guide the ball to its target. Further work with random reinforcement regimes indicated that superstitious behaviour could also be related to an irrelevant stimulus (Morse & Skinner, 1957). This has been taken to be akin to the development of a belief in lucky items (see Vyse, 1997).

To date, most studies on superstition in sport have been correlational in nature relying on questionnaire measures (e.g. Bleak & Frederick, 1998; Brevers, Dan, Noel, & Nils, 2011; Burger & Lynn, 2005; Todd & Brown, 2003). For example, in the study by Bleak and Fredericks (1998), it was found that chance locus of control was negatively correlated with increases with superstitious behaviours in athletes. That is, those who believed less in chance were more likely to engage in superstitious behaviour. This is a seemingly contradictory outcome, but can be interpreted as showing that those who do not believe in chance engage in superstitious behaviours as a means to control random events in the world. When athletes are uncertain of success, a greater emphasis is placed on the importance of carrying out superstitious rituals as this reduces psychological tension (Brevers et al., 2011; Schippers & Van Lang, 2006). Studies such as these can identify possible associations with personality traits, but more experimentally controlled studies are needed to identify the potential causes of superstition, such as that proposed by Skinner. There are, however, very few studies which have attempted to study sporting superstitions in a laboratory setting, one of the reasons being that it is difficult to create representative designs in this area. Notable exceptions to this are studies by Van Raalte, Brewer, Nemeroff, and Linder (1991), Wright and Erdal (2008) and Damisch, Stoberock, and Mussweiler (2010), who use a “lucky ball” procedure in a laboratory setting.

In the study by Damisch et al. (2010), participants performed better on a golf putting task when using a ball that was said to be lucky. They also considered superstitious beliefs in other situations; participants performed a motor-dexterity task better when the experimenter told the participant that they would keep their fingers crossed for them and had better memory when in the presence of a lucky charm. They suggested that in the presence of a lucky charm, a good luck superstition is activated, giving participants greater self-efficacy in mastering a task,
leading to greater persistence and ultimately higher performance. However, the study does not shed light on how these superstitions might develop.

Van Raalte et al.’s (1991) lucky ball procedure involved asking participants to putt on an artificial putting green with one of four differently coloured balls (red, blue, pink and green). In an attempt to remove participant colour preferences, these colours were selected on the basis that they were the most popular colour golf balls overall as determined in a pre-test of 135 participants. After a putt, the experimenter noted whether the putt was successful or not, then for the next trial, the ball was returned to the participant who therefore made their selection for their subsequent putt from the initial pool of four coloured golf balls. This method supposes that superstitious behaviour has occurred if the participant selects the same coloured ball after a successful performance. In line with Skinner’s prediction, the participant would associate the irrelevant colour with the holed putt, thereby creating a superstition for that particular ball, and indeed this is the outcome that Van Raalte et al. report. However, a potential methodological issue may in part explain their findings. Van Raalte et al. were wise to try to remove the possibility that participants might have preferences for colours, but by still having four colour choices available, it does still leave open the possibility that a participant might make their selection wholly, or in part, on the basis of a colour preference and not their putting performance. To illustrate this issue, a participant who used the blue ball consistently throughout the study because they preferred it, and holed 10 putts, but missed 10, would register as showing 10 examples of superstitious behaviour, where, clearly, there was no difference between their “success” colour choice and their “fail-to-putt” colour choice. Van Raalte’s study may therefore, in part, demonstrate superstitious preference based on colour choice rather than on the basis of putting success.

