What Factors Influence Sport Performance Consistency?

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ABSTRACT

In this paper, we sought to understand what the reasons are for why athletes' performance fluctuates, so that we could learn how to improve our overall performance in our respective sports. Previous research has predicted athletic performance consistency by variables such as anxiety, mental conditioning, and confidence. In our first (correlational) study, we tested the strength of these relationships by examining naturalistic daily changes in their variables longitudinally over a one-week period. We measured anxiety, focus, and confidence each on a zero to ten scale, and measured performance consistency by recording our basketball shot attempts in comparison to shot makes. Based on the strength of correlation found between mental conditioning and performance consistency in our correlational study, we then conducted a second (experimental) study to test for a causal relationship between these two variables. Over a one-week period, we assigned participants on alternate days to either a focused condition or an unfocused condition and measured the effect this manipulation had upon mental conditioning. Data pooled across participants in our correlational study showed that performance consistency was associated with mental conditioning and confidence, but not with anxiety. Data pooled across participants in our experimental study failed to establish a causal role of mental conditioning upon performance consistency.

1. Introduction

1.1 Research Problem

We chose to research the consistency of athletes' performance to help isolate the variable that will improve our overall performance in our respective sports. We wanted to research this problem to improve our basketball shooting percentage and learn how to not let the pressure of the game affect our play. We would like to understand why athletes have "good days" or "bad days" when performing in their respective sports and what factors influence this drastic change of performance. The importance of this research is to help us better shape our mindset to improve our execution of training during games.

1.2 Literature Review

One factor previously found to predict sport performance consistency is anxiety. For example, in an experimental study by Woodman and Davis (2008), the researchers collected data via a survey and a heart rate monitor. The survey was a self-report measure of anxiety in three areas each rated on an eleven-point scale: cognitive anxiety,

somatic anxiety, and self-confidence. The participants were asked to perform a series of baseline golf putts and then they put money on the green to induce anxiety for the experimental golf putt condition. They measured the heart rate of the participants during baseline and experimental golf putts to measure their psychological response to anxiety. In the study, high anxiety people putted best in the final experimental putt condition compared to people who rated their anxiety as lower. Based on these results, the researchers suggested that high anxiety can help people putt better in final situations.

Another factor previously found to predict sport performance consistency is mental conditioning. For example, in a case study by Krol and Štěrbová (2020), the methods used in the case study were the use of a questionnaire in recording progress made by the weightlifter and a training program that had three phases: an educational phase, a training phrase, and a practical phase where the techniques taught were focusing, re-focusing, and anger coping. The weightlifter was subjected to integrating these psychological skills in competitive situations. Results that were gathered from the study provided the weightlifter with a good understanding of the implementation of the psychological skills in her future endeavours while proving that the use of mental conditioning can be fruitful in the improvement of one's own performance in their respective sports. Based on these results, the researchers suggested that that the use of mental conditioning training can be crucial in an athlete's development and overall performance improvement.

A third factor previously found to predict sport performance consistency is confidence. For example, in an experimental study by Grandjean et al. (2002), Olympic gymnast

participants were randomly assigned to two groups. The gymnasts of the experimental group vaulted first and second, then the controls groups went third and fourth. Six highly trained judges gave the gymnasts scores on one to ten scales, but the highest and lowest scores from each group were removed from the results to reduce any bias or misperception from the judges. The results showed that the shortened vault had a substantial impact on improving confidence. Based on these results, the researchers suggested that the more confidence one has, the better you will perform.

1.3 Hypotheses

Based on the above literature review, we predicted the following hypotheses: Hypothesis #1: If anxiety increases then performance consistency will increase. Hypothesis #2: If mental conditioning increases then performance consistency will increase. Hypothesis #3: If confidence increases then performance consistency will increase.

2. Methods

2.1 Participants

The two authors of this paper served as the participants in its studies. The participants ranged in age from 18 years old, with an average age of 18 years, and included Asian males. The participants were all undergraduate students at Camosun College who completed the current studies as an assignment for Psyc 110-003A ("Experimental Psychology") and were grouped together due to their mutual interest in sport performance. Both participants are athletes, one is experienced in basketball and the other is not.

2.2 Correlational Study Methods

We first performed a correlational study to test concurrently all our hypotheses by examining naturalistic daily changes in their variables longitudinally. Each participant kept a study journal with them at all times over this study's two-week period to record self-observations of the following four variables: (1) anxiety, (2) mental conditioning, (3) confidence, and (4) performance consistency. This will be recorded over seven days, five of which will be one on ones with my fellow researcher and two days in games situations.

