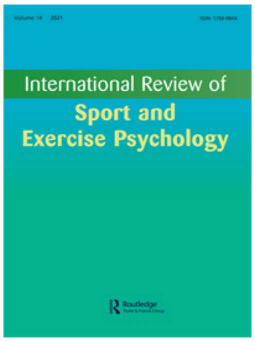


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# The performance and psychological effects of goal setting in sport: A systematic review and meta-analysis

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# The performance and psychological effects of goal setting in sport: A systematic review and meta-analysis

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**ABSTRACT**

Goal setting is widely applied in sport. Whereas existing reviews have addressed the performance effects of goal setting, less is known about the concurrent psychological and psychophysiological effects. Therefore, we conducted a systematic review and meta-analysis that synthesised the effects of goal setting on task performance and various psychological and psychophysiological outcomes in sport. Searches returned 17,841 articles, with 27 meeting eligibility criteria. A meta-analysis of the performance effects and a narrative synthesis of the psychological and psychophysiological effects were undertaken. Process goals had the largest effect on performance ($d = 1.36$) compared to performance goals ($d = 0.44$) and outcome goals ($d = 0.09$). No significant difference in performance was found between specific ($d = 0.37$) and non-specific goals ($d = 0.72$). Process goals also had large effects on self-efficacy ($d$ = 1.11), whereas studies guided by self-regulation theory ($k = 5$) produced the greatest performance enhancements ($d = 1.53$). It was rarely possible to draw conclusions regarding the effects of goal setting on psychological/psychophysiological outcomes due to a lack of cross study evidence. Nevertheless, these findings provide important insights to guide research and practice on the use of goal setting to enhance performance and psychological/psychophysiological outcomes in sport.

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**KEYWORDS**
Competitive athletes; non-specific goals; goal-setting theory; self-regulation theory; quantitative synthesis

## Introduction

A goal is defined as 'what an individual is trying to achieve; it is the object or aim of an action' (Locke et al., 1981, p.126). Goal-setting research in sport began in the mid-1980s (Locke & Latham, 1985) and, like other domains (e.g. industrial settings), predominantly assessed the core propositions of goal-setting theory (Locke & Latham, 1990). Goal-setting theory proposes that setting specific (i.e. quantifiable) and challenging performance[1] goals lead to higher levels of performance than non-specific goals (e.g. 'to do-

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your-best'), easy goals, or no goal. Unlike findings from industrial settings, however, the effects of goal setting in sport first appeared equivocal. Some studies supported goal setting as an effective performance enhancement strategy (e.g. Hall & Byrne, 1988; Lee, 1989), whereas others observed minimal benefits (e.g. Miller & McAuley, 1987; Boyce, 1994).

These inconsistent findings prompted a systematic review and meta-analysis of experimental research by (Kyllo & Landers, 1995), which found that goal setting had a small effect ($g = 0.34$) on sport, exercise, and motor performance. Furthermore, several factors moderated the strength of this effect, such as goal type and who set the goal (i.e. researcher or participant). Since Kyllo and Landers' (1995) review, further research on goal setting has accumulated. Researchers have assessed the effects of goal setting on performance across individual and team sports (e.g. Kolovelonis et al., 2012; Lane & Streeter, 2003), as well as in both lab-based (Kolovelonis et al., 2010) and field-based settings (Kingston & Hardy, 1997). Researchers have recruited participants that vary in expertise, including experienced and novice athletes (Dutra et al., 2017; Zimmerman & Kitsantas, 1997), and implemented goal setting interventions over different timeframes, ranging from acute, single sessions (Dewar et al., 2013) to multiple sessions over an extended period (Palao et al., 2016).

Another development is that researchers have begun to explore the effects of alternate goal theories and goal types. For instance, researchers have adopted achievement goal theory (Nicholls, 1989) to assess the effects of mastery/performance goals and approach/avoidance[2] goals (see Lochbaum & Gottardy, 2015; Van Yperen et al., 2014); self-regulation theory (Scheier & Carver, 1988) to compare the effects of multiple strategies (e.g. transformed[3] and shifting goals[4]; Zimmerman & Kitsantas, 1996, 1997); and integrated multiple theories (e.g. achievement goal theory and self-determination theory; Mulvenna et al., 2020). Finally, researchers in sport have also adopted the concurrent use of process[5], performance and outcome[6] goals (e.g. Filby et al., 1999). Taken together, not only has research on goal setting in sport accumulated, but evidence has also developed on various goal theories and types, ultimately justifying further synthesis of this evidence base.

Whereas most goal-setting research has addressed performance effects (Kyllo & Landers, 1995), researchers have also assessed the effects of goal setting on various psychological and/or psychophysiological outcomes. Such outcomes have included motivation (e.g. Bieleke et al. 2019), anxiety (e.g. Dewar et al., 2013), confidence (e.g. Kingston & Hardy, 1997), self-efficacy (e.g. Kolovelonis et al., 2011), and perceived exertion (Neumann & Honke, 2018). Like the moderating effects different goals have on performance (Kyllo & Landers, 1995), qualitative interviews with athletes suggest that adopting different goals could lead to different psychological experiences (Jackman et al., 2020; Swann et al., 2016, 2017), which deserves synthesis with experimental studies.

To date, only a few systematic reviews have addressed the effects of goal setting in sport (Jeong et al., 2021; Kyllo & Landers, 1995). Nevertheless, there are notable gaps in these reviews. First, the systematic review by Kyllo and Landers (1995) synthesised studies that assessed the effects of goal setting on sport, exercise, and motor performance collectively. Synthesis across these contexts implies that the effect sizes reported might not represent the sporting context alone. Additionally, given that the review was published 26 years ago and, as highlighted above, numerous advancements have been made in this field, further synthesis of this literature could be beneficial. Conversely, the systematic review by Jeong et al. (2021) synthesised research on goal setting in sport, but only included studies guided by goal-setting theory and, did not include studies that were conducted under different theoretical frameworks, thus preventing comparison with contrasting perspectives. Second, neither of the systematic reviews comprised an in-depth analysis of the psychological or psychophysiological effects of different goal types. This is a notable limitation given that a major role of a sports psychologist is to help athletes change their thoughts, feelings, and emotions (Harmison, 2006), and that different goal types can elicit qualitatively different psychological and psychophysiological experiences (Swann et al., 2016). Further, a systematic review of meta-analyses conducted by Lochbaum et al. (2022) found that sport and exercise psychology researchers commonly assess psychological and/or psychophysiological variables, which consistently influence sporting performance. Taken together, psychological and psychophysiological outcomes are not only independent outcomes of interest, but they may also help to explain why various goal-setting interventions enhance or hinder performance.

The purpose of this systematic review and meta-analysis was, therefore, to synthesise the effects of goal setting in sport. The specific objectives were to determine: (1) the overall effect of goal setting on task performance in sport; (2) the factors that moderate the strength of these effects; and (3) the effects of different goal types on various psychological and psychophysiological outcomes. By doing so, we aimed to provide an updated synthesis that assesses the general effects of goal setting and to disentangle the performance effects and psychological and psychophysiological effects of different goal types, thereby providing a more holistic account of goal-setting effects in sport.

## Methods

### *Protocol and registration*

This systematic review followed the preferred reporting items for systematic reviews and meta-analysis (PRISMA; Page et al., 2021; see Appendix 1) and the synthesis without meta-analysis in systematic reviews (SWIM; Campbell et al., 2020; see Appendix 2) guidelines. The review protocol was registered on Open Science Framework before commencement of the searches . There were several changes made to the original protocol[7], that can also be seen at this reference.

### *Eligibility criteria*

Eligibility criteria were established to ensure relevant literature was identified and that review parameters were well-defined (Smith, 2018). To meet eligibility, each study was required to: (1) be a peer-reviewed journal article written in English; (2) contain original, empirical data; (3) expose participants to at least one goal type compared against a within-subjects or between-subjects control; (4) include a measure of task performance in sport; and (5) include at least one psychological and/or psychophysiological outcome measure. When it was difficult to determine if a task was sport-related (e.g. quickness ladder test – Dewar et al., 2013), eligibility was based on the context the study was written (i.e. a study referring to sporting performance was included). The only exclusion criterion was that studies must not have: (6) combined goal setting with other psychological interventions but did not isolate effects of goal setting, for example, when goal setting was part of a multimodal psychological intervention package.

## *Search strategy*

A search was conducted on November 13th 2020 in three electronic databases: APA PsychINFO; SportDISCUS; and Web of Science (Core Collection). After initial scoping searches and consultation of previous reviews (e.g. Kyllo & Landers, 1995), the following search string was used: (1) goal*, AND (2) sport* OR perform*, AND (3) Psycho*, NOT (4) education* OR business* OR organisation*. Where possible, additional limiters were applied to ensure records were journal articles published in English in scholarly peer-reviewed journals (see Appendix 3 for each database's search strategy). Additionally, the first author searched reference lists (see below) and forward citations (Google Scholar) of relevant reviews (see Appendix 4)

## *Screening*

All returns were screened by the first and fifth author independently against the eligibility criteria. This process occurred first, at the title and abstract stage, and second, at the full-text stage. The inter-rater agreement level was substantial at the title and abstract ($\kappa = .66$) and full text ($\kappa = .75$) stages. Any disagreements were resolved through meetings between both authors. To identify any further studies relevant to the review, the lead author screened the reference lists of all studies remaining at the full-text stage.