The present study investigates potential mechanisms for superstition development in sport within the context of Skinner’s (1948) theory of operant conditioning. Based on the paucity of well-controlled sport superstition studies, the objective of the current study was to determine the extent to which it was possible to induce superstitious behaviour and beliefs in a golf putting task in a laboratory. In the present study, an experimental manipulation was employed in which inherent biases to the sports equipment were removed by simply using identical equipment, in this case, three identical golf putting clubs. Given the clubs were identical, there needed to be some mechanism by which they could be told apart; we therefore referred to them based on their location leant against a wall in the laboratory: the club on the left, the club in the centre and the club on the right. The experimental manipulation involved providing a regime of false feedback to the participant such that they thought that they had performed differently with the three clubs (good, average and poor performance). It was hypothesised that participants would develop a superstitious preference towards the “good” putter on the basis of this reinforcement, demonstrated by choosing it in a competition phase of the experiment over other putters, and by perceiving it to have better qualities.

**Method**

**Design**

A one-factor repeated-measures design was employed where feedback regarding performance was manipulated for a given putter being positive, honest or negative in nature. The dependent measures were the perceptions of the putters used in the task and putter selection by the participant for a competition phase.

**Participants**

Participants were 17 males and 11 females aged between 19 and 41 ($M = 21.8$, $SD = 4.35$). They were an opportunity sample and all reported having no golfing experience. All were right handed,
as assessed using items from the Edinburgh Handedness Inventory (Oldfield, 1971). More importantly for the current task, all used a putter in a right-handed manner. After the experimental deception was revealed, all participants indicated consent for their data to be used for analysis. The primary research institution provided ethical approval.

**Measures, materials and apparatus**

Putting took place in a laboratory with a level floor on short pile carpet tiles, providing a surface comparable to a “fast” putting green. The three experimental putters were Regal Silver Knight putters of the same size. All putters were, apart from to-be-expected minimal manufacturing differences, identical in appearance. An additional putter (Cleveland Vas) was used in an initial familiarisation phase. The balls used throughout the study were white Wilson Staff Ti-DNA-Spin balls.

The task itself required participants to putt towards a $7 \times 7$ grid comprising of $0.15 \times 0.15$ m squares marked with tape (see Figure 1). The centre of the central square was 5 m from the participants striking point. In front of the participant (1 m away) was an opaque divider screen (1.95 m in height, 1.80 m in width) preventing visual feedback of the task outcome, but allowing passage of the golf ball underneath. Attached to the divider screen was a chart of the target grid allowing the participant to easily understand the verbal feedback regarding ball position, provided during the experiment (see Procedure).

To ascertain a participant’s perception of each club, a series of items were asked about the physical qualities and perceptions experienced whilst using the positive, negative and honest putters. All items were responded to on a 5-point Likert scale for each putter, for example, for item 1, “Not at all comfortable”, “Slightly comfortable”, “Moderately comfortable”, “Very comfortable”, “Extremely comfortable”. Data were collected for each item for each putter. The 10 items were:

1. Overall, how comfortable did each of the putters feel?
2. Overall, how clean was the contact on the ball with each of the putters?
3. In general, how easy was each of the putters to use?
4. Overall, how smooth was the roll of the golf ball from each of the putters?
5. Overall, how comfortable was the weight of each of the putters?
6. In general, how confident did each of the putters make you feel?
7. Overall, how accurately did each of the putters control the distance of the ball?
8. Overall, how accurately did each of the putters control the direction of the ball?
9. Overall, how accurately did each of the putters control the speed of the ball?
10. In general, how well do you feel you performed with each of the putters?

![Figure 1. Illustration of putting task.](image)
Procedure

Prior to commencing the study, participants read briefing instructions which explained that they would be asked to perform putts using three identical putters. To explain the experimental procedure, participants were told that the study was about how visual feedback affects performance. Participants then used the acquisition putter, without the divider screen, to learn the basics of the task in 30 practice trials, thus ensuring that participants were familiar with the strength and line required for the task. A 7 × 7 grid marked on the floor with tape was used to rate putting performance (each square being 0.15 m × 0.15 m), the centre of which (D4) was considered the target outcome. In a practice trial, the participant would place the ball at a starting point and putt towards the grid; when the ball came to a stop, the experimenter would call out the grid reference. For example, A1 meant they had overhit the ball to the left and G7 would mean they had underhit to the right. Any balls that were out of the grid were called as out of bounds and the participant did that trial again; however, feedback was still provided on the magnitude and direction of error. In this way, the participant could see how the outcome of their putt was translated into the verbal feedback scheme.

