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**To cite this article:** Simon Lange-Smith, Josephine Cabot, Pete Coffee, Katie Gunnell & David Tod (2024) The efficacy of psychological skills training for enhancing performance in sport: a review of reviews, *International Journal of Sport and Exercise Psychology*, 22:4, 1012-1029, DOI: [10.1080/1612197X.2023.2168725](https://doi.org/10.1080/1612197X.2023.2168725)

**To link to this article:** <https://doi.org/10.1080/1612197X.2023.2168725>



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Published online: 30 Jan 2023.



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RESEARCH ARTICLE



## The efficacy of psychological skills training for enhancing performance in sport: a review of reviews

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### ABSTRACT

Psychological skills training (PST) is one approach within sport psychology to enhance athletic performance. A significant amount of research documents the efficacy of PST for enhancing performance which has led to numerous reviews. Such is the volume of reviews, that a “review of reviews”, or overview, is warranted. This overview aimed to examine reviews summarising the evidence that PST enhances performance in sport. Six online databases were searched electronically, and thirteen journals were searched manually, following which accumulated articles were forward- and backward-searched. A total of 30 systematic, meta-analytic, and narrative reviews were included that (a) reviewed studies involving the application of PST to athletes, and (b) summarised the effects of PST interventions on sport performance, or a motor performance-based surrogate of a sporting task. Data regarding review characteristics, PST interventions reviewed, and outcomes were extracted. Included reviews were assessed using the AMSTAR 2 instrument. 90% of the reviews concluded that PST interventions can enhance performance; however, 97% were rated as critically low in quality. Critically low quality reviews should not be relied on to provide an accurate and comprehensive summary of the available studies, thus the conclusion of this overview is that practitioners must be cautious when making claims about the review-level evidence for their PST interventions. It is suggested that prospective reviewers ensure they draw on current and accepted review methodology so that readers have clarity about the efficacy of the reviewed PST interventions in future research.



### ARTICLE HISTORY

Received 19 May 2022  
Accepted 10 January 2023

### KEYWORDS

Psychological skills training; mental skills training; sport performance; overview; umbrella review

Psychological skills training (PST) is a popular method which involves teaching athletes methods to help them to enhance the quality and consistency of their performance (Weinberg, 2019). Practitioners debate the definition of a psychological skill, for example Behncke (2004) refers to psychological skills as cognitive-somatic techniques, such as imagery, relaxation, and self-talk, whereas others include trait-like components

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such as confidence, motivation, and focus (Vealey, 2019). To clarify the issue, Dohme et al. (2017) systematically reviewed terms used in empirical studies to describe psychological components purported to facilitate athletic performance. Dohme et al. (2017) defined psychological skills as “an athlete’s ability to use learned methods to regulate or enhance their psychological characteristics” (pp. 158–159), and it was this definition that was adopted for the present review. Conversely, they defined psychological characteristics as “trait-like dispositions that can be regulated or enhanced through systematic development despite their relative stability” (pp. 158–159). For example, psychological skills such as imagery may be used to enhance psychological characteristics, such as self-confidence (Dohme et al., 2019).

As the use of PST by athletes has increased, the research examining the efficacy of these PST interventions has rapidly expanded. Confronted with a large volume of research on PST interventions, authors have reviewed the studies to summarise, synthesise, and simplify the evidence of the efficacy of PST in sport (e.g., Agosti & Sirico, 2020; Brown & Fletcher, 2017; Tod et al., 2011).

The rapidly increasing number of reviews comprise of narrative, systematic, and meta-analytic reviews. Although well intentioned, this rapid increase in the number of reviews has limitations. Firstly, it compounds the problem stakeholders already face in sorting through multitudes of evidence. Secondly, these reviews often present conflicting results. For example, Brown and Fletcher (2017) concluded that PST techniques such as imagery and relaxation enhance sport performance, whereas Pelka et al. (2016) concluded that these PST techniques did not enhance performance. Conflicting conclusions from reviews about the same topic suggest a need to critically appraise the reviews themselves to identify causes of these inconsistencies. For example, the reviews might focus on different populations, outcomes, inclusion criteria, and comparators, or their quality might be limited, affecting the inferences made from the reviews. Importantly, stakeholders in sport make decisions on the basis of reviews, so it is critical to examine what is leading to these inconsistencies among reviews so that they can develop a better understanding of the effectiveness of PST in sport.

One method of appraising reviews is to conduct a “review of reviews” (i.e., an overview). Overviews systematically document evidence from existing systematic reviews on a topic with the goal of generating results to give a high-level overview (Higgins et al., 2019). An overview represents one of the highest levels of evidence synthesis currently employed, and they are influential in health and biomedical literature (Fusar-Poli & Radua, 2018) because they provide “user-friendly” summaries of research relevant to a decision, without decision makers needing to assimilate the results of multiple reviews themselves (Hartling et al., 2016). In addition, an overview can provide an opportunity for stakeholders and policy makers identify the reasons why extant reviews may differ in their findings and quality, and take these reasons into account when they read reviews and use them to make decisions. Faulkner et al.’s (2021) search found only two overviews in sport and exercise psychology (Biddle et al., 2011; Biddle et al., 2019), both on physical activity. To the authors’ knowledge, there are no overviews on PST in sport.