## *Data extraction*

Data from each study were extracted by the first and sixth author, with each author extracting data from half of the studies each. This included: author name(s); year of publication; sample characteristics; study design; goal-setting conditions; control groups; outcome measures; and statistics to compute effect sizes (see *Meta-analysis*). If no data were available to compute effect sizes, the corresponding author was contacted to request this information. Before formal data extraction, the first and sixth author cross-checked extraction forms for a random sample of five studies, with no discrepancies found.

## *Quality assessment*

The mixed methods appraisal tool (MMAT; Hong et al., 2018; See Appendix 5) was used to assess study quality. The MMAT permits appraisal of quantitative, qualitative, and mixed methods studies. The MMAT requires reviewers to assess the extent to which a study meets relevant criteria for the study design, with ratings of '*yes*', '*no*', and '*can't tell*' generated for each criterion (Hong et al., 2018). All studies were appraised by two authors independently. The first author appraised all studies, whereas the fifth and sixth authors appraised 14 and 13 of the studies, respectively. The level of inter-rater agreement was substantial (κ = .60). All 24 discrepancies were resolved through discussions between the two authors that appraised each respective study.

## Data synthesis

Two methods for data synthesis were employed. A meta-analysis was used to examine the effects of goal setting on sport performance. Due to substantial heterogeneity in the psychological and psychophysiological outcomes assessed and how they were measured, a narrative synthesis was conducted to synthesise these effects.

### Meta-Analysis

Data were analysed using a random effects model on Comprehensive Meta-Analysis Version 3 (Borenstein et al., 2013). The effect size metric used was the 'standardised difference in means', which is appropriate when similar constructs (i.e. sporting performance) are measured using different scales (Takeshima et al., 2014). Using Cohen's (1992) criteria, 0.2, 0.5, and 0.8 represented small, medium, and large sized effects, respectively. A random effects model was chosen because it assumes that the true effect size varies across studies (Borenstein et al., 2021), which is common in sport and exercise psychology meta-analyses (Lochbaum et al., 2022) and was expected due to variation in several factors (e.g. goal type and participant characteristics). Where possible, means, standard deviations, and sample sizes at pre- and post-intervention for the goal and control conditions were used (Borenstein et al., 2021). When these statistics were not accessible, post-intervention means and standard deviations, and pre-post means, and standard deviations were used. If unavailable, other data, such as *F* statistics and *p*-values were used. WebPlotDigitizer version 4.5 (Rohatgi, 2021) was employed to extract relevant statistics from graphs and figures. In instances where studies reported more than one effect size (i.e. multiple goal-setting groups), all effect sizes were combined to create one pairwise comparison (Higgins et al., 2021). For each study, the effect size, confidence interval, *z*-value, *p*-value, and relative weight was reported. Relative weight is based on precision (i.e. sample size, confidence interval and standard error) of the study, with studies higher in precision assigned more relative weight.

Tests of heterogeneity were performed to assess the consistency of goal-setting effects across studies. To determine if heterogeneity in effect sizes existed, we used the *p*-value and *Q*-statistic. The *Q*-statistic indicates heterogeneity across studies if it was larger than the total degrees of freedom. The $I^2$ statistics (expressed as a percentage) was used to determine how much of the observed effect could be attributed to true variance. For instance, $I^2$ of 80% indicates that 80% of the observed effect is true variance, whereas 20% of the observed variance is sampling error. The prediction interval was used to determine the magnitude of effect size variance across studies. The prediction interval is a measure of dispersion that computes a range where 95% of effect sizes from comparable studies will fall, and therefore, can help predict the size and direction of effect in future settings (IntHout et al., 2016).

**Moderator analysis.** Eleven potential moderating factors were examined. These moderators included: theoretical framework; goal type; goal proximity; goal specificity; whether the active control (e.g. to do-your-best) was removed; study setting (i.e. lab-based or field-based); sex; age; level of experience; goal determination (e.g. self-set, researcher-set or other); provision of feedback (either explicitly or inherent in the activity); and mode of delivery. For each moderating factor, an effect size, standard error, 95% confidence interval, *p*-value, and *z*-value were calculated (see Appendix 6 for coding details for each moderating factor).

### *Narrative synthesis*

A narrative synthesis was undertaken to synthesise quantitative findings from studies using diverse methodologies (Baumeister, 2013). Initially, a preliminary synthesis of findings was undertaken (Popay et al., 2006). The first author undertook line-by-line readings of the results of included studies and generated codes that represented psychological or psychophysiological outcomes. Codes were then grouped into broader overarching themes (see Appendix 7). Only codes containing findings from two or more studies were included. After collating studies and findings for each theme, the first author explored relationships within and between studies to identify factors that might explain effect sizes and direction across the included studies (e.g. goal type; Popay et al., 2006). All psychological and psychophysiological effect sizes were standardised using Comprehensive Meta-analysis Version 3 (Borenstein et al., 2013) and computed using means, standard deviations, sample sizes, or relevant statistics. Findings from the primary studies are presented in the results, with additional, non-significant effect sizes detailed in Appendix 8.

## Results

The database searches returned 17,700 articles, whereas additional hand searches identified a further 141 articles. After removing duplicates and screening the remaining 15,154 articles, 27 independent studies meeting eligibility criteria were included (Figure 1; see Appendix 9 for studies removed at full-text and primary reasons). Table 1 presents contextual information of included studies.

### *Contextual information*

#### *Publication trend*

Overall, ($k = 11$) studies were conducted between 2010-2019, ($k = 9$) studies were conducted between 1990-1999, ($k = 5$) studies were conducted between 2000-2009, with ($k = 1$) study conducted between 1980–1989 and ($k = 1$) conducted in 2020.

#### *Study design*

Overall, ($k = 11$) studies used mixed designs, ($k = 10$) employed within-subject designs, and ($k = 6$) adopted between-subject designs. Just over half ($k = 14$) involved single-session experiments, whereas ($k = 9$) were conducted over multiple sessions, whereas the remaining ($k = 4$) were conducted over five months or a competitive season. Most studies ($k = 22$) were conducted in controlled laboratory settings, whereas ($k = 5$) were conducted in naturalistic sporting environments. Overall, ($k = 15$) studies used a theoretical framework to guide their intervention, including self-regulation theory ($k = 5$), goal-setting theory ($k = 4$), achievement goal theory ($k = 4$), or multiple theories ($k = 2$). The theoretical framework was unclear or not stated in almost half of studies ($k = 12$).

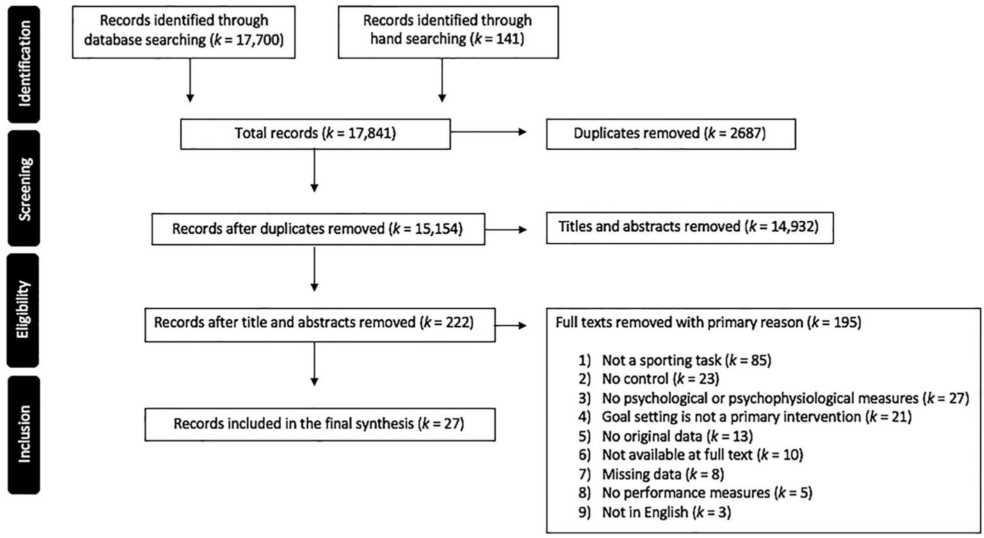



**Figure 1.** PRISMA flow diagram of results from the literature search.

Finally, the sports/tasks used in each study were: darts ($k = 6$); golf ($k = 4$); basketball ($k = 3$); volleyball ($k = 3$); swimming ($k = 3$); bowling ($k = 2$); whereas ($k = 1$) used either football, running, tennis, table-tennis, boxing, or an agility quickness ladder.

### *Sample characteristics*

1,764 participants were included, comprising females ($k = 794$) and ($k = 879$) males, with the sex of the remaining participants ($k = 91$) not provided. Most participants were novices (i.e. no/limited prior experience; $k = 967$), whereas the remainder ($k = 759$) had prior experience in the task or related tasks. Finally, ($k = 1077$) of participants were adults (i.e. over 18), whereas ($k = 684$) were youths (i.e. under 18).