2.2.1 Anxiety

To measure anxiety, at the end of the day each participant recorded in their study journal the amount of anxiety they experienced that day on a scale of zero to ten during this study, with zero having low-level anxiety and ten having high-level anxiety for that day. We define anxiety as how anxious said person is while playing the sport.

2.2.2 Mental Conditioning

To measure mental conditioning, at the end of the day each participant recorded in their study journal how focused they were that day on a scale from zero to ten, with zero having low-level focus and ten having a high level of focus for that day. We define focus as how concentrated said person is when playing the sport.

2.2.3 Confidence

To measure confidence, at the end of the day each participant recorded in their study journal how confident they were that day on a scale from zero to ten, with zero having low-level confidence and ten having high-level confidence for that day. We define confidence as the confidence experienced while playing the sport.

2.2.4 Performance Consistency

To measure performance consistency, we recorded our shot attempts compared to our shot makes, in one-on-one situations and game situations. The game situations will be Camosun recreational four on four games that happen on Tuesdays and Thursdays.

2.3 Correlational Study Planned Analyses

To assess the strength and statistical significance of associations between variables predicted by our three hypotheses, we performed Pearson product moment correlations of their predictor variables anxiety, mental conditioning, and confidence with their outcome variable performance consistency. For testing Hypothesis #1, we correlated scale data on anxiety with percentage of shots scored. For testing Hypothesis #2, we correlated scale data on mental conditioning with percentage of shots scored. For testing Hypothesis #3, we correlated scale data on confidence with percentage of shots scored. We performed all of the above correlations separately for each participant as well as using data pooled across all of the participants. For the correlations using pooled data, in addition to using the raw data, we also performed correlations after we had first transformed the data from each participant into z-scores in order to standardize differences in averages and variability seen between the participants in their data and thus make them more comparable. A correlation coefficient was considered statistically significant if the probability of its random occurrence (p) was $< .05$ (i.e., less than 5% of the time expected by chance alone).

2.4 Experimental Study Methods

Based on the strength of the correlation between mental conditioning and performance consistency found in our correlational study, we then chose to conduct an experimental study to test for a causal relationship between these two variables from Hypothesis #2.

We manipulated the independent variable, mental conditioning, over a one-week period by assigning participants each day to either a focused condition or an unfocused condition. Before each experiment or control day, we used a behavioural scale from 0 to 10 to measure how focused we were before commencing said activity, with 0 being a low level of mental conditioning and 10 being a high level of mental conditioning. These scales will account for the manipulation check of the independent variable. On experimental days we took five free throws while saying to ourselves using the mental conditioning technique of self-talk "aim for a swish" during the entirety of the five free throws. On control days we did the same thing without using self talk, just silence. After that we recorded the percentages of how many shots we made during both the experimental/control day, this accounts for the dependent variable.

Since we had no way of achieving a double-blind procedure, there was no way to control for placebo effects. To prevent order effects, we used an alternate design in that if one day was an experimental day then the next day was to be a control day, and vice versa. In order to reduce experimenter expectancy effects, we used objective behavioural measurements of the dependent variable.

2.5 Experimental Study Planned Analyses

To assess the statistical significance of differences seen in performance consistency on focused experimental days vs. unfocused control days, Student's *t*-tests were performed. We performed *t*-tests separately for each participant as well as using data pooled across all of the participants. For the *t*-tests using pooled data, in addition to using the raw data, we also performed *t*-tests after we had first transformed the data from each participant into *z*-scores in order to standardize differences in averages and variability seen between the participants in their data and thus make them more comparable. An average difference between conditions was considered statistically significant if, using a one-tailed distribution (i.e., to determine if there is a difference between groups in a specific direction), the probability of its random occurrence (*p*) was < .05 (i.e., less than 5% of the time expected by chance alone).

3. Results

3.1 Correlational Study Results

As shown in Table 1, both confidence and mental conditioning were significantly correlated with performance consistency when examining the pooled standardized data. For anxiety, the data for one participant was statistically significant ($r = -0.82$, $p = 0.02$) and for the other participant they were not ($r = 0.24$, $p = 0.62$). The pooled raw data ($r = 0.11$; see Figure 1) and the pooled standardized data ($r = -0.29$; see Figure 2) for anxiety were not statistically significant ($p > 0.32$). For mental conditioning, the data for one participant was statistically significant ($r = 0.92$, $p = 0.001$) and for the other participant they were not ($r = 0.73$, $p = 0.06$). Likewise, the pooled standardized data for mental conditioning was statistically significant ($r = 0.83$, $p < 0.001$; see Figure 4) and the pooled raw data for mental conditioning were not statistically significant ($r = 0.44$, $p = 0.16$; see Figure 3). For confidence, the data for one participant was statistically significant ($r = 0.80$, $p = 0.03$) and for the other participant they were not ($r = 0.65$, $p = 0.12$). Likewise, the pooled standardized data for confidence was statistically significant ($r = 0.73$, $p = 0.002$; see Figure 6) and the pooled raw data for confidence were not statistically significant

($r = 0.41$, $p = 0.15$; see Figure 5). Based on a comparison of the correlation coefficients using either the pooled raw data or the pooled standardized data, mental conditioning and performance consistency showed the strongest correlation.