An overview of reviews on PST for performance enhancement could make several key contributions. Firstly, it would summarise the extant literature to provide a “user-friendly” summary of research relevant to whether or not to use PST, without needing to assimilate

the results of multiple reviews. Secondly, an overview of this area would be an opportunity to assess the overall quality of the extant literature, so that practitioners of PST can be aware of the quality of the evidence behind their practice. Finally, an overview could bring insight into why existing reviews have inconsistent results by examining variations in methodology and quality of evidence between reviews.

As such, the aim of this overview was to examine the review literature on PST's effectiveness in enhancing sport performance, and provide a clear and thorough understanding of the topic. More specifically, this overview's objectives included examining (a) the types of PST interventions included in the reviews, (b) the conclusions of the reviews, and (c) the quality of the review literature. Achieving these objectives indicate which PST interventions have been examined in the review literature, what evidence there is that they enhance performance, and how reliable that evidence is.

### ***Aims of the current study***

The objectives for the review were developed using the population, intervention, comparator, outcomes (PICO) framework (Schardt et al., 2007). Specifically, this overview summarised reviews investigating the relationship between athletes' (P, an individual who participates in competitive sport; Swann et al., 2015) use of PST (I, learned methods to regulate or enhance athlete's psychological characteristics; Dohme et al., 2017) and their performance (O, the execution of actions necessary to complete a task; Swann et al., 2015) in sport in comparison with controls (C), where included.

## **Methods**

### ***Protocol and publication standard***

Prior to conducting this review, the protocol was made available on the Open Science Framework (OSF).<sup>1</sup> We used the Preferred Reporting Items for Overviews of Systematic Reviews pilot tool (PRIOSR, Bougioukas et al., 2018) as the publication standard for this overview (available on the OSF<sup>2</sup>). The PRIOSR ensures the complete and transparent reporting of overviews to facilitate interpretation.

### ***Eligibility criteria and outcomes of interest***

Articles satisfying the following criteria were included:

- (a) Systematic, meta-analytic, and narrative reviews, where the primary purpose was to review the literature. The authors elected to include narrative reviews in the search because it was felt that, while narrative reviews traditionally do not answer directional research questions about intervention efficacy like that of the present overview, they provide interpretation and critique, and contribute by deepening understanding (Greenhalgh et al., 2018), which may be valuable for addressing the objective of the overview. Furthermore, narrative reviews were more common than other approaches in older literature, therefore valuable earlier information could be missed if they were omitted.

- (b) Articles which reviewed studies involving the delivery of PST (as defined by Dohme et al., 2017) as an intervention to athletes to improve performance in sport.
- (c) Articles which summarised the effects of PST interventions on a measure of sport performance, or motor performance-based surrogates of a sporting task. These measures of performance were the specific outcome of interest. Motor performance surrogates were considered because athletes use PST to enhance motor skill performance, as well as competitive performance (Tod et al., 2015).
- (d) Articles written in English, the only language read by the authors.
- (e) Articles which were either published or unpublished (e.g., unpublished dissertations, conference abstracts, preprints, etc.).

## Information sources and search strategy

### Search term generation

Search terms were generated using “Pearl growing” (Booth, 2016); an approach to systematic literature searching which identifies relevant literature. A review which met the inclusion criteria (Brown & Fletcher, 2017) was identified, and relevant search terms were extracted from the main text. This paper’s reference list and “cited by” list were then screened for reviews which met the inclusion criteria, from which relevant search terms were also extracted. This process continued iteratively until no more relevant search terms could be identified. The final search terms are presented in Table 1.

### Search dates

The initial search was carried out in August 2019. The search was repeated in December 2021 and September 2022 so as to include more recently published articles.

### Electronic search

An electronic search was then conducted using the search terms shown in Table 1 via the following electronic databases: (a) PsycINFO on OVID (b) SPORTDiscus on EBSCO (c) PubMed on MEDLINE (d) SCOPUS on Elsevier (e) and WebOfScience.

### Additional search strategies

Three additional search strategies were used; manual, forward, and backward searches. If the electronic search returned three or more eligible reviews from a single journal, that