### *Quality assessment*

Table 2 details the results of the quality assessment (see Appendix 10 for an extended version). Twenty of the 27 studies were quantitative non-randomised studies. The most common issue is the failure to consider potentially confounding variables (e.g. spontaneous goal setting of control group participants). Among the five studies classified as randomised studies, the main quality concerns were that it was often unclear if randomisation had been appropriately performed, groups were comparable at baseline, and participants adhered to the assigned intervention. Finally, for two mixed methods studies, the main issues concerned quality standards for the qualitative phase of both studies.

## *Meta-Analysis*

Results regarding the effects of goal setting, along with summary statistics and a forest plot, are presented in Table 3. Overall, goal setting had a medium, positive effect on

**Table 1.** Contextual information of studies included in the final synthesis.

| ID | Author (year) | Total sample (Females, Males) (more information on sample) Mean age (SD) or age range | Study design | Goal conditions | Comparison | Sporting task/ measure | Psychological/psychophysiological measure/s |
|---|---|---|---|---|---|---|---|
| 1 | Bar-Eli et al. (1997) | 97 (0/97) (military high school students) 19.3 years (0.72). | Within-subjects design, 6 sessions | Competition/pairs; mastery/single; mastery/pairs; competition plus mastery/pairs | Baseline | 1600 m running | Goal commitment; how hard they tried; how hard the goal was to accomplish; the importance of competition vs. mastery goals during performance; attributions for perceived success and failure. |
| 2 | Bieleke et al. (2019) | 62 (27/35) (volleyball players) 13.9 years (1.0) | Within-subjects design, one session | Process goal | Baseline | Volleyball service | Motivation |
| 3 | Burton (1989) | 65 (30/35) (experienced swimmers) Goal setting group 20.1 years and non- goal-setting group 20.4 years | Mixed-design, five months | Specific, short-term, individual, performance goal | No goal | Swimming performance during competitive swimming meets | Expectancy accuracy; cognitive anxiety; self-confidence; concentration; effort; perceived success; success attributions; satisfaction; perceived ability |
| 4 | Dewar et al. (2013) | 120 (60/60) (undergraduate students competing in various sports) 20.6 years (1.56). | Mixed-design, one session | Task-goal; ego-goal | No goal | Quickness ladder performance time | Anxiety; happiness; anxiety; perceived importance |
| 5 | Dutra et al. (2017) | 36 (0/36) (experienced volleyball players) 15.3 years (*SD* = 0.4) | Mixed-design, 2–3 weeks | Specific goals with moderate difficulty; specific goals with high difficulty | No goal | Volleyball receive | Commitment |
| 6 | Filby et al. (1999) | 40 (17/23) (university students) 21.6 years (2.36) | Mixed-design, two-three weeks | Outcome goal; outcome and process goal; process goal; outcome, process and performance goal | No goal | Soccer volleying accuracy | Goal commitment; semi-structured interviews |
| 7 | Frierman et al. (1990) | 72 (41/31) (university students, 45 were novices and 27 were intermediate bowlers) 18–22 years. | Mixed-design, 13 weeks | Short-term; long-term; short- and long-term | 'Do-your-best' | Bowling score | Goal difficulty; effort; confidence; acceptance; reality of the assigned goal |
| 8 | Johnson et al. (1997) | 36 (0/36) (undergraduate students) 21.6 years | Mixed-design five weeks | Group goal; individual goal | 'Do-your-best' | Bowling score | Perceived goal difficulty |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | Kavussanu et al. (2009) | 102 (63/39) (undergraduate students) | Within-subjects design, one session | Mastery goal; performance approach goal; performance avoidance goal | Baseline | Golf-putting | Enjoyment; practice |
| 10 | Kingston and Hardy (1997) | 37 (0/37) (golfers) 44.1 years (10.87) | Mixed design, 54 weeks | Process goal; performance goal | No goal | Golf handicap | State anxiety; confidence; psychological skills |
| 11 | Kolovelonis et al. (2010) | 72 (44/28) (elementary school students) 11.1 years | Between-subjects design, one session | Social feedback and process goal and self-recording; process goal and self-recording | Practice-only control | Darts-throwing | Self-efficacy; satisfaction; intrinsic motivation |
| 12 | Kolovelonis et al. (2011) | 105 (49/56) (elementary school students) 11 years (0.65) | Between-subjects design, one session | Process goal and self-recording; process goal; performance outcome goal and self-recording; performance outcome goal; process and performance outcome goal and self-recording; process, performance and outcome goal | 'Do-your-best' | Darts-throwing | Self-efficacy; attributions; adaptive influences; satisfaction; effort; enjoyment |
| 13 | Kolovelonis et al. (2012) | 85 (45/40) (elementary school students) 10.5 years (0.43) | Between-subjects design, one session | Process goal; performance goal | 'Do-your-best' | Darts-throwing | Self-efficacy; attributions; enjoyment |
| 14 | Lane and Streeter (2003) | 72 (0/72) (experienced basketball players) 15.4 years (1.3) | Between-subjects design, four weeks | Easy goal; difficult goal; unrealistic goal | No goal | Basketball shooting | Perceptions of goal difficulty; intended effort; confidence |
| 15 | Liu et al. (2012) | 60 (60/0) (table tennis players) experimental group mean age 12.9 years (2.5) control group mean age 13.6 years (2.78) | Mixed-design, one session | Easy goal; moderate goal; difficult goal | No goal. | Table tennis serving | Self-regulation |
| 16 | Meggs and Chen (2019) | 49 (N/A) (swimmers) 10.8 years (1.25) | Mixed-design, six weeks | Goal setting model comprising of qualitative, technical goals and quantitative performance goals | No goal | 200 m swimming | Engagement and attendance |

(Continued)

**Table 1.** Continued.

| ID | Author (year) | Total sample (Females, Males) (more information on sample) Mean age (SD) or age range | Study design | Goal conditions | Comparison | Sporting task/ measure | Psychological/psychophysiological measure/s |
|---|---|---|---|---|---|---|---|
| 17 | Mulvenna et al. (2020) | 114 novice (52/62) (basketballers) 23.5 years (4.56) | Between-subjects design, one session | Task-approach, autonomy supportive; task-approach controlling; self-approach, autonomy supportive; self-approach controlling; other-approach, autonomy supportive; other-approach controlling | Baseline | Basketball shooting | Cardiovascular reactivity; cognitive appraisal of stress; competitive state anxiety; enjoyment; competence; goal attainment |
| 18 | Neumann and Honke (2018) | 30 (0/30) (basketball players) 24.6 years (0.97) | Mixed-design, four days | Performance and outcome goal | 'As-man-as-possible' | Basketball shooting | State anxiety; perceived exertion |
| 19 | Neumann and Thomas (2011) | 50 (17/33) (18 participants were novices, 16 were experienced and 16 were elite) 23.4 years (5.81) | Between-subjects design, one session | Process goal; performance goal; outcome goal | 'make each putt' baseline | Golf-putting | Attentional focus; cardiac reactivity |
| 20 | Ntoumanis et al. (2009) | 138 (87/51) (undergraduate students) 19.3 years (1.15) | Within-subjects', one session | Mastery-approach; mastery-avoidance; performance-approach; performance-avoidance | Baseline | Darts-throwing | Self-handicapping; perceived confidence |
| 21 | O'Brien et al. (2009) | 6 (0/6) (3 elite, 3 non-elite boxers) 16 years (1) | Single-subject, one season | Goal setting intervention that comprised of goal-determination, goal setting and goal reviewing | Baseline | Boxing performance | Anxiety; importance of performance improvement; significance of the changes; acceptance of the procedure |
| 22 | Palao et al. (2016) | 14 (0/14) male (volleyball players) 23.3 years | Single-subject, one season | 'SMART' performance goals | Baseline | Volleyball match performance | Qualitative perceptions of effectiveness of the intervention |
| 23 | Steinberg et al. (2000) | 72 (36/36) (college students) 20.5 years | Mixed design, six weeks | Mastery-competitive; mastery; competitive; | No goal | Golf-putting | Intrinsic motivation; persistence; acceptance; commitment |
| 24 | Theodorakis (1995) | 42 (N/A) (university students) | Within-subjects design, one session | Personal performance goal | 'To achieve the greatest number of meters swimming in a time of 20 s' | Swimming performance | Self-efficacy; self-satisfaction |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 25 | Theodorakis (1996) | 48 (26/22) (university students) 21.2 years. | Within-subjects design, one session | Personal performance goal | 'To achieve the greatest number of correct service' | Tennis serving | Trait self-efficacy; self-efficacy expectations; self-satisfaction; goal commitment |
| 26 | Zimmerman and Kitsantas (1996) | 50 (50/0) (students from four ninth and tenth grade physical education classes) 15.8 years | Between-subjects design, one session | Product goal and no self-recording; product goal-plus self-recording; process goal and no self-recording; process goal-plus self-recording | No goal | Darts-throwing | Self-efficacy; self-reaction; intrinsic interest |
| 27 | Zimmerman and Kitsantas (1997) | 90 (90/0) (students from four ninth and tenth grade physical education classes) 15.4 years | Between-subjects design, one session | Outcome goal; outcome goal with self-recording; process goal; process goal with self-recording; transformed goal; transformed goal with self-recording; shifting goal; shifting goal with self-recording | No goal | Darts-throwing | Self-efficacy; self-reaction; intrinsic interest |