3.2 Experimental Study Results

As shown in Table 2, no significant differences were found in mental conditioning between the focused and unfocused conditions. Statistically significant differences between these conditions were not seen using any single participant's data (all $p \geq 0.42$), pooled raw data ($p = 0.38$; see Figure 7), or pooled standardized data ($p = 0.36$; see Figure 8).

4. Discussion

4.1 Summary of Results

We wanted to test if anxiety, mental conditioning, or confidence improved our performance consistency in sports. We found that confidence and mental conditioning have were strongly correlated with performance consistency, with mental conditioning being the stronger of the two correlated with performance consistency. Anxiety was not found to be significantly correlated with performance consistency. In our experimental study, mental conditioning was found to not have a significant causal relationship upon performance consistency using either the individual participant data or the pooled data.

4.2 Relation of Results to Past Research

Our group's findings were not consistent with past findings that anxiety improves performance consistency. Woodman & Davis (2008) had golfers in actual game situations where pressure can be found to increase anxiety which then makes the athlete more aware/calculating, essentially making them perform better. Our correlational findings where we played in games did not exhibit the same amount of pressure because nothing was at stake, meaning we only felt anxiety when we were guarded well by our opponent or when we performed badly which does not affect us in a good way to increase our performance consistency.

We found that mental conditioning is associated with improvements in performance consistency, but does not itself cause these improvements. This is not in agreement with the Krol & Štěrbová (2020) article that found that the more focused you are when participating in a sport then the better you will perform in general. That article referenced a bodybuilder who, with the implementation of mental conditioning specifically focusing, was able to perform better in Olympic events than without the use of mental conditioning techniques. We speculated that the difference methodologically between the Krol & Štěrbová (2020) study and our experimental study was that the time needed to implement the mental conditioning techniques in the article took weeks or months to fully integrate said mental conditioning techniques in the article while we never really practiced self-talk before doing this project, so time could be taken as a factor. Another difference that we noticed was that the bodybuilder was learning through a program which efficiently taught said person to develop these mental conditioning techniques into a daily routine while we were never taught to do these techniques at all much less in our daily routines.

Confidence was found to be associated with improvements in performance consistency in support of our hypothesis.

This is in agreement with the Grandjean et al. (2002) article that found that gymnasts who experienced ease of difficulty when performing the first trial had more confidence and so performed better knowing they had the capability of doing well on the second trial. Our study had us play knowing who we were facing as well in terms of skill level as with ample warm-up resulting in better confidence which may have influence us to perform better under a game situation.

4.3 Implications of Results

We have noticed from our findings that having a high level of confidence and the ability to implement mental conditioning before participating in a sport can greatly predict how well you can consistently perform. Although with our correlational study mental conditioning was significantly associated with performance, it was shown through our experimental study to not have a significant effect upon performance. One possible interpretation of this result is that without proper training and time to implement mental conditioning this technique will not have a significant impact on how you will perform. Anxiety, although it could be used to help you in certain situations, had no relationship with our performance consistency. The practical application of this is to not worry about whether you're feeling anxious or calm before a sports event.

Our original rationale for embarking on this research was the improvement of our performance consistency in playing sports. Through our experimental results we have found that mental conditioning has no significant effect upon performance consistency.

References

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Krol, P., & Štěrbová, D. (2020). Mental training and influence of temperamental dimensions in preparation of the Czech Republic weightlifting representative in junior category under 23 years: Case study. *E-Psychologie, 14*(4), 31–42. https://doi.org/10.29364/epsy.383

Woodman, T., & Davis, P. A. (2008). The role of repression in the incidence of ironic errors. *Sport Psychologist, 22*(2), 183–196. https://doi.org/10.1123/tsp.22.2.183

Table 1

Correlations for Study Variables

Variables	Participant #1		Participant #2		Pooled raw data		Pooled standardized data	
	r	*n*	*r*	*n*	*r*	*n*	*r*	*n*
Anxiety & Performance Consistency	-0.82*	7	0.24	7	0.11	14	-0.29	14
Mental Conditioning & Performance Consistency	0.73	7	0.92*	7	0.44	14	0.83*	14
Confidence & Performance Consistency	0.65	7	0.80*	7	0.41	14	0.73*	14

* $p < .05$.