**Table 1.** Search terms for online database search.

Search terms	Descriptors
1. PST	“self-talk” OR “self talk” OR “inner dialogue” OR “arousal control” OR “relaxation” OR “activation” OR “PMR” OR “emotion control” OR “breath*” OR “mindfulness” OR “imagery” OR “visualisation” OR “mental rehearsal” OR “goal setting” OR “performance profiling” OR “performance routine*” OR “pre-performance routine*” OR “anxiety” OR “stress” OR “reflection” OR “self-aware*” OR “self aware*” OR “attention” OR “focus” OR “attentional shift” OR “biofeedback” OR “associative attention” OR “dissociative attention” OR “refocus*” OR “mental skills training” OR “psychological skills training” OR “MST” OR “PST” OR “psychological intervention*” OR “intervention”
2. Review	“systematic review” OR “narrative review” OR “meta-analysis” OR “review”
3. Sport performance	“athlet*” OR “sport*” OR “perform*”
Combination	#1 AND #2 AND #3

journal's table of contents was screened manually. In addition, the tables of contents of the following journals, which the authors were aware had previously published literature on PST interventions in the context of sport, were also manually screened: (a) *Case Studies in Sport and Exercise Psychology* (b) *International Journal of Sport and Exercise Psychology* (c) *International Journal of Sport Psychology* (d) *International Review of Sport and Exercise Psychology* (e) *Journal of Applied Sport Psychology* (f) *Journal of Clinical Sport Psychology* (g) *Journal of Imagery Research in Sport and Physical Activity* (h) *Journal of Sport & Exercise Psychology* (i) *Journal of Sport Psychology in Action* (j) *Psychology of Sport and Exercise* (k) *The Sport Psychologist* (l) *Sport and Exercise Psychology Review* (m) *Sport, Exercise and Performance Psychology*.

Additionally, the reference lists of the eligible articles which were screened as full texts were backward- and forward-searched for further potentially relevant articles. Backward searching is the process of examining the works cited by an author to establish what research has influenced the author. Forward searching is where articles that cite an original article or work after it has been published are identified. This type of search focuses on the publications created after an article's publication.

### **Data management and selection process**

Records from the searches were stored using Endnote X7 before being exported to Rayyan (Ouzzani et al., 2016) for screening and duplicate removal. The first author screened titles and abstracts and reviewed full texts for eligibility according to a standardised process illustrated in a flowchart which is available on the OSF.<sup>3</sup> The second author (blinded to the first author's inclusion decisions) randomly sampled 20% of the full-text assessed papers and independently assessed their eligibility using the flowchart described above. Disagreements between the two authors were resolved by the third author.

### **Data collection process and data items**

Data were extracted from included articles via a piloted standardised form, available on the OSF.<sup>4</sup> Extracted data included: (a) authors' names, (b) publication date, (c) publishing journal (or document type if unpublished), (d) review objectives, (e) review methodology, (f) number of studies reviewed, (g) critical appraisal tool, (h) psychological skill(s) reviewed, (i) authors' conclusions, (j) performance enhancement effect, (k) controls, (l) manipulation checks, and (m) funding.

### **Assessment of methodological quality**

We used the "Assessing the Methodological Quality of Systematic Reviews" tool (AMSTAR 2) to analyse the methodological and evidence quality. The AMSTAR 2 is a valid and reliable appraisal tool (Shea et al., 2017). The methodological and evidence quality of the included reviews were assessed by the first author using a piloted standardised form available on the OSF.<sup>5</sup>

## **Data synthesis**

Data regarding review selection, review characteristics, and assessment of methodological quality and quality of evidence are described narratively. Data regarding the interventions described in the included reviews and their outcomes are synthesised in text and supported by the relevant tables.

## **Results**

### **Review selection**

The literature search returned 904 records. After screening titles and abstracts, 77 papers had their full-text assessed. After full-text screening, 30 reviews met inclusion and exclusion criteria ([Figure 1](#) for PRISMA flow diagram). A list of excluded articles with reasons is on the OSF.<sup>6</sup> Agreement between the first and second authors was 90% and, after mediation by a third author, all disagreements were resolved in favour of inclusion.

### **Review characteristics**

#### **Review types**

Characteristics of the 30 reviews are summarised in a table, on the OSF.<sup>7</sup> Of the 30 reviews, 14 were systematic reviews without meta-analysis, 11 were systematic reviews with meta-analysis, and 5 were narrative reviews. Of the systematic reviews (with or without meta-analysis), the number of included studies ranged from 7 to 66 ( $m = 34.12$ ,  $SD = 18.50$ ).