**Table 2.** Study quality assessment based on the mixed methods appraisal tool (MMAT; Hong et al., 2018).

| Author(s) | Category of study design | Assessment criteria | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Bar-Eli et al. (1997) | Quantitative non-randomised | Can't tell | Yes | No | No | Yes |
| Bieleke et al. (2019) | Quantitative non-randomised | No | Yes | Yes | No | Yes |
| Burton (1989) | Quantitative non-randomised | Yes | Yes | No | No | No |
| Dewar et al. (2013) | Quantitative non-randomised | Can't tell | Yes | No | No | Yes |
| Dutra et al. (2017) | Quantitative non-randomised | Can't tell | Can't tell | Yes | Can't tell | Can't tell |
| Filby et al. (1999) | Mixed methods | Yes | Yes | Yes | Yes | Can't tell |
| Frierman et al. (1990) | Quantitative non-randomised | Can't tell | Yes | No | No | Yes |
| Johnson et al. (1997) | Quantitative non-randomised | No | Yes | Yes | No | Yes |
| Kavussanu et al. (2009) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Kingston and Hardy (1997) | Quantitative non-randomised | No | Yes | Yes | No | Yes |
| Kolovelonis et al. (2010) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Kolovelonis et al. (2011) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Kolovelonis et al. (2012) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Lane and Streeter (2003) | Randomised | Can't tell | Yes | Yes | No | Can't tell |
| Liu et al. (2012) | Randomised | Can't tell | Can't tell | Yes | Can't tell | Can't tell |
| Meggs and Chen (2019) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Mulvenna et al. (2020) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Neumann and Honke (2018) | Randomised | Can't tell | Can't tell | Yes | No | Can't tell |
| Neumann and Thomas (2011) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Ntoumanis et al. (2009) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| O'Brien et al. (2009) | Quantitative non-randomised | Yes | No | Yes | No | Yes |
| Palao et al. (2016) | Mixed methods | No | Yes | Yes | Yes | No |
| Steinberg et al. (2000) | Quantitative non-randomised | Can't tell | Yes | Can't tell | Can't tell | Yes |
| Theodorakis (1995) | Quantitative non-randomised | No | Yes | Yes | No | Yes |
| Theodorakis (1996) | Quantitative non-randomised | Yes | Yes | Yes | No | Yes |
| Zimmerman and Kitsantas (1996) | Randomised | Can't tell | Can't tell | Yes | No | Can't tell |
| Zimmerman and Kitsantas (1997) | Randomised | Can't tell | Can't tell | Yes | No | Can't tell |

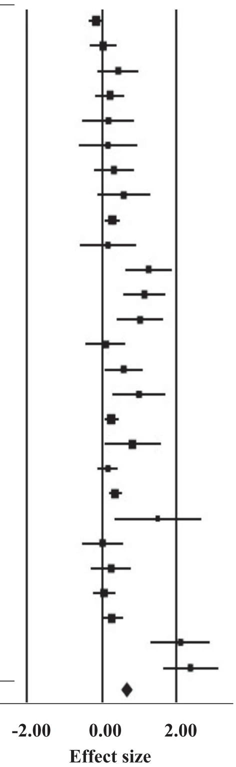
sporting performance ($d = 0.47$). The confidence interval for the standardised mean difference, 95% CI = 0.30-0.63, indicates that comparable studies' true mean effect size will likely fall in this range. Moreover, based on the *z-value* (5.59) and corresponding *p*-value (<.001), it can be concluded that goals had a significant, positive effect on sporting performance. Tests of heterogeneity revealed significant differences in observed effect sizes across studies, $Q(\text{df}) = 111.26(26)$, $p < .001$. Moreover, the $I^2$ value (76.63) indicated that a large proportion (> 76%) of observed variance across studies reflected true variance. Finally, based on the prediction interval, −0.26-1.19, it can be expected that the true effect size in 95% of comparable studies falls in this range. Based on this information, there will be some instances where goal setting has a large, positive effect and others where it has a small, negative effect on sporting performance.

## *Moderator analysis*

Results of the moderator analysis are displayed in Table 4. Significant, positive effects of goal setting were found when a single theoretical framework was used or when it was unclear if one was used ($d$'s $\geq 0.28$). Nonetheless, no significant difference in performance was found in studies that used a combination of theories to guide their intervention ($d = 0.05$). Additionally, studies informed by self-regulation theory resulted in significantly greater performance improvements than studies guided by goal-setting theory ($Q = 16.81[1]$, $p < .001$), achievement goal theory ($Q = 20.89[1]$, $p < .001$), or when the theory was unclear/when no theory was applied ($Q = 21.03[1]$, $p < .001$).

**Table 3.** Results of the meta-analysis.

| Study | Weight (%) | Effect size | 95% CI (lower, upper) | *z*-value | *p*-value |
|---|---|---|---|---|---|
| Bar-Eli et al. (1997) | 5.42 | -0.16 | -0.36, 0.04 | -1.54 | .123 |
| Bieleke et al. (2019) | 4.55 | 0.03 | -0.33, 0.40 | 0.17 | .863 |
| Burton (1989) | 3.56 | 0.43 | -0.11, 0.98 | 1.56 | .120 |
| Dewar et al. (2013) | 4.40 | 0.22 | -0.17, 0.61 | 1.09 | .275 |
| Dutra et al. (2017) | 2.86 | 0.18 | -0.52, 0.87 | 0.50 | .618 |
| Filby et al. (1999) | 2.53 | 0.17 | -0.60, 0.95 | 0.44 | .660 |
| Frierman et al. (1990) | 3.61 | 0.32 | -0.22, 0.85 | 1.17 | .244 |
| Johnson et al. (1997) | 2.80 | 0.59 | -0.12, 1.30 | 1.62 | .105 |
| Kavussanu et al. (2009) | 5.42 | 0.28 | 0.08, 0.50 | 2.74 | .006 |
| Kingston and Hardy (1997) | 2.62 | 0.17 | -0.58, 0.92 | 0.45 | .655 |
| Kolovelonis et al. (2010) | 3.22 | 1.25 | 0.64, 1.86 | 3.99 | <.001 |
| Kolovelonis et al. (2011) | 3.45 | 1.23 | 0.56, 1.70 | 3.90 | <.001 |
| Kolovelonis et al. (2012) | 3.21 | 1.02 | 0.41, 1.64 | 3.26 | <.001 |
| Lane and Streeter (2003) | 3.62 | 0.10 | -0.43, 0.64 | 0.38 | .705 |
| Liu et al. (2012) | 3.71 | 0.59 | 0.07, 1.11 | 2.23 | .026 |
| Meggs and Chen (2019) | 2.78 | 0.99 | 0.27, 1.70 | 2.72 | .007 |
| Mulvenna et al. (2020) | 5.47 | 0.26 | 0.07, 0.44 | 2.69 | .007 |
| Neumann and Honke (2018) | 5.03 | 0.82 | 0.08, 1.57 | 2.16 | .030 |
| Neumann and Thomas (2011) | 2.65 | 0.16 | -0.12, 0.43 | 1.09 | .275 |
| Ntoumanis et al. (2009) | 5.53 | 0.36 | 0.19, 0.53 | 4.08 | <.001 |
| O'Brien et al. (2009) | 1.48 | 1.49 | 0.33, 2.65 | 2.51 | .012 |
| Palao et al. (2016) | 3.50 | 0.02 | -0.53, 0.58 | 0.08 | .937 |
| Steinberg et al. (2010) | 3.61 | 0.25 | -0.28, 0.79 | 0.92 | .357 |
| Theodorakis (1995) | 4.90 | 0.07 | -0.24, 0.37 | 0.42 | .674 |
| Theodorakis (1996) | 4.98 | 0.27 | -0.02, 0.56 | 1.85 | .065 |
| Zimmerman and Kitsantas (1996) | 2.43 | 2.09 | 1.29, 2.90 | 5.09 | <.001 |
| Zimmerman and Kitsantas (1997) | 2.66 | 2.37 | 1.63, 3.11 | 6.25 | <.001 |
| **Overall** | **100** | **0.47** | **0.30, 0.63** | **5.59** | **<.001** |




Note: CI = confidence interval

Process goals and performance goals produced significant improvements in performance ($d$'s $\geq$ 0.44), but process goals elicited significantly greater improvements than performance goals ($Q = 4.77[1]$, $p = .029$). Conversely, no significant performance improvements were found by setting mastery, outcome, or ego goals. Both short-term, and a combination of short-term and long-term goals, generated significant performance improvements ($d$'s $\geq$ 0.43), but these did not differ significantly. Nevertheless, long-term-goals did not have a significant effect on performance ($d = -0.08$). Specific and non-specific goals produced significant performance improvements ($d$'s $\geq$ 0.37), but their effects did not significantly differ.