Table 2

Descriptive Statistics for Performance Consistency Across Different Mental Conditioning Conditions

Condition	Statistic	Participant #1	Participant #2	Pooled raw data	Pooled standardized data
Focus	*M*	40	68	54	0.08
	SD	20	10.95	21.19	0.62
	n	5	5	10	10
Unfocus	*M*	36	64	50	-0.08
	SD	29.66	38.47	35.59	1.27
	n	5	5	10	10

Note. *M*, *SD*, and *n*, represent mean, standard deviation, and sample size, respectively. [Type here what units of measurement were used for the DV values shown above].

* *p* < .05 for comparison of focused condition with its respective unfocused condition.

Figure 1

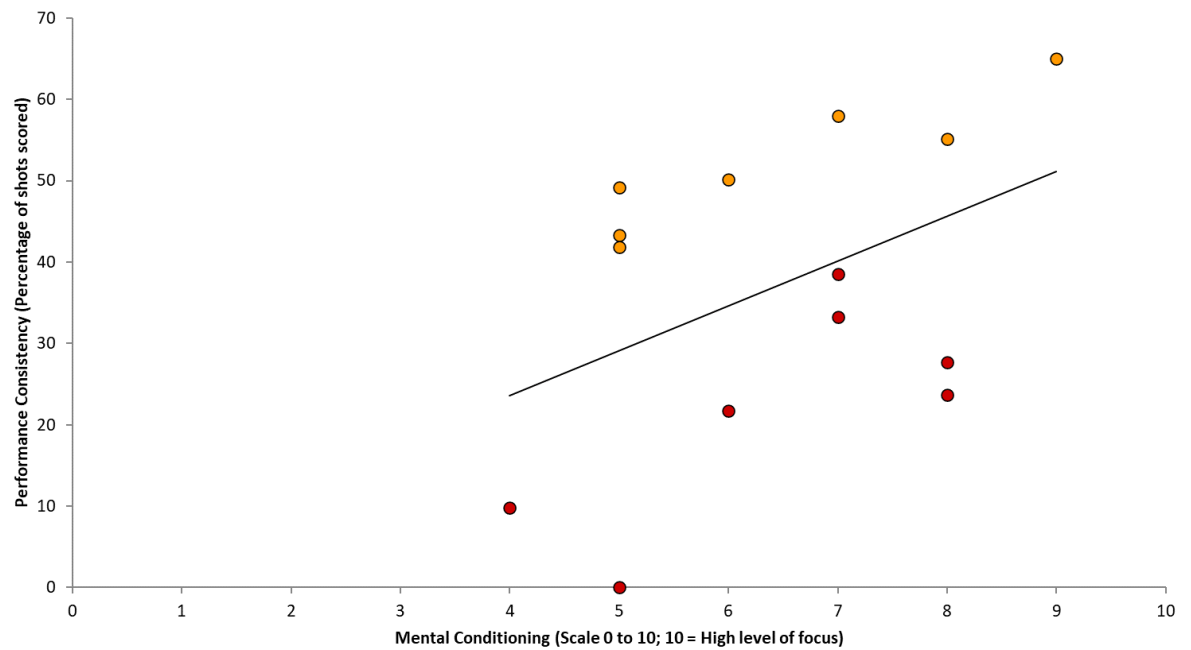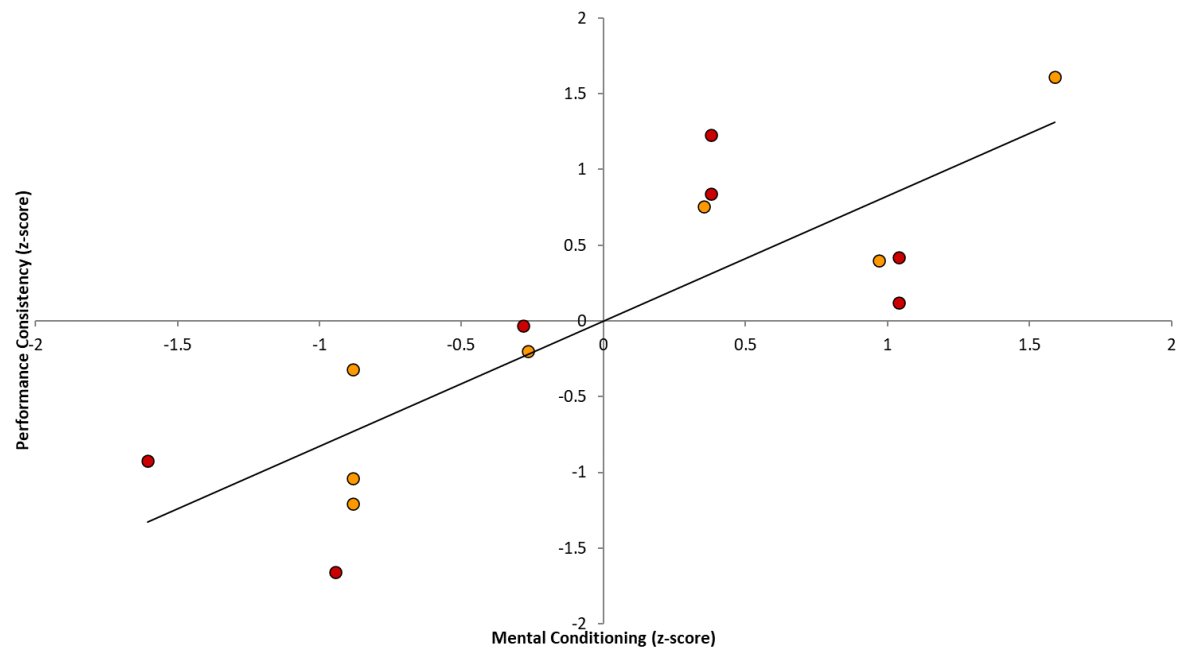*Association Between Anxiety and Performance Consistency Using Pooled Raw Data*
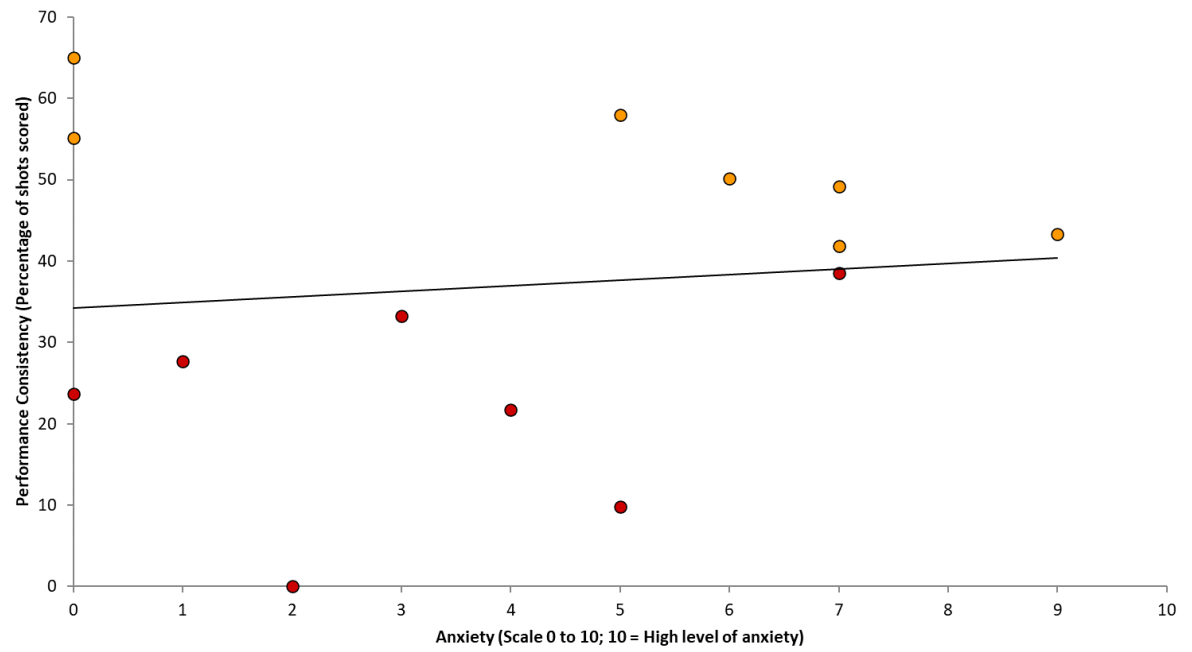
Notes. Marker colour differentiates participants: red = participant #1 and orange = participant #2.

Some data might not be visible in the figure due to overlapping markers.