#### **Publication**

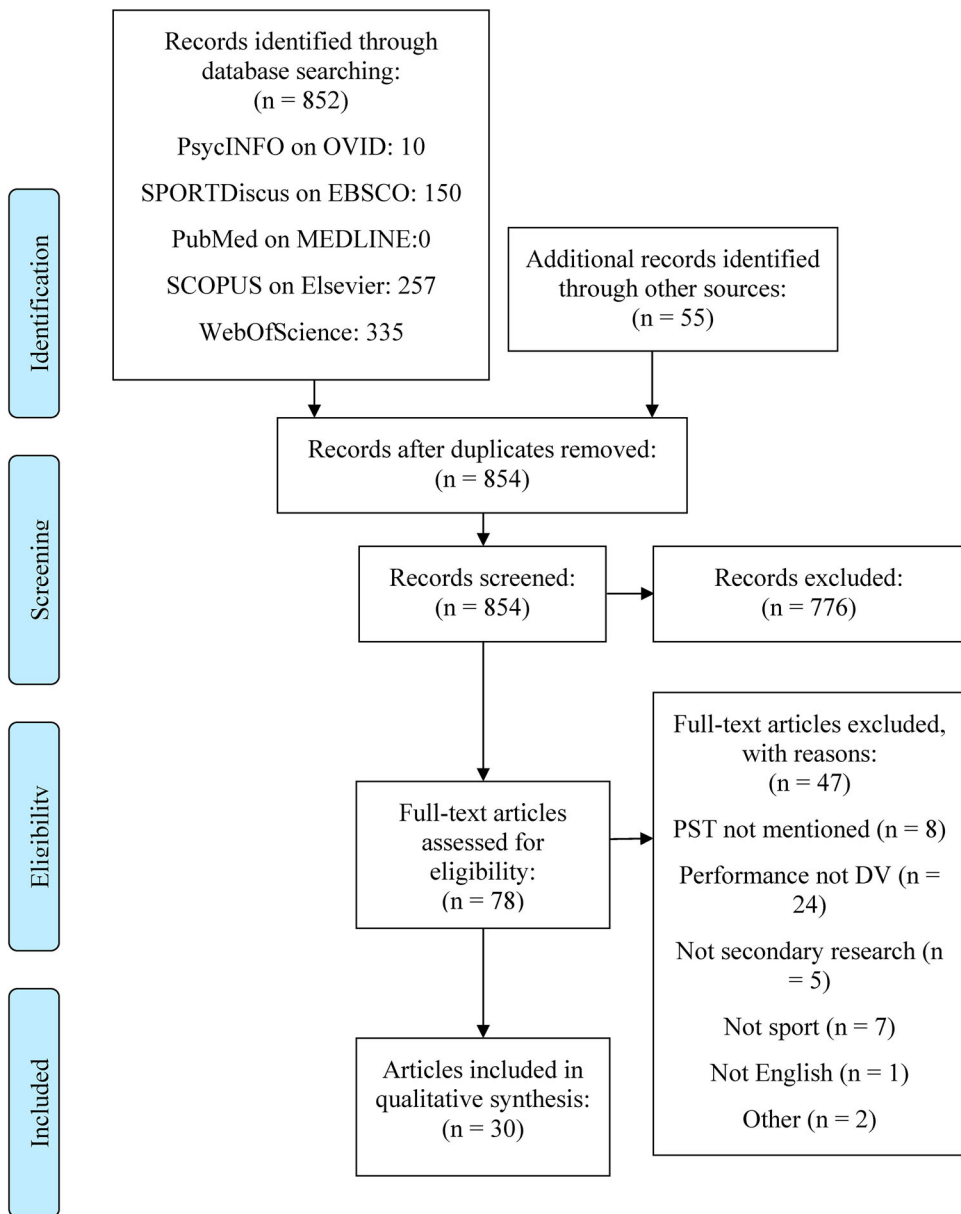
28 of the reviews appeared in academic journals with two (Moore, 2003; Oppermann, 2013) that were unpublished doctoral dissertations. Of the published reviews, 12 appeared in sport psychology journals, 12 in sport science journals, 4 in mainstream psychology journals, and 1 each in journals dedicated to psychophysiology and performance enhancement.

#### **Review objectives**

The reviews reported various objectives. The most common was to present a synthesis of the literature on a particular psychological skill (e.g., Hinshaw, 1991). Other objectives were more focused on the effects of a psychological skill on performance (e.g., Landers & Feltz, 1983).

#### **Comparison groups**

Reporting of the comparison groups used in the primary studies was mixed. Ten reviews did not record employed comparison groups. Five reviews stated all reviewed studies used control groups, but gave no further details. The remaining reviews described various types of comparison groups, including “do your best controls”, waiting list controls, attentional controls (e.g., a non-relevant video) and no-instruction controls. [Table 2](#) presents the frequency of which different comparison groups were mentioned across the 30 reviews. 20 reviews mentioned at least one study for which the comparison group was not described.



**Figure 1.** PRISMA Flow diagram illustrating literature research and selection process.

### **Manipulation checks**

Reviews were inconsistent in documenting manipulation checks. Only Bühlmayer et al. (2017) stated that manipulation checks were performed on all of the experimental groups in the included studies. Six reviews stated that manipulation checks were performed on some but not all experimental groups in the reviewed studies. None of the included reviews described if manipulation checks were performed on the comparison groups.