Goals led to significant positive effects when the comparison group was an active control or a no-goal control ($d$'s $\geq$ 0.46), with no difference between the two. Goals had significant effects in laboratory and field settings ($d$'s $\geq$ 0.46), with no between-setting difference. Goal setting had a large and significant positive effect in females ($d = 1.50$) but produce no significant performance improvements in males. ($d = 0.23$). Youths and adults experienced significant performance improvements ($d$'s $\geq$ 0.21), but significantly greater improvements were produced in youths ($Q = 10.34[1]$, $p = .001$). Comparably, novice and experienced participants experienced significant performance improvements

**Table 4.** Results of the moderator analysis.

| Moderator | *k* | Effect size (SE) | 95% CI | Z-value | *p*-value | *Q*-value (df), *p*-value |
|---|---|---|---|---|---|---|
| *Theoretical framework* | | | | | | 23.70[4], *p*<.001 |
| Goal-setting theory | 4 | 0.32 (0.14) | 0.04, 0.60 | 2.21 | *p*=.027 | |
| Achievement goal theory | 4 | 0.31 (0.06) | 0.19, 0.43 | 5.06 | *p*<.001 | |
| Self-regulation theory | 5 | 1.53 (0.26) | 1.02, 2.04 | 5.90 | *p*<.001 | |
| Combination of theories | 2 | 0.05 (0.21) | −0.36, 0.46 | 0.25 | *p* =.805 | |
| Other/none | 12 | 0.28 (0.09) | 0.10, 0.45 | 3.16 | *p* =.002 | |
| *Goal type* | | | | | | 14.10[4], *p*=.007 |
| Process | 9 | 1.36 (0.41) | 0.57, 2.16 | 3.35 | *p*<.001 | |
| Performance | 16 | 0.44 (0.11) | 0.22, 0.66 | 3.94 | *p*<.001 | |
| Outcome | 2 | 0.09 (0.20) | −0.29, 0.47 | 0.47 | *p* =.636 | |
| Mastery | 6 | 0.06 (0.11) | −0.15, 0.28 | 0.57 | *p*=.572 | |
| Ego | 6 | 0.20 (0.11) | −0.01, 0.42 | 1.86 | *p*=.062 | |
| *Goal proximity* | | | | | | 6.78[2], *p*=.034 |
| Short-term | 23 | 0.43 (0.10) | 0.24, 0.63 | 4.42 | *p*<.001 | |
| Long-term | 4 | −0.08 (0.18) | −0.43, 0.28 | −0.42 | *p*=.675 | |
| Combination | 5 | 0.47 (0.16) | 0.15, 0.80 | 2.89 | *p*=.004 | |
| *Goal specificity* | | | | | | 2.69[1], *p*=.101 |
| Specific | 24 | 0.37 (0.09) | 0.19, 0.56 | 4.01 | *p*<.001 | |
| Non-specific | 14 | 0.72 (0.19) | 0.35, 1.08 | 3.84 | *p*<.001 | |
| *Active control removed* | | | | | | 0.01[1], *p*=.936 |
| Yes | 19 | 0.47 (0.11) | 0.26, 0.68 | 4.44 | *p*<.001 | |
| No | 8 | 0.46 (0.13) | 0.20, 0.72 | 3.44 | *p*<.001 | |
| *Setting* | | | | | | 0.03[1], *p*=.856 |
| Laboratory | 22 | 0.46 (0.09) | 0.28, 0.64 | 5.10 | *p*<.001 | |
| Field | 5 | 0.51 (0.23) | 0.06, 0.95 | 2.23 | *p*=.026 | |
| *Sex* | | | | | | 6.06[1], *p*=.014 |
| Males | 9 | 0.23 (0.15) | −0.05, 0.52 | 1.61 | *p*=.108 | |
| Females | 4 | 1.50 (0.47) | 0.52, 2.37 | 3.07 | *p*=.002 | |
| *Age* | | | | | | 10.34[1], *p*<.001 |
| Youths | 11 | 0.97 (0.23) | 0.55, 1.43 | 4.22 | *p*<.001 | |
| Adults | 16 | 0.21 (0.05) | 0.11, 0.32 | 4.01 | *p*<.001 | |
| Level of experience | | | | | | 8.04[1], *p*=.017 |
| Experienced | 14 | 0.24 (0.09) | 0.06, 0.43 | 2.64 | *p*=.008 | |
| Novice | 12 | 0.71 (0.14) | 0.44, 0.98 | 5.18 | *p*<.001 | |
| Goal determination | | | | | | 4.97[2], *p*=.083 |
| Participant set | 3 | 0.21 (0.10) | 0.01, 0.40 | 2.08 | *p*=.038 | |
| Researcher set | 19 | 0.52 (0.10) | 0.32, 0.73 | 5.02 | *p*<.001 | |
| Collaboratively set | 5 | 0.47 (0.25) | −0.02, 0.96 | 1.87 | *p*=.061 | |
| Feedback on progress | | | | | | 1.98[1], *p*=.159 |
| Yes | 25 | 0.49 (0.09) | 0.32, 0.66 | 5.54 | *p*<.001 | |
| No | 2 | 0.21 (0.18) | −0.14, 0.56 | 1.17 | *p*=.241 | |

(*d*'s ≥ 0.24), but novices displayed greater improvements ($Q = 8.04[1]$, $p = .005$). Although goals produced significant effects when set by the researcher or self-set by the participant (*d*'s ≥ 0.21), researcher-set goals were significantly more effective ($Q = 4.79[1]$, $p = .029$). Further, goals only approached significance when set cooperatively by researchers, coaches, or participants ($d = 0.47$). Finally, goals only elicited significant performance improvements when feedback was provided ($d = 0.49$), with no significant improvements occurring when feedback was not ($d = 0.21$).

## *Narrative synthesis*

Overall, 16 psychological outcomes grouped into six overarching themes were included in the synthesis. The six themes comprised emotions, perceptions of ability, motivation, effort, perceptions of performance, and cognitions.

### *Emotions*

**Cognitive anxiety**. Six studies that assessed the effects of goal setting on cognitive anxiety generally suggested that self-referenced goals reduce symptoms, whereas goals to outperform others increase symptoms. Burton (1989) found that compared to no goal setting, performance goal training over time (> 5 months) in experienced swimmers resulted in large, significant reductions in cognitive anxiety in males ($d = 1.35$) and females ($d = 0.85$). Similarly, significant reductions in cognitive anxiety were found throughout a 54-week intervention in experienced golfers through performance goal training ($d = 1.02$), and process goal training ($d = 0.88$) compared to no goal setting (Kingston & Hardy, 1997). Nonetheless, process goals significantly increased golfers' ability to control anxiety ($d = 0.68$), though performance goals did not ($d = 0.14$). Although performance goals marginally increased cognitive anxiety in six boxers of mixed ability, O'Brien et al. (2009) reported these increases were perceived as more facilitative than debilitative to performance post-intervention.

Conversely, no significant difference in cognitive anxiety was found between basketballers performing a shooting task when assigned to a performance/outcome goal condition or an 'as many as possible' control condition ($d = 0.00$; Neumann & Honke, 2018). In a multi-sport sample of undergraduate students performing a 'quickness ladder' test, Dewar et al. (2013) reported no significant differences in cognitive anxiety between those assigned to the no goal control compared with task goals (i.e. performance improvement; $d = 0.15$) or ego goals (i.e. outperform others; $d = 0.42$). Nonetheless, cognitive anxiety was significantly higher ($d = 0.46$) in those assigned ego goals versus those assigned task goals. Finally, Mulvenna et al. (2020) reported that novice basketballers performing a shooting task reported significantly lower ($d = 0.86$) cognitive anxiety when assigned task-approach goals (i.e. to master the task) rather than other-approach goals (i.e. to outperform others).

**Somatic anxiety**. Four studies investigated the effects of goal setting on somatic anxiety and generally revealed positive effects of self-referenced goals. Nevertheless, given the small number of studies and lack of cross-study evidence, these findings should be interpreted cautiously. Golfers assigned to process goal training and performance goal training groups over 54 weeks reported significantly lower somatic anxiety than those assigned no goal-setting training ($d = 1.13$ and $d = 0.57$, respectively; Kingston & Hardy, 1997). Although somatic anxiety in boxers was comparable before and after a performance goal intervention, somatic anxiety was perceived as more facilitative than debilitative after the intervention compared to baseline (O'Brien et al., 2009). Mulvenna et al. (2020) found that basketballers assigned task-approach goals reported significantly lower somatic anxiety than those assigned other-approach goals after performing a shooting task ($d = 0.70$). Finally, Steinberg et al. (2000) found no significant differences in pressure/tension between mastery (i.e. self-improvement), competitive (i.e. to outperform others), and mastery/competitive goals, or the no goal control among college students.

**Enjoyment**. Five studies assessed the effect of goal setting on enjoyment, with only one of these studies demonstrating beneficial effects. College students assigned mastery/competitive goals significantly increased enjoyment compared to baseline, but mastery and competitive goals resulted in no significant improvement (Steinberg et al., 2000). Conversely, four studies using process and performance goals (Kolovelonis et al., 2011, 2012), approach goals (Kavussanu et al., 2009; Mulvenna et al., 2020) and avoidance goals (Kavussanu et al., 2009), found no significant effects of goal setting on enjoyment.