Figure 2

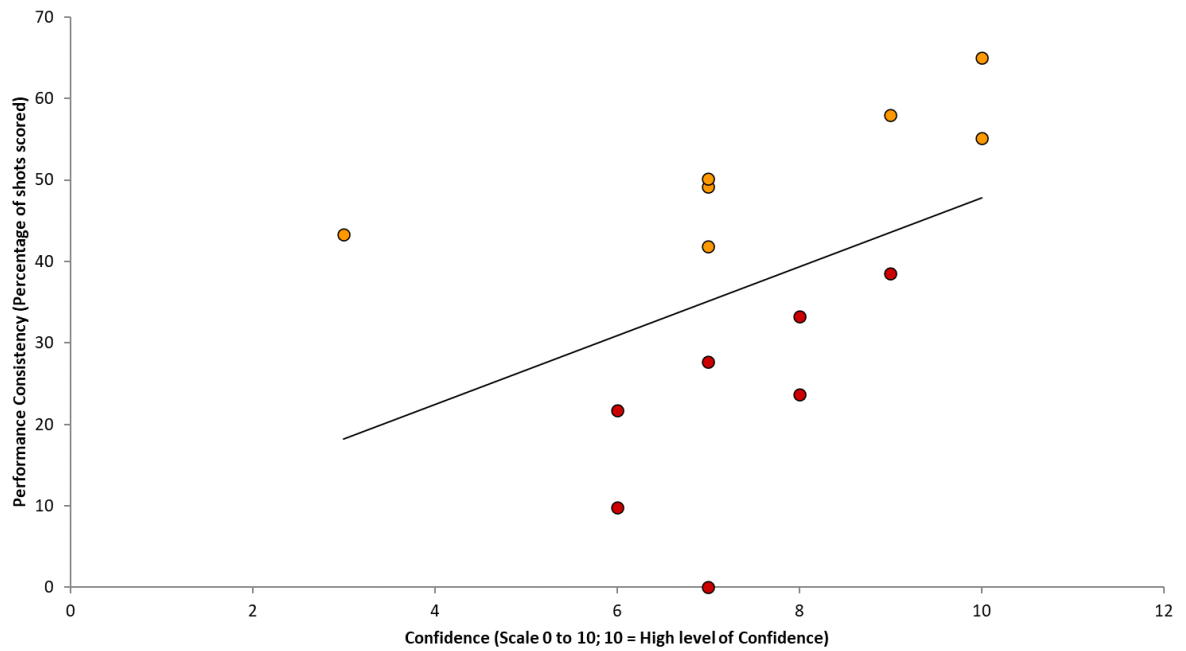*Association Between Anxiety and Performance Consistency Using Pooled Standardized Data*
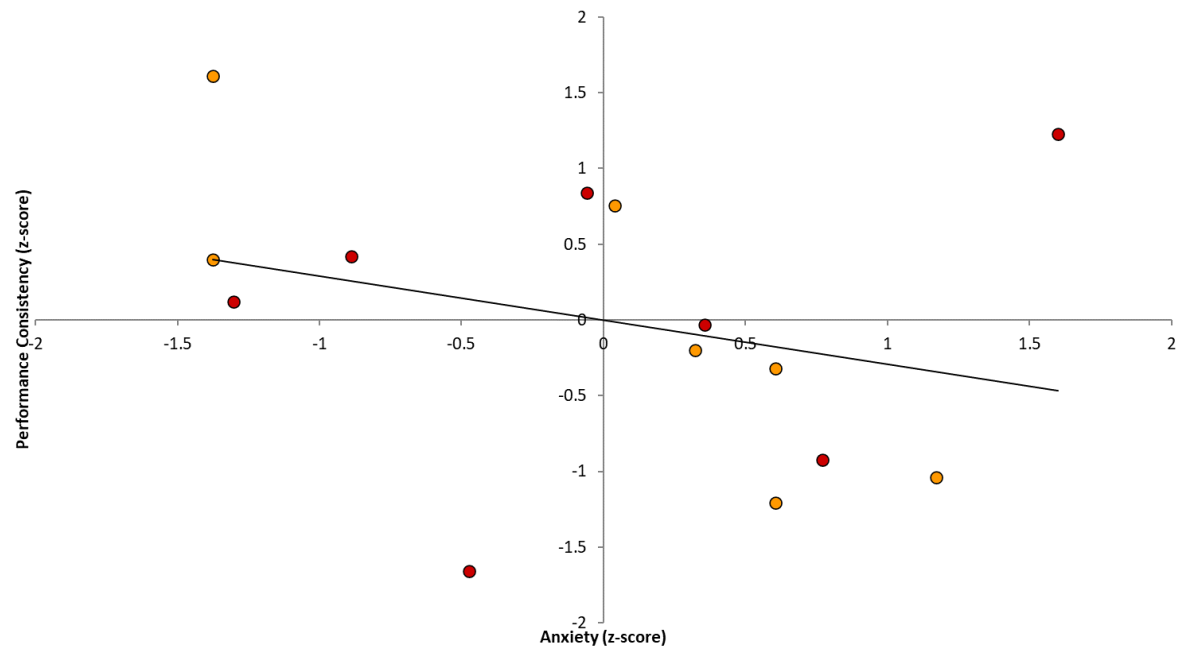
Notes. Marker colour differentiates participants: red = participant #1 and orange = participant #2.