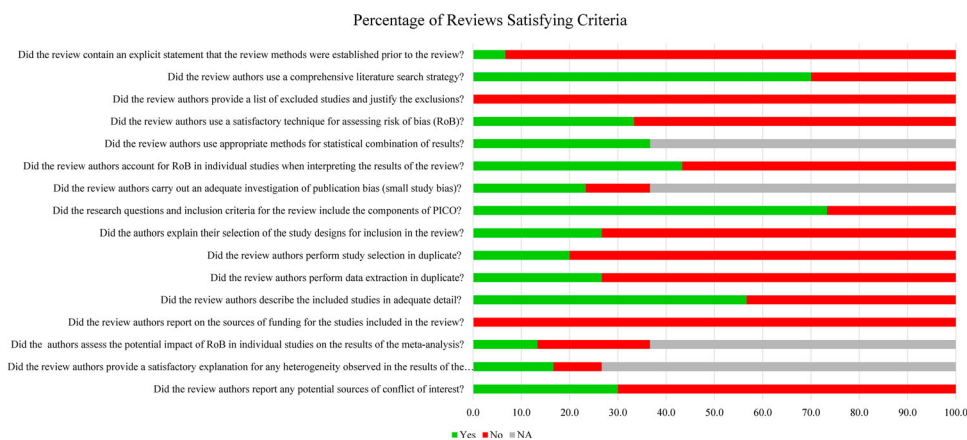
**Table 2.** Frequency of which different comparison groups were mentioned in relation to the studies across all of the included reviews.

Comparison type	Number of mentions
Motivational control	6
Pre-post design with no control	3
Single subject control	1
No control	4
Simple control	1
Direct control	1
No contact	1
No goal	1
No treatment, with physical practice	1
No treatment, without physical practice	1
Alternative treatment	2
Attentional control	2
Placebo	2
Negative treatment	1
No instruction	1
Not stated	20

### Methodological quality and quality of evidence

Each review's rating is presented for each of the AMSTAR 2's sources of bias. Figure 2 presents the percentages associated with each source of bias. The full AMSTAR 2 assessment is available on the OSF.<sup>8</sup>

Using the AMSTAR 2, 1 review was rated low quality, and 30 reviews were rated as critically low quality. Interested readers can find the protocol for generating the confidence ratings in Shea et al. (2017). Only one review indicated that its methods were established prior to conducting the review. 21 reviews deployed a comprehensive literature search strategy, and those that did not were typically narrative in nature and did not describe any search strategy. None of the included reviews provided a list of excluded studies with justifications of exclusions. 10 reviews used satisfactory techniques for assessing risk of bias. 18 reviews did not account for risk of bias when interpreting their review results. In 22 reviews, the research questions and inclusion criteria did not conform to PICO. 8 reviews *explained* their selection of study designs for inclusion (as opposed to

**Figure 2.** Percentages of reviews satisfying the criteria of the AMSTAR-2 assessment tool.

merely *describing* it). Less than a third of authors performed study selection ( $n = 6$ ) or data extraction ( $n = 8$ ) in duplicate. 17 of the reviews described the included studies in adequate detail. No authors reported sources of funding for included studies. Finally, 10 reviews included statements pertaining to funding or conflicts of interest, of whom none declared any such conflicts.

Several AMSTAR 2 criteria applied only to meta-analytic reviews ( $n = 11$ ). In these cases, all reviews used appropriate methods for statistical analysis. 7 reviews investigated publication bias. 5 reviews assessed the potential impact of risk of bias in individual studies on the results of their meta-analyses, or adequately explained observed heterogeneity.

## Synthesis of results

### Interventions

45 psychological skills training interventions appeared in the reviews (frequencies are presented in [Table 3](#)). Interventions were placed in one of 10 categories based on broad definitions of the method the athlete used to execute the skill. Nine such categories of interventions were identified, and a separate category was identified for multi-method interventions.

Four interventions involving a multisensory mental image were mentioned (Category 1): mental practice (5 reviews), imagery (12), mental rehearsal (1), and motor imagery (1). Four interventions centred on modifying the words that individuals use to speak to themselves (Category 2): were self-talk (8), self-efficacy statements (1), cognitive reappraisals (1), and cognitive restructuring (1). In category 3 were 2 interventions where individuals were exposed to anxiety-inducing stimuli: stress inoculation (2) and systematic desensitisation (1). Eight reviews mentioned goal setting (Category 4). Category 5 contained 10 interventions involving deliberate modification of breathing rate and/or muscle tension: preparatory arousal (3), relaxation (4), Progressive Muscle Relaxation (PMR) (3), arousal management (1), arousal regulation (1), breathing techniques (1), applied tension release (1), autogenic training (1), danjeon breathing (1), and left-hand contractions (1). The majority of these were mentioned once in the same review (Pelka et al., 2016). Category 6 included five interventions involving deliberate efforts to direct visual or mental attention toward something: attentional focus (1), associative attention (1), dissociative attention (1), attentional focus manipulation (1), and quiet eye training (2). Eight interventions based on biofeedback (category 7) were mentioned in the reviews: electromyography (EMG) biofeedback (2), electroencephalography (EEG) biofeedback (1), heart rate biofeedback (1), heart rate variability (HRV) biofeedback (1), skin temperature biofeedback (1), postural biofeedback (1), multimodal biofeedback (1), and neurofeedback (1). Many of these interventions were mentioned only once, and in the same review (Oppermann, 2013). Five reviews mentioned hypnosis (Category 8). Category 9 includes mindfulness-based interventions (1), mindfulness practice techniques (1) and mindfulness and acceptance approaches (1). Category 10 comprised 7 multi-method interventions: visuomotor behaviour rehearsal (VMBR; 1), Activation (1), Pre-performance routines (2), Multimodal Performance routines (1), Cognitive self-regulation (1), Realistic self-evaluation (1), maintaining a sense of balance (1), and multicomponent interventions (1).