### *Perceptions of ability*

**Self-confidence**. Four studies assessed the effects of goal setting on self-confidence largely demonstrating beneficial effects of performance goals in athletes over a prolonged period. In experienced swimmers, Burton (1989) found performance goals produced significantly higher self-confidence than no goal setting in males ($d = 1.35$) and females ($d = 0.78$). Likewise, Frierman et al. (1990) reported that compared to a do-your-best control, short-term (i.e. weekly; $d = 0.65$), long-term (i.e. five weeks; $d = 1.04$) and short-term plus long-term performance ($d = 0.61$) goals resulted in significantly higher self-confidence in a mixture of novice and intermediate tenpin bowlers. Additionally, long-term goals resulted in significantly higher self-confidence than short-term plus long-term goals ($d = 0.88$).

Further, at week 4, the long-term goal group reported significantly higher confidence than the short-term ($d = 1.38$), the short-term plus long-term ($d = 1.37$) goal groups, and the 'do-your-best' control ($d = 0.94$). O'Brien et al. (2009) reported increased confidence in elite boxers after a performance goal intervention compared to baseline. Despite these findings, Kingston and Hardy (1997) found that, compared to no goal setting, neither process nor performance goals significantly improved golfers' self-confidence ($d = 0.69$ and $d = 0.23$, respectively). Finally, O'Brien et al. (2009) found no difference in non-elite boxers' self-confidence after a performance goal intervention compared to baseline.

**Self-efficacy.** Seven studies investigated the effects of goal setting on self-efficacy, often revealing beneficial effects of interventions comprised of process goals compared to no goal and performance goals. In novice dart throwers, self-efficacy was significantly higher for those assigned process goals compared with product goals (e.g. to achieve the highest numeric score; $d = 0.68$) or those in the practice-only control ($d = 1.74$; Zimmerman & Kitsantas, 1996). In a similar sample, Zimmerman and Kitsantas (1997) reported self-efficacy was highest for those assigned shifting-goals compared to transformed goals ($d = 1.00$). Transformed goals produced higher self-efficacy than the process goals ($d = 1.14$). Process goals elicited higher self-efficacy than outcome (i.e. performance) goals ($d = 1.38$), and the practice-only control reported significantly lower levels of self-efficacy than shifting ($d = -4.02$), transformed ($d = -4.59$), and process goals ($d = -3.08$). Kingston and Hardy (1997) found that experienced golfers assigned to process goal training over 54 weeks experienced significant improvements in self-efficacy at post-intervention compared to baseline ($d = 0.87$), whereas golfers assigned to performance goal training reported only small, non-significant improvements ($d = 0.28$)

Conversely, Kolovelonis et al. (2011) found that process goals, performance goals, and a combination of the two had no effect on self-efficacy compared with a do-your-best control ($d = -0.09$, $d = -0.18$, and $d = -0.08$, respectively). Kolovelonis et al. (2012) found no difference in self-efficacy between process and performance goals compared with a practice-only control ($d = 0.29$, $d =$ - 0.05, respectively). Theodorakis (1995, 1996) found that university students self-efficacy expectations did not differ between the first, self-set performance goal (for one trial of a swimming or tennis serving task) and the second, self-set performance goal (for a consecutive trial of either task; $d = 0.00$ and $d = 0.14$, respectively).

**Perceived competence.** Three studies examined the effects of goal setting on perceived competence, but the absence of cross-study findings made it difficult to draw meaningful conclusions. Mulvenna et al. (2020) found task-approach goals produced significantly higher perceived competence than other-approach goals among novices performing a basketball shooting task ($d = 0.59$). Burton (1989) found that performance goal training led to significantly higher perceived ability than no goal setting among experienced swimmers ($d = 0.75$). Nonetheless, Ntoumanis et al. (2009) reported no difference in perceived competence or competence-valuation between mastery-approach, mastery-avoidance, performance-approach, and performance-avoidance goals in undergraduate students.

### *Motivation*

**Motivational responses.** Two studies assessed the effects of goal setting on motivation; however, the lack of cross-study evidence and lack of contributing studies made it difficult to draw conclusions. Kolovelonis et al. (2010) found that intrinsic motivation was significantly higher during interventions comprised of process goals compared to a practice-only control ($d = 0.67$) among school students performing a dart-throwing task. Process goals elicited high levels of motivation ($M = 4.4$ on a 5-point scale) among volleyball players performing a serving task (Bieleke et al., 2019).

**Commitment.** Three studies explored commitment toward goal setting. Nevertheless, the lack of cross-study evidence and contributing studies made it difficult to draw conclusions. Volleyball players exposed to a 2–3-week intervention reported similar levels of commitment when they were set a specific, performance goal, irrespective of difficulty level (i.e. to improve by 10% or 30%) on a volleyball receive task (Dutra et al., 2017). University students undertaking a soccer wall-volley task increased their commitment throughout the intervention compared to baseline in the outcome ($d = 0.73$) and process goal ($d = 0.94$) conditions. Conversely, the goal condition that combined these goals with performance goals produced moderate, but non-significant increases in commitment ($d = 0.66$; Filby et al., 1999). Finally, Theodorakis (1996) found similar commitment in university students between the first, self-set performance goal (for one trial of a tennis serving task) and the second, self-set performance goal (for a consecutive trial; $d = 0.04$)

**Intrinsic interest.** Two studies examined the effects of goal setting on intrinsic task interest, revealing benefits of interventions comprised of process goals. Zimmerman and Kitsantas (1996) found process goals significantly increased novice dart throwers' intrinsic interest more than product goals ($d = 0.74$) or the practice-only control ($d = 1.99$). In a similar sample, Zimmerman and Kitsantas (1997) reported significantly higher intrinsic interest in shifting goals versus transformed goals ($d = 0.64$); transformed goals versus process goals ($d = 0.71$); and process goals versus outcome (i.e. performance) goals ($d = 1.41$). Additionally, the practice-only control resulted in significantly lower intrinsic interest than shifting ($d = -3.43$), transformed ($d = -2.64$), and process ($d = -2.11$) goals.

## *Effort*

**Effort mobilisation.** Six studies assessed the effects of goal setting on effort mobilisation, revealing positive effects of performance goals. Experienced male swimmers exposed to a performance goal intervention significantly increased exerted effort versus those in a no-goal control condition ($d = 1.01$; Burton, 1989). Novice and intermediate tenpin bowlers assigned short-term (i.e. weekly) performance goals significantly increased effort from weeks 1–4 ($d = 0.36$); however, the long-term ($d = -0.04$) and long-term plus short-term ($d = 0.12$) goals did not significantly increase effort. Whereas a small, non-significant decrease ($d = -0.47$) was found in effort in the do-your-best control group over the same timeframe (Frierman et al., 1990). School students assigned to performance-outcome goal conditions (e.g. to hit the centre of the target) reported significantly higher effort on a dart-throwing task than groups assigned: process goals ($d = 0.51$); process goal plus performance outcome goals ($d = 0.71$); and a do-your-best control ($d = 0.93$; Kolovelonis et al., 2011). College students assigned mastery/competitive goals significantly increased effort from baseline, whereas the mastery and competitive goals yielded no significant improvements (Steinberg et al., 2000). Conversely, Neumann and Honke (2018) found a small, but non-significant difference in ratings of perceived exertion between the performance/outcome goal and 'as many as possible' control in basketballers ($d = 0.24$). Finally, there was no significant difference in effort among experienced basketballers assigned easy or difficult performance goals ($d = 0.36$) and unrealistic performance goals ($d = -0.13$), with unrealistic performance goals leading to moderate, but not significantly higher effort than difficult performance goals ($d = 0.51$; Lane & Streeter, 2003).

**Engagement.** Four studies investigated the effects of goal setting on engagement, suggesting beneficial effects of mastery goal interventions. College students assigned mastery/competitive goals practiced for significantly more time outside of class than those assigned mastery ($d = 0.77$), competitive goals ($d = 0.79$), or no goal ($d = 0.84$) over six weeks (Steinberg et al., 2000). Undergraduate students assigned mastery goals spent significantly more time practicing golf-putting than when they were assigned performance approach goals ($d = 0.62$; Kavussanu et al., 2009). Ntoumanis et al. (2009) revealed that performance-avoidance goals produced significantly lower amounts of dart-throwing practice than mastery-approach goals ($d = -0.74$) and mastery-avoidance goals ($d = -0.84$) during a 10-minute free-choice period. Additionally, performance-approach goals also elicited significantly less time practicing than the mastery-approach ($d = -0.48$) and mastery-avoidance goals ($d = -0.58$). Finally, Meggs and Chen (2019) found a negligible, non-significant difference ($d = 0.18$) in engagement in competitive youth swimmers assigned to SMART[8] goal group and no-goal control.