After this practice session, the divider screen was introduced and the three identical putters were leant against a wall (0.30 m apart) next to the participant. The putters were referred to as the left, centre and right-hand putters to ensure that there was no natural preference for any of them (compared to if they had been labelled with a number or colour coded). At this stage, participants were reminded verbally that the putters were identical.

Participants were asked to select a putter according to a random order. Unbeknownst to the participant, the experimenter also used a random order to determine whether the feedback for this putter would be positive, honest or negative. The participant was told that they would be required to produce about 20 putts within the grid before the next putter was used. The procedure for honest feedback was as had occurred in the practice condition, the grid reference called out after each putt. For reference, a diagram was placed on the divider screen. After sufficient trials had been collected, participants were asked to replace the putter they had been using in its previous location and select another specified by the experimenter. The procedure for the negative feedback condition was to exaggerate feedback away from the centre, for example, balls that landed in D2 were feedback to the participant as D1, B4 became A4, B2 became A1. Balls in D4 were called as the square they were nearest to, balls in the outer ring of the grid were called out of bounds. The procedure for positive feedback was to exaggerate towards the centre, D2 was fed back as D3, B4 became C4 and any square outside D4 was called as D4. Balls that were out of bounds were still called as such, however.

After the third putter had been used, it was replaced in its position by the wall and the divider screen was removed. Participants were informed that as thanks for participating in the study, a competition would take place where the person who could get the best putting score out of 10 putts would be given a small cash prize. They were asked to select any putter (the selection was noted by the experimenter) and their putting score was assessed over 10 putts for the purpose of the competition. After this competition phase, participants were asked to fill in the Likert scales assessing qualities of the putters (see materials) and were then debriefed and thanked for their time. Participants afterwards reported that they had not suspected the feedback had not been honest and had not realised the true nature of the study.

To analyse the data, a Chi statistic was generated for putter preference, and a one-way repeated-measures Analysis of Variance (ANOVA), followed by linear contrasts, was used for the questionnaire data.
Results

Overall, the selection of putter for the competition phase was more likely to be the positive putter ($N = 22$), although the honest and negative feedback putter were also selected ($N = 5$ and $N = 1$, respectively). This selection was not random as determined by a contingency table, $\chi^2 (2, N = 28) = 26.65, p < 0.01$.

One-way repeated-measures ANOVA indicated that the perceptions of the putter also varied depending on the feedback provided, with all main effects significant at $p < .001$, the effect sizes were all large (see Table 1). In addition, all linear contrasts were significant for all questions at $p < .001$. The positive putter was perceived most favourably, followed by the honest, then the negative feedback putter. Assumptions of normality were met as indicated by skewness and kurtosis values within the range deemed acceptable (Tabachnick & Fidell, 2007). Where the sphericity assumption was violated, Greenhouse-Geisser statistics are reported. For the sake of brevity, all descriptive and inferential statistics are reported in Table 1.

Finally, analysis of putting performance during the manipulation phase indicated a significant condition effect ($F_{2, 54} = 38.88, p < .001, \eta^2_p = .59$), with performance best with the positive putter ($M = 56.25, s = 3.15$), followed by the honest ($M = 61.18, s = 4.06$), then the negative putter ($M = 64.36, s = 4.56$).

Discussion

The results strongly suggest that it is possible to induce a superstitious belief in a laboratory setting in a short period of time. As predicted, the participants in the present study preferred to use the positive putter for the competition and had more positive perceptions about it. For example, items relating to physical properties of the putter such as “comfort” and “weight” were rated as significantly higher in the positive putter, meaning that they were rated as more comfortable to hold and having a better weight for the task. It must be borne in mind that this was in spite of the fact that the putters themselves are all identical. Items relating to the function of the putter were also higher in the positive putter; it was considered to contact the ball better and produce more smoothness. Again, considering the putter was identical to the others, it has no more capacity for better function than the others did.