Some data might not be visible in the figure due to overlapping markers.

Figure 3

Association Between Mental Conditioning and Performance Consistency Using Pooled Raw

Data

Notes. Marker colour differentiates participants: red = participant #1 and orange = participant #2.

Some data might not be visible in the figure due to overlapping markers.

Figure 4

Association Between Mental Conditioning and Performance Consistency Using Pooled
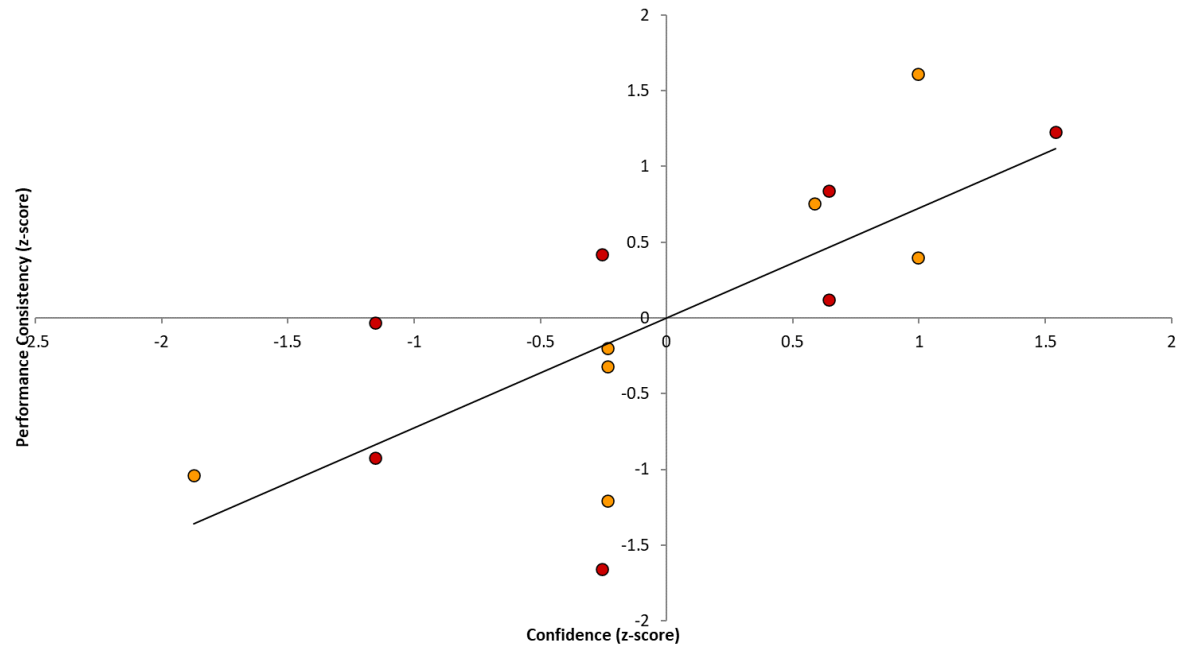
Standardized Data

Notes. Marker colour differentiates participants: red = participant #1 and orange = participant #2.

Some data might not be visible in the figure due to overlapping markers.

Figure 5

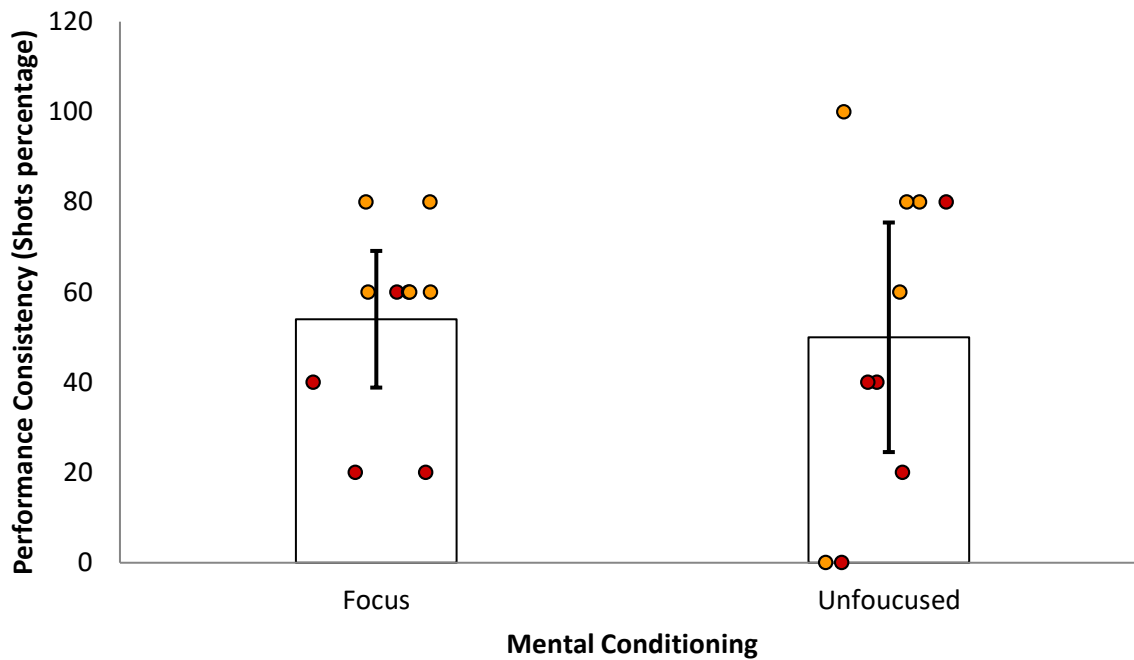*Association Between Confidence and Performance Consistency Using Pooled Raw Data*