## *Perceptions of performance*

**Satisfaction.** Eight studies assessed the effects of goal setting on performance satisfaction, suggesting beneficial effects of performance goals. Experienced swimmers who set performance goals reported significantly higher satisfaction ($d = 1.15$) than swimmers who did not (Burton, 1989). Zimmerman and Kitsantas (1996) reported that novices performing a dart-throwing task experienced significantly better self-reactions (i.e. satisfaction) when assigned process goals versus product goals ($d = 0.75$), which in turn elicited better self-reactions than the control group ($d = 0.81$). In a similar sample, Zimmerman and Kitsantas (1997) found that shifting goals produced better self-reactions than transformed goals ($d = 1.30$) and process goals ($d = 1.29$). Both transformed and process goals yielded better self-reactions than product goals ($d = 1.69$; $d = 1.35$, respectively). Additionally, self-reactions of the practice-only control were significantly lower than the shifting ($d = -4.58$), transformed ($d = -3.44$), process ($d = -2.60$), and product ($d = -1.13$) goal groups. Moreover, interventions comprised of process goals produced significantly higher satisfaction than practice-only controls among school students performing a dart-throwing task ($d = 0.61$; Kolovelonis et al., 2010). In a similar sample, the process goal and performance-outcome goal conditions led to significantly higher satisfaction than the 'do-your-best control' ($d = 0.85$, $d = 0.73$, respectively; Kolovelonis et al., 2011). Similarly, Kolovelonis et al. (2012) found performance goals led to significantly higher satisfaction ($d = 0.83$) than the practice-only control. Finally, negligible differences in satisfaction were found between the first, self-set performance goal (for one trial of a swimming/tennis serving task) and the second, self-set performance goal (for a consecutive trial) ($d = -0.07$, $d = -0.004$; Theodorakis, 1995, 1996).

**Perceptions of success/performance.** Two studies that assessed the effects of goal setting on perceptions of success/performance suggested positive effects. Compared to those who did not set goals, perceptions of success were significantly higher in male swimmers who set performance goals ($d = 0.84$; Burton, 1989). Compared to a no-goal control, undergraduate students reported significantly higher perceptions of performance in task-goal ($d = 0.56$) and ego-goal conditions ($d = 0.51$) in a quickness ladder test (Dewar et al., 2013).

### *Cognition*

**Attentional focus.** Five studies examined the effects of goal setting on concentration/focus, suggesting beneficial effects of performance goals and process goals. Performance goals resulted in higher levels of concentration than no goals in experienced swimmers ($d = 1.25$; Burton, 1989), whereas qualitative findings suggested performance goals were beneficial for concentration/focus for some volleyball players (Palao et al., 2016). Liu et al. (2012) found that specific performance goals of varying difficulty (e.g. serving frequency) led to no significant changes in 'consciousness' compared to the practice-only control group ($d = 0.41$) in youth table-tennis players. Conversely, Kingston and Hardy (1997) found that only a process goal group significantly increased golfers' concentration throughout the intervention ($d = 0.78$), whereas no improvements were found in the performance goal group ($d = 0.13$). Neumann and Thomas (2011) found that process, performance, and outcome goals consistently resulted in novice, experienced and elite golfers adopting the intended focus of attention.

**Attributions.** Three studies that assessed the effects of goal setting on attributions revealed that goal setting generally resulted in individuals attributing success to ability, and failure, to poor execution or a lack of effort. Burton (1989) found male swimmers who set performance goals attributed success to ability significantly more than those who did not set goals ($d = 0.75$). Zimmerman and Kitsantas (1997) reported that novice dart throwers in the practice-only control and product goal conditions attributed their failures more frequently to ability deficiencies than participants in the process, transformed, and shifting goal conditions. In contrast, these participants frequently attributed deficiencies in performance to strategy choice or execution. Finally, Kolovelonis et al. (2011) reported school students attributed dart-throwing failures significantly less frequently to technique in a 'do-your-best' control group, compared to process, performance, or process and performance goal conditions.

**Perceived goal difficulty.** Four studies assessed the perceived difficulty of various goal-setting interventions. Nevertheless, the lack of cross-study evidence made it difficult to draw conclusions. At week 4 of a 5-week intervention, novice and intermediate tenpin bowlers rated long-term goals as significantly less difficult than short-term goals ($d = 1.22$), or short-term and long-term goals ($d = 1.09$) and the 'do-your-best' control ($d = 0.88$; Frierman et al., 1990). Lane and Streeter (2003) found that Basketballers viewed easy goals as significantly easier than difficult ($d = 2.68$) and unrealistic goals ($d = 5.16$). Additionally, difficult goals were perceived as significantly less difficult than unrealistic goals ($d = 2.17$). Johnson et al. (1997) found that perceived goal difficulty was no different in undergraduate students assigned to either the individual goal or group goal conditions ($d = 0.31$). Finally, Mulvenna et al. (2020) found novice basketballers' perceived task-approach goals as significantly less challenging than other-approach goals ($d = 0.68$).

## Discussion

The purpose of this systematic review and meta-analysis was to synthesise the effects of goal setting in sport. The specific objectives were to determine: (1) the overall effect of goal setting on task performance in sport; (2) the factors that moderate the strength of these effects; and (3) the effects of different goal types on various psychological and psychophysiological outcomes. Overall, goal setting had a medium, positive effect on task performance in sport, ultimately supporting goal setting as a successful intervention strategy (Kyllo & Landers, 1995). This effect was moderated by the theoretical framework, goal type, goal proximity, sex, age, level of experience, goal determination, and availability of feedback. Although the lack of cross-study evidence and mixed findings often made it difficult to draw robust conclusions regarding the psychological and psychophysiological outcomes of different goal types, there were instances where stronger conclusions could be drawn. Specifically, process goals generally enhanced self-efficacy, intrinsic interest, and satisfaction; performance goals generally reduced anxiety symptoms, increased self-confidence, effort mobilisation and satisfaction; and mastery goals were often more effective than ego goals for reducing anxiety symptoms and increasing engagement.

By combining the performance effects and psychological and psychophysiological effects, we provide new insight into the utility of process goals. Specifically, process goals were more beneficial for increasing performance and self-efficacy than other goal types. The latter is a noteworthy finding, given self-efficacy has been shown to enhance decision-making (Hepler & Feltz, 2012), increase motivational intentions (Chase, 2001), and is positively correlated with sport performance (Moritz et al., 2000), thereby potentially explaining findings in the present review concerning the goal-performance relationship. According to Kingston and Hardy (1997), process goals should have a beneficial effect on self-efficacy due to increased perception of control. Put simply, frequently achieving process goals may produce higher levels of self-efficacy, consistent with postulations in self-efficacy theory (Bandura, 1977). Goal-setting research in sport normally advocates process goals to supplement performance and outcome goals (Weinberg & Butt, 2014). Nevertheless, findings from the present review suggest process goals can be effective when set in isolation. This finding could encourage sport psychology consultants, coaches, and athletes to advocate and use process goals to enhance performance and self-efficacy.

Relatedly, goal controllability moderated the effects goals had on performance and various psychological outcomes. Process and performance goals had significant positive benefits on performance, yet mastery goals and ego and outcome goals had little effect. Nonetheless, process, performance, and mastery goals produced more positive psychological effects compared to goals centred on outperforming others. Previous research has highlighted the negative consequences of goals based on interpersonal and normative comparisons, stating they lack controllability and flexibility, thereby reducing motivation (Burton, 1989) and increasing anxiety symptoms (Weinberg & Butt, 2014). In support of this research, findings in the current review indicated that goals to outperform others generally reduced participants' engagement with the task and increased anxiety symptoms compared to mastery goals. Similarly, researchers often advocate setting outcome goals alongside process and performance goals (Weinberg & Butt, 2014). Nevertheless, as researchers from only two studies combined outcome goals with process and/or performance goals, both resulting in mixed effects (e.g. Filby et al., 1999; Neumann & Honke, 2018), the findings of the current review cannot support this proposition. Based on these findings, goals within an athletes' control should be recommended and applied, and goals based solely on outperforming others should not, at least until further, high-quality evidence accumulates.

Findings also revealed that specific and non-specific goals were similarly beneficial for enhancing performance; however, this finding should be interpreted with caution. First, studies in the present review did not supply sufficient information to include goal difficulty in the moderator analysis. As Locke and Latham (2002) note, 'goal specificity in itself does not necessarily lead to high performance because specific goals vary in difficulty' (p. 706). Second, the specific goal category of the moderator analysis comprised performance and outcome goals, the latter of which yielded non-significant effects. As goal-setting theory advocates for performance goals (Locke & Latham, 2013), including outcome goals reduced the effects size in the analysis. Further, process goals were included in the non-specific goal category, which had a large effect on performance, thereby enhancing the overall effect size of non-specific goals. Hence, different types of non-specific goals may vary in effectiveness, and this is worth considering when interpreting these findings. Third, researchers in nearly half of the studies in the present review recruited novice participants. Indeed, goal-setting theory now suggests that performance goals[1] may hinder performance when an individual is at the early stages of learning a new, complex task and learning goals[9] may be more appropriate (Locke & Latham, 2006). In other words, non-specific goals might have resulted in marginally higher performance improvements than specific goals due to participants' levels of ability. Irrespectively, the effect size of non-specific goals on performance was still at the upper limit of the expected effect of setting specific and difficult performance goals (e.g. 0.42-0.80; Locke & Latham, 2002). Ultimately, the present study's findings coincide with Kyllo and Landers (1995) and provide further support that non-specific goals are as effective for enhancing task performance in sport as specific goals.

Next, interventions guided by self-regulation theory elicited greater performance enhancements than alternate theories. Nevertheless, it should be noted that studies informed by self-regulation theory all comprised novice participants, who experienced significantly greater performance improvements than experienced athletes, which was somewhat expected due to previous suggestions of a ceiling effect for goal setting (Miller & McAuley, 1987). Conversely, although interventions informed by goal-setting theory significantly enhanced performance, they did not include all elements of the theory (e.g. goal difficulty). Indeed, the systematic review by Jeong et al. (2021) criticised goal-setting research for failing to encompass all characteristics of goal-setting theory. Considering these limitations, studies informed by goal-setting theory could have resulted in further performance benefits if all these components were implemented. Overall, further research is needed to enable a more complete test of the assertions made by goal-setting theory.