**Table 3.** Frequency of occurrence of PST interventions in the included reviews, categorised based on description of the method performed by the athlete.

Category number	Description of method	Psychological skill (as described in review)	Number of reviews of psychological skill		
1	Projecting a multisensory mental image of something.	Mental practice	5		
		Imagery	13		
		Mental rehearsal	1		
		Motor imagery	1		
2	Modifying the words that a person uses to speak to themselves, either aloud or internally.	Self-talk	9		
		Self-efficacy statements	1		
		Cognitive reappraisals	1		
		Cognitive restructuring	1		
3	Deliberate exposure of a person to an anxiety-inducing stimulus.	Stress inoculation	2		
		Systematic desensitisation	1		
4	Systematic development of a target or targets which an individual aims to achieve.	Goal setting	9		
5	Deliberate modification of breathing rate and/or muscle tension.	Preparatory arousal	3		
		Relaxation	4		
		Progressive muscle relaxation	3		
		Arousal management	1		
		Arousal regulation	1		
		Breathing techniques	1		
		Applied tension release	1		
		Autogenic training	1		
		Danjeon breathing	1		
		Left-hand contractions	1		
		6	Deliberate efforts to direct visual or mental attention toward something.	Attentional focus	1
				Associative attention	1
Dissociative attention	1				
Attentional focus manipulation	1				
Quiet eye training	2				
7	Making use of technology to receive feedback on a physiological function which the individual is attempting to exert control over.	Transcendental meditation	1		
		EMG Biofeedback	2		
		EEG Biofeedback	1		
		HRV Biofeedback	1		
		Heart rate Biofeedback	1		
		Skin temperature biofeedback	1		
		Postural biofeedback	1		
Multimodal biofeedback	1				
8	Induction of a state of consciousness in which a person is more responsive to suggestion.	Neurofeedback	1		
		Hypnosis	5		
9	Focusing awareness on, and acceptance of the present moment.	Mindfulness based interventions	1		
		Mindfulness practice techniques	1		
		Mindfulness and acceptance approaches	1		
10	Multi-method interventions	VMBR	1		
		Activation	1		
		Pre-performance routines	2		
		Multimodal Performance routines	1		
		Cognitive self-regulation	1		
		Realistic self-evaluation	1		

*(Continued)*

**Table 3.** Continued.

Category number	Description of method	Psychological skill (as described in review)	Number of reviews of psychological skill
		Maintaining a sense of balance	
		Multi-component interventions	1

### Outcomes

Performance measures are summarised in a Table available on the OSF.<sup>9</sup> These measures included motor skill learning, motor skill performance, a combination of both, and simply “performance.” 27 reviews reported a positive effect of PST on a measure of performance in comparison to controls. Eleven meta-analyses presented quantitative evidence of a PST performance enhancement effect. Effect sizes for visualisation interventions ranged from  $d = .43$  (Simonsmeier et al., 2020) to .68 (Hinshaw, 1991). The only effect size for self-talk was .48 (Hatzigeorgiadis et al., 2011). For goal-setting, effect sizes ranged from .34 (Kyllo & Landers, 1995) to .54 (Meyers et al., 1996). The effect size for quiet eye was 1.53 (Lebeau et al., 2016). Mindfulness had an effect size of 1.35 (Bühlmayer et al., 2017). The biofeedback effect size was .72 (Oppermann, 2013). Meyers et al. (1996) found an effect of .73 for relaxation and 1.23 for arousal increase interventions. Brown and Fletcher’s (2017) meta-analysis contained several psychological and psychosocial interventions, and reported an effect size of .57.

Three systematic reviews used vote-count to summarise findings. Morgan and Mora (2017) reported that in 85.71% of the studies they reviewed ( $n = 6$ ), heart rate variability biofeedback enhanced psychophysiological variables that improved sport performance. Tod et al. (2015) reported relationships between strategy use and strength performance of; imagery 63%, goal setting 65%, self-talk 61% and preparatory arousal 63%. Tod et al. (2011) reported that 75% of studies of positive self-talk supported the presence of an enhancement effect on general performance, whereas 100% of studies suggested negative self-talk resulted in decrements to general performance.

Eighteen reviews synthesised evidence narratively, concluding that a range of PST interventions enhanced performance. For example, Alexander et al. (2019) concluded that imagery has the potential to positively influence performance in powerlifting. Several narrative reviews reported that multi-method PST interventions enhanced performance (e.g., Rumbold et al., 2012).