Table 1. Mean response on a 1–5 scale to questions about the club (Standard deviation in parenthesis), with main effect of putter type followed by linear contrast (Effect size, $\eta^2_p$, in parenthesis).

| Question                        | Negative (0.88) | Honest (0.74) | Positive (0.79) | $F_{(2, 54)} = $ | $F_{(1, 27)} = $ |
|---------------------------------|-----------------|---------------|-----------------|-----------------|-----------------|
| How comfortable to hold?       | 2.43 (0.88)     | 3.00 (0.77)   | 3.93 (0.47)     | 33.45*** (0.55) | 31.50*** (0.64) |
| How clean was contact?          | 2.64 (0.91)     | 3.11 (0.74)   | 3.71 (0.81)     | 16.89*** (0.38) | 24.20*** (0.47) |
| How easy was it to use?         | 2.71 (1.01)     | 3.36 (0.78)   | 4.18 (0.61)     | 29.98*** (0.53) | 41.60*** (0.61) |
| How smooth was roll?            | 2.75 (0.89)     | 3.14 (0.71)   | 3.86 (0.80)     | 30.36*** (0.53) | 40.86*** (0.60) |
| How comfortable was weight?     | 2.39 (0.79)     | 3.11 (0.79)   | 4.07 (0.66)     | 37.96*** (0.58) | 39.45*** (0.66) |
| How confident did you feel?     | 2.11 (0.96)     | 2.96 (0.64)   | 4.11 (0.74)     | 61.01*** (0.69) | 75.60*** (0.74) |
| How accurate (distance)?        | 2.14 (0.85)     | 2.86 (0.76)   | 3.64 (0.62)     | 39.03*** (0.59) | 63.00*** (0.70) |
| How accurate (direction)?       | 2.11 (0.96)     | 2.79 (0.74)   | 3.64 (0.78)     | 33.11*** (0.58) | 57.58*** (0.68) |
| How accurate (speed)?           | 1.86 (0.80)     | 2.82 (0.77)   | 3.64 (0.83)     | 58.65*** (0.68) | 97.54*** (0.78) |
| How well did you perform?       | 1.71 (0.76)     | 2.79 (0.88)   | 3.96 (0.69)     | 80.67*** (0.75) | 164.61*** (0.86) |

Note: A higher number indicates more preference. Full questions can be located in method. Where appropriate, adjusted degrees of freedom (Greenhouse-Geisser) were used, all effects remained significant at the <0.001 level.

***$p < 0.001$. 

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It might be argued, however, that any “identical” items will, upon closer scrutiny, reveal slight manufacturing differences. Hence, it might be that one of the clubs was, in fact, slightly “better” than the others. We do not doubt that there are slight manufacturing differences between the clubs used in this particular study, for example, the rubber handle was 2 mm longer on one club compared to the other two. It is unlikely, however, that these minimal manufacturing differences could account for such differences in perception and behaviour. More importantly, this potential alternative explanation was guarded against by randomly allocating clubs to the feedback regime. Hence, the fact that the participants responded that a particular club was more comfortable to hold was due to the feedback condition and not the club itself because all three clubs were employed within each feedback condition during the study.

The finding that participants performed better with the positive putter during the feedback phase of the study can similarly not be due to the club. The random allocation of clubs to feedback regime does not permit this explanation. We believe, we were successful at producing a situation where a performer perceives a run of good performance (with the positive putter) or bad performance (with the negative putter) with a club, with false feedback serving to exaggerate the perceived performance differences between the clubs. Since the clubs were identical, any perceived difference about the quality of the putters as a consequence of feedback is an irrational belief, even if performance with a certain club is better than with others. A comparable scenario would be a craps player who perceives a certain die to be superior to others due to a run of good performance with it. It is perhaps easier to understand the irrational thinking in this scenario since there is obviously no difference between dice.