Notes. Marker colour differentiates participants: red = participant #1 and orange = participant #2.

Some data might not be visible in the figure due to overlapping markers.

Figure 6

Association Between Confidence and Performance Consistency Using Pooled Standardized Data

Notes. Marker colour differentiates participants: red = participant #1 and orange = participant #2.

Some data might not be visible in the figure due to overlapping markers.
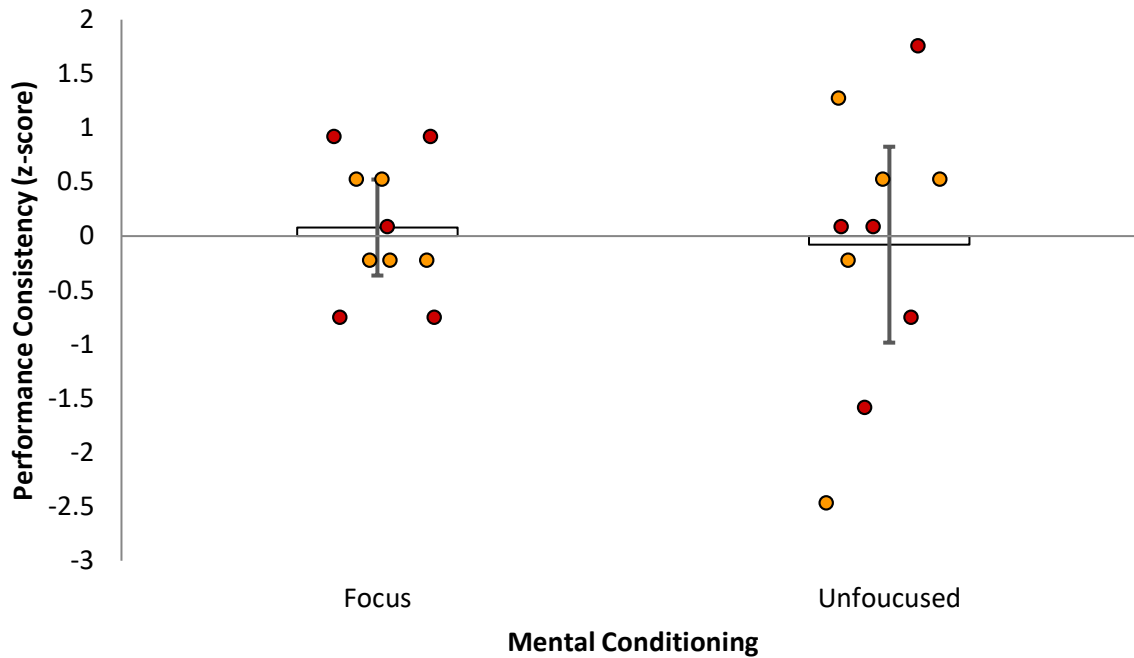
Figure 7

Average Performance Consistency Across Different Mental Conditioning Conditions Using

Pooled Raw Data

Notes. Performance Consistency scores are shown for focused and unfocused conditions using

pooled raw data from all participants. Error bars show ± 95% confidence levels. The overlapping

scatterplot shows data from each participant. Marker colour differentiates participants: red =

participant #1 and orange = participant #2.

Figure 8

Average Performance Consistency Across Different Mental Conditioning Conditions Using

Pooled Standardized Data

Notes. Performance consistency scores are shown for focused and unfocused conditions using

pooled raw data from all participants. Error bars show ± 95% confidence levels. The overlapping

scatterplot shows data from each participant. Marker colour differentiates participants: red =

participant #1 and orange = participant #2.