Three reviews presented mixed or no evidence for performance enhancement and were systematic reviews without meta-analysis. Gröpel and Mesagno (2019) reported that pre-performance routines, quiet eye training, left-hand contractions, and acclimatisation training consistently enhanced performance, but found mixed evidence for analogy learning and no evidence for goal setting, neurofeedback training, and reappraisal cues. Similarly, Pelka et al. (2016) concluded that biofeedback and hypnosis can positively influence performance consistently; however, the other techniques that were proven effective in clinical environments (PMR, breathing techniques, applied tension release, imagery, autogenic training, transcendental meditation and Danjeon breathing) did not consistently enhance performance. Finally, Moore (2003) indicated that imagery, goal-setting, self-talk, and arousal regulation did not meet the standards required for designation as efficacious interventions.

## Discussion

This is the first overview investigating the efficacy of PST to enhance sport performance. In this article, the findings of 30 narrative, systematic, and meta-analytic reviews were synthesised. In general, there was varied evidence from the included reviews to suggest that PST can enhance skill execution. There are limitations to this evidence, including the mixed reporting of comparison groups, the lack of manipulation checks, and the use of vote counting to synthesise the findings. In addition, indications from the AMSTAR 2 assessment suggested that much of the review literature lacked rigour, and tells us little about the quality of the primary research (i.e., reviewers have seldom critically appraised primary research according to recognised procedures or standards).

The included reviews gave varied evidence regarding the effect of PST interventions on performance. Some of the included reviews presented quantitative evidence of PST enhancing performance, with effect sizes, ranging from small to large. Additionally, three vote counts indicated that PST enhances performance. Also, all five included narrative reviews concluded that PST enhances performance across several contexts. Conversely, three systematic reviews presented mixed or no evidence for performance enhancement. There are multiple potential reasons for this discrepancy.

It may be that PST does not help all athletes enhance competitive performance. Paralleling other psychological interventions, PST may help some people, and have no effect on others (Paul, 1967). The challenge would be to identify which moderating variables might produce divergent effects. For example, researchers and reviewers may investigate whether skill level (Swann et al., 2015) or the type of skill (Davis et al., 2000) moderates the effect of PST on performance.

Alternatively, the variation in results may be due to the critically low quality of the included reviews. 29 of the 30 included reviews were rated as critically low in quality using the AMSTAR 2 tool, meaning that they have “more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies” (Shea et al., 2007). There are several potential reasons for this preponderance of critically low ratings. Many of the reviews predate even the original AMSTAR checklist (Shea et al., 2007), and the science of reviewing has advanced since they were written. Nonetheless, many of the unmet AMSTAR 2 criteria require relatively little effort to satisfy. For example, no authors provided a list of excluded studies along with exclusion reasons, or reported sources of funding. Similarly, only one review stated that the review methods were established prior to conducting the review (Oppermann, 2013). Such missing details suggest that authors may be unaware of the criteria their reviews will be assessed against. If reviewers became aware of the accepted review methods and standards, then their conclusions would carry greater validity and provide more useful information for stakeholders in the sporting world.

It would have been instructive to understand how the distribution of AMSTAR 2 quality ratings of reviews of PST compare with other overviews within sport psychology, as this might give some indication of the relative strength or weakness of the PST literature in comparison to other areas in sport psychology. However, the existing overviews within sport psychology (Biddle et al., 2011, 2019) did not use the AMSTAR 2, therefore such comparisons are not possible at this time. Nonetheless, it would be of benefit for

prospective authors of future overviews to consider using the AMSTAR 2, so that such comparisons are possible in future.

A noteworthy methodological issue in the included reviews was the reporting of comparison groups. 50% of the reviews either gave no details regarding the comparison groups used in the research, or provided limited details about the types of control groups. Readers must be aware of what PST interventions are being compared with, to make informed interpretations of any performance enhancement effect. For example, an intervention might have no effect, but the “control” decreases performance. Without accurate description of the control this is impossible to determine, leading to an increased risk of type I errors. When reviewers did report the type of comparison, often groups such as “alternative treatment” or “motivational control” were reported with no further consideration. Such reporting leaves readers unaware of whether increases in performance are due to the intervention, placebo, or other extraneous factors.

A related issue is the lack of details about manipulation checks. Although a few reviews reported whether studies included manipulation checks on interventions, none reported whether manipulation checks were performed on controls. Researchers have indicated that control participants spontaneously use psychological skills (Hardy et al., 2005). Such groups, where participants spontaneously use interventions, are more correctly termed contrast groups (APA Board of Scientific Affairs, 1999). Contrast groups do not provide a consistent baseline measure for comparison, increasing the risk of type II errors. When reviewing the efficacy of PST interventions compared to controls, authors can help readers by reporting on manipulation checks used on the contrast groups and discuss this information as part of their interpretations.

When exploring PST efficacy, meta-analyses have benefits beyond other review types; they can examine the strength (or lack thereof), direction, and precision of the intervention effectiveness (Riemsma et al., 2003). They can correct for low statistical power, a situation likely to occur in studies of elite sports performers, who are by definition a small population and challenging to recruit. Other types of reviews do not allow for such corrections (Riemsma et al., 2003). It is recommended that authors seeking to quantify the effects of PST interventions on sporting performance should adopt meta-analytic methodology.