Additionally, though studies informed by achievement goal theory generated significant performance improvements, these effects were likely mitigated due to our combined synthesis of approach and avoidance goals. A previous meta-analysis conducted by Lochbaum and Gottardy (2015) found that both mastery-approach and performance (i.e. ego) approach goals, led to significant performance improvements (both, $g = 0.38$). Conversely, mastery-avoidance and performance-avoidance goals led to negative, but non-significant decreases in performance ($g = -0.11$ and $g = -0.15$, respectively). Similarly, in the current review, it is probable that the effect sizes of mastery and ego goals (see Table 4) would have been enhanced if we analysed mastery-approach and performance-approach goals separately from their avoidance counterparts. Nonetheless, as our analysis was restricted to the information provided in the final sample of studies, this analysis was not possible. Ultimately, researchers should endeavour to conduct experimental research that compares the effectiveness of each goal-setting approaches outlined by achievement goal theory (Elliot et al., 2011). By assessing both performance/mastery goals and approach/avoidance goals, researchers can draw more accurate conclusions regarding the effects of each goal-setting approach.

Finally, although our results suggest that goal setting might not be as effective for males, we recommend that the findings for females is interpreted with caution given the small number of studies ($k = 4$) and participants ($n = 230$) in the female sub-group in our moderator analysis. Moreover, there was substantial heterogeneity within the female samples. Two of the four studies (Zimmerman & Kitsantas, 1996, 1997) contributing to the female effect-size sampled novice participants and tested goals that were not used in any other study (e.g. shifting and transformed goals), with these studies also providing the highest effect sizes in the review ($d = 2.43$ and 2.46, respectively). Conversely, the two remaining studies (Burton, 1989; Liu et al., 2012) sampled more experienced female athletes, used more conventional goal-setting interventions, and reported more conservative effect sizes ($d = 0.59$ and 0.87, respectively). Given the small number of female samples, methodological and sampling variations, and the contrasting results, we suggest that further research is needed to develop more robust conclusions about the effects of goal setting among males and females.

### *Methodological reflections and future research directions*

The present review highlights several methodological issues in goal-setting research in sport. First, a common issue in all non-randomised, quantitative studies was minimal consideration for additional confounders (see Table 2). Specifically, none of these studies included manipulation checks for control conditions or baseline phases. Locke (1991) noted that unless certain precautions are taken (e.g. withholding feedback), participants in control conditions often set personal goals. In a previous study, 83% of participants in a control condition set personal goals, resulting in similar performance effects between conditions (Weinberg et al., 1985). Ultimately, including manipulation checks will enable researchers to determine if participants adhere to their assigned instructions, thereby explaining the lack of effects in some instances.

Second, nearly one-third of studies used an active control group (e.g. 'to do-your-best') as a comparison for experimental goal condition(s). Nevertheless, research has found these instructions can elicit different psychological and psychophysiological responses to no goal (Hawkins et al., 2020; Swann et al., 2020) and enhance performance (Locke & Latham, 2013). The above findings imply that the presence of these active controls may have reduced differences in observed goal-setting effects. Although the presence of active controls did not significantly affect performance, it was not possible to determine their effects on psychological and psychophysiological outcomes. Hence, researchers in future studies should carefully consider giving control groups instructions that may enhance performance and induce psychological and psychophysiological responses.

Third, only three studies reported using a power analysis to determine sample size, with one of these studies noting that their sample size was insufficient (e.g. Mulvenna et al., 2020). Consequently, 25 studies included in the final sample were at greater risk of a type II error (Cohen, 1992). To further exemplify this issue, numerous non-significant findings had small- and medium-sized effects (see Appendix 8). Small sample sizes in goal-setting research in sport is well-known. Indeed, both Kyllo and Landers (1995) and Jeong et al. (2021) highlighted the problem of small sample sizes in experimental studies. Although Jeong et al. (2021) noted that recruiting adequate sample sizes (e.g. sustained access to participants and dropout rates) can be challenging, future studies should endeavour to include power analyses to ensure the sample size is sufficient to validate findings and enable readers to draw more informed conclusions.

Finally, though the utility of non-specific goals has been demonstrated in this review, certain types of non-specific goals were not employed in any of the experimental designs. Notably, qualitative research with experienced athletes has reported that open goals, which have been defined as 'exploratory' and 'without a fixed aim or outcome' (e.g. to see how fast I can run), form part of the process underlying the occurrence of flow[10] (Swann et al., 2016, 2017). Additionally, recent experimental research in cognitive and physical activity settings has found that open goals can significantly improve task performance and induce a wide range of positive psychological experiences, including increased confidence (Schweickle et al., 2017) and perceptions of performance (Swann et al., 2020). Nevertheless, to date, no experimental studies have been conducted to assess the utility of open goals in sport. Along these lines, it is also unclear how athletes value and use open and non-specific goals more broadly when preparing for and during sporting competition. Research into these areas will help to further explore the applicability and effects of non-specific goals in sport, thereby offering alternate goal-setting perspectives.

### Limitations of the review

Although this systematic review provides valuable insights regarding the effects of goal setting in sport, it is not without limitations. Whereas the search strategy comprised terms to identify relevant studies, using the Boolean term 'AND' instead of 'OR' meant studies that assessed these outcomes independently were excluded. More specifically, 27 studies that independently assessed performance and five studies that independently assessed psychological or psychophysiological outcomes were excluded (See Figure 1 and Appendix 9). Second, the review only included published studies, which are more likely to contain significant results (Franco et al., 2014). The meta-analysis was, therefore, more prone to contain studies that reported significant effects (Borenstein et al., 2021) and this likely enhanced the observed effect sizes. Third, the review was limited to research published in English and the findings are therefore susceptible to language bias due to the omission of studies conducted in alternate languages. Finally, there was a lack of cross-study evidence in the final sample of studies. More specifically, there was heterogeneity in various elements of study designs, including goal types, comparison groups, and outcomes. Therefore, findings regarding various psychological and psychophysiological effects of goal setting were often based on insubstantial evidence and meaningful conclusions could not be drawn.

## Conclusion

This systematic review and meta-analysis synthesised the effects of goal setting in sport. By synthesising the performance effects and psychological and psychophysiological effects of goal setting in 27 studies, this review has revealed several noteworthy findings. First, based on the evidence included, process goals appear to be the most effective goal type for enhancing performance and improving certain psychological outcomes (e.g. self-efficacy). Second, self-referenced goals (e.g. process, performance, and mastery) often lead to positive outcomes, whereas goals based on normative comparisons do not improve performance and result in some maladaptive psychological outcomes. Third, non-specific goals appear to be just as effective as specific goals for improving sport performance. Finally, studies guided by self-regulation theory produced the greatest performance enhancements, although the participants sampled in these studies (i.e. novices), as well as poor implementation of other theoretical frameworks, may explain these findings. Future research should include manipulation checks for control groups, carefully consider using active control groups, determine appropriate sample sizes, and continue to explore the utility of non-specific goals in sport. By complying with these suggestions, researchers may better explain and gauge goal-setting effects and help to clarify the benefits of alternate goal-setting strategies, thereby advancing knowledge in the field, ultimately helping athletes maximise goal-setting benefits.

## Notes

1. A performance goal "frames the goal instructions so that an individual's focus is on a specific task outcome" (Seijts et al., 2013, p.196).
2. An approach goal can be defined as the demonstration of competence, whereas an avoidance goal can be defined as avoiding the demonstration of incompetence (Elliot & Harackiewicz, 1996).
3. A transformed goal is explained by Zimmerman and Kitsantas (1997) as a self-reaction to outcome information involving strategic process adjustments
4. A shifting goal is explained by Zimmerman and Kitsantas (1997) as a process goal that changes to an outcome goal once a movement is automatised.
5. A process goal is what an athlete focuses on when performing a specific skill (Weinberg & Butt, 2014).
6. An outcome goal is a focus on the end result or outcome (Weinberg & Butt, 2014).
7. The changes made to the protocol outlined on the Open Science Framework document are as follows: (1) a revised title; (2) an updated completion date; (3) listing an additional author; (4) an update to the search strategy (i.e., only searching for studies in "sport" rather than "sport and exercise"); (5) an update of the comparator/control criteria (i.e., to include within-subject controls); (6) the process to decide eligibility (i.e., to consider the context the study was written in); and (7) additional clarity regarding data synthesis.
8. The SMART heuristic commonly stands for Specific, Measurable, Achievable, Realistic, and Time-bound goals (Swann et al., 2022).
9. Learning goals focus on "the number of ideas or strategies one acquires or develops to accomplish the task effectively" (Locke & Latham, 2002. P.706)
10. Flow is as an intrinsically rewarding psychological state involving a sense of total control, with complete absorption and concentration in the present activity, and the exclusion of irrelevant thoughts and emotions (Csikszentmihalyi, 2013).

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Note: All references included in the systematic review are marked with an asterisk.

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