

Abstract

Objective: Goal setting is a common feature of behavior change interventions, but it is unclear when goal setting is optimally effective. The aims of this systematic review and meta-analysis were to evaluate: (a) the unique effects of goal setting on behavior change, and (b) under what circumstances and for whom goal setting works best.

Method: Four databases were searched for papers that assessed the unique effects of goal setting on behavior change using randomized controlled trials. 141 papers were identified from which 384 effect sizes ($N = 16,523$) were extracted and analyzed. A moderator analysis of sample characteristics, intervention characteristics, inclusion of other behavior change techniques, study design and delivery, quality of study, outcome measures and behavior targeted was conducted.

Results: A random effects model indicated a small positive unique effect of goal setting across a range of behaviors, $d = .34$ ($CI = .28$ to $.41$). Moderator analyses indicated that goal setting was particularly effective if the goal was: (a) difficult, (b) set publicly, and (c) was a group goal. There was weaker evidence that goal setting was more effective when paired with external monitoring of the behavior/ outcome by others without feedback and delivered face-to-face.

Conclusions: Goal setting is an effective behavior change technique that has the potential to be considered a fundamental component of successful interventions. The present review adds novel insights into the means by which goal setting might be augmented to maximize behavior change and sets the agenda for future programs of research.

KEYWORDS: goal setting, behavior change, randomized controlled trials, meta-analysis, systematic review

Public Health Significance

The findings reported in the present review show that goal setting is an effective behavior change technique that can be considered a fundamental component of successful behavior change interventions.

Findings suggest that optimally goals should be: (a) difficult but achievable, (b) set publicly, (c) set face to face, (d) set as a group goal and (e) set without drawing attention to goal commitment. There is also some indication that goal setting is particularly effective in certain samples (i.e., school children, general population, male, younger people and those of Asian ethnicity) in particular settings (i.e., schools and workplaces).

Unique Effects of Goal Setting on Behavior Change: Systematic Review and Meta-Analysis

A goal is “the object or aim of an action” (Locke & Latham, 2002, p. 705) and goal setting is one of the fundamental techniques that public bodies and government agencies recommend to promote behavior change (e.g., NICE, 2014; NHBLI, 2000). Goal setting is considered to be a key element in helping individuals to regulate their own behavior and has been used in numerous fields including education (e.g., Bandura & Schunk, 1981), sport (e.g., Anshel, Weinberg & Jackson, 1992), health (e.g., Alexy, 1985), social behaviors (e.g., Madera