Some of the included reviews used vote counting to synthesise their findings, which is a flawed method (Higgins et al., 2019). At least two problems can occur with vote counting (Tod, 2019). First, problems occur if subjective decisions or statistical significance are used to define “positive” and “negative” studies (Shuster, 2011). Second, vote counting does not account for the quality of the studies, the size of the samples, or the size of the effect (Shuster, 2011). As noted previously, authors seeking to quantify the effects of PST interventions on sporting performance should ideally adopt meta-analytic methodology. However, where this is not possible, authors should refrain from resorting to vote counting, due to the limitations of this method outlined above, and instead offer narrative summaries of the evidence they have accumulated.

Many PST interventions were reported in the reviews, which were categorised under descriptions of the behaviour being performed, to facilitate readers’ understanding, and provide a “friendly front end” to the literature on the efficacy of PST. Creating umbrella categories of PST interventions helped address the significant heterogeneity

in the terms describing PST interventions in the reviews. Such heterogeneity in describing PST interventions risks complicating an already large literature base, and confusing readers. A potential solution could be further systematic reviews like Dohme et al.'s (2017) review. A systematic review categorising and defining PST interventions could be the first step towards forging a common language for PST.

### **Limitations**

This overview included only English language reviews. Nonetheless, only one article was screened out as a consequence of being written in another language. Furthermore, evidence suggests that English-language restrictions do not always introduce biases (Morrison et al., 2012).

The present overview could be critiqued for including narrative reviews. Conventional systematic reviews address narrowly focused questions; their key contribution is summarising data. Conversely, narrative reviews provide interpretation and critique; their key contribution is deepening understanding (Greenhalgh et al., 2018). Nonetheless, it was felt by the authors that while narrative reviews traditionally serve different purposes, they may nonetheless contain information valuable for addressing the objective of the overview. Indeed, it emerged that all of the five narrative reviews which were included in this overview presented evidence of positive effects for PST on performance. That all of the non-supportive results for performance enhancement effects emerged from the included systematic and meta-analytic reviews suggests that narrative reviews may not be sensitive enough to capture non-supportive results. Based on this of low sensitivity, the authors recommend that prospective reviewers avoid narrative reviews as a methodology, where possible, when seeking to quantify performance enhancement effects of PST. Instead, as previously discussed, it is recommended that authors seeking to quantify the effects of PST interventions on performance consider adopting meta-analytic methodology.

A related potential limitation of this overview pertaining to the assessment of methodological quality was that the AMSTAR 2 was not designed to assess the methodological quality of narrative reviews. In other words, it may be somewhat unfair to compare the methodological quality of a narrative and systematic reviews with the AMSTAR 2; however, this was deemed necessary in order to give a consistent evaluation of methodological quality and quality of evidence across the included reviews.

### **Implications**

The current findings present stakeholders in sport with a dilemma. The reviews largely conclude that PST can enhance sporting performance, but are typically of critically low quality. A review of critically low quality should not be relied on to provide an accurate and comprehensive summary of the available studies (Shea et al., 2017). Therefore, one could conclude that there is insufficient high quality evidence to support using PST to help athletes enhance performance. Such a decision represents a value judgement and scientific evidence is just one factor practitioners need to consider when working with athletes. Other factors include client preferences, context and available resources (APA, 2006). The current review has provided a "friendly front end" to assist practitioners in

their decision making. With regards to the academic implications, a unequivocal outcome of this overview is that reviewers of the PST literature will benefit from drawing on current and accepted review methodology so that stakeholders in sport have clarity about the efficacy of the PST interventions for their own decision making.

## Conclusions

This overview summarised evidence from narrative, systematic, and meta-analytic reviews on the relationships between PST and performance in sport, with the aim of providing a “friendly front end” to the review literature on the subject. The included reviews varied in methodology, outcomes and the terms used to describe psychological skills. The vast majority of reviews were rated as critically low in quality using the AMSTAR 2 assessment tool, suggesting that they should not be relied on to provide an accurate and comprehensive summary of the available studies. In light of this, practitioners must be cautious when making claims about the review-level evidence for their PST interventions. Prospective reviewers would benefit by drawing on current and accepted review methodology so that readers have clarity about the efficacy of the reviewed PST interventions. Finally, future authors may consider conducting reviews aiming to define and categorise PST interventions, with the aim of providing clarity to stakeholders in sport by developing a common lexicon.

## Notes

1. Protocol – <https://osf.io/tg7wv>.
2. Reporting Standard – <https://osf.io/qkshp>.
3. Inclusion Flowchart – <https://osf.io/86fah>.
4. Extraction Sheet – <https://osf.io/rq2cf>.
5. AMSTAR 2 Assessment Tool – <https://osf.io/5q6y2>.
6. Excluded Reviews – <https://osf.io/yztpk>.
7. Evidence Table – <https://osf.io/634q2>.
8. AMSTAR 2 Assessment – <https://osf.io/8cu5n>.
9. Review Outcomes – <https://osf.io/53wdn>.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article and its supplementary materials.

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Items marked with an asterisk (\*) were included in this overview.

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