A superstitious belief was also created in this study against the negative putter. Its use was avoided in the competition phase by all but one participant and the physical and functional perceptions of it were more negative. It was considered to have poorer weight for the task, was less comfortable to hold and produced poorer accuracy. Sporting superstitions, in some instances, can take the form of “unlucky” items. Where performance is particularly poor with an item, they tend to be avoided in the future, as was the case in the present study, suggesting a possible connection between poor performance and perceptions of unluckiness. In line with this, a study by Brevers et al. (2011) also indicated that increases in uncertainty were related to increased rates of superstitious behaviour.

The categorisation of putters in this study into these dichotomous positions occurred in the space of about 20–30 minutes in a laboratory setting. The feedback regimes provided apparent evidence that the clubs somehow differed. This was by necessity an artificial situation, but by extension, one could see how this situation could occur in real sporting situations when, by chance, sporting performance happens to be better with one specific item of equipment. For example, tennis players who have served an ace have been known to request the exact same ball back from the ball boy or girl for the next serve. Given the quality testing for these items of equipment, it is unlikely that particular ball differs from any of the others in play, they are more than likely all the same. In addition, these dichotomous positions were developed in spite of the fact that participants were told that the putters were identical, and indeed they could also see the putters were the same make and model.

These results can be seen in the context of the work on conditioning and the development of superstitious behaviour (Ono, 1987; Rudski, 2001; Skinner, 1948). The experimental manipulation involved providing a regime of false feedback to the participant such that they thought they had performed differently with the clubs. We argue that this can be considered a surrogate circumstance for real-world performance, in that using a putter under these varying circumstances causes the irrational decision-making. We would see our procedure as akin to a situation where a sportsperson gets a run of good or bad performance, and how this can cause superstitious preferences.
Our study is comparable to that of Skinner (1948) since it shows that participants behave as if there is a causal relation between the putter used and the quality of their performance. In Skinner’s study, pigeons behaved as if there was a causal relation between their behaviour (e.g. turning, twisting, pecking) and the presentation of food. In both studies, no such causal relation was apparent and, therefore, according to Skinner, a superstition is demonstrated.

The present study extends the only other laboratory-based work that examines the development of superstitions in golf conducted by Van Raalte et al. (1991). In this study, it was argued that participants developed a superstitious preference for a “lucky” golf ball based on previous good performance with that ball. However, a preference for a ball may have been primarily due to the colour of the ball rather than previous performance. In our study, we employed an experimental manipulation in which inherent biases to the sports equipment were removed by simply using identical equipment. Despite participants putting with three identical golf clubs, a superstitious preference was developed for one of the clubs based on perceived superior performance with that putter.

It would be interesting to know whether other features of operant conditioning could be mirrored in the development of superstitions. For example, the operant conditioning literature has explored various regimes of reinforcement (Variable vs. Fixed and Interval vs. Ratio). Although some work has taken place along these lines (e.g. Rudski, 2001, found no major influence between different Variable Interval schedules and superstitious belief), it was not specifically sport-based, instead using competitive button pressing tasks. More sport-like situations would be needed to conclude whether varying schedules exert the same effects on sporting superstitions as they do on conditioned behaviour. Such findings would lend more support to the idea that operant conditioning was a factor in the development of these beliefs. One further line of research would be to consider alternative procedures, perhaps involving real-world variability, to create an even more representative experimental situation.

In summary, an experiment was conducted in which participants developed a superstitious belief towards a particular putter (and against another). Not only did participants assume the putter had superior qualities compared to other identical putters, but they felt more confident and preferred to use it in a competition situation. In addition, this preference was developed in a relatively short time in the laboratory, approximately 20–30 minutes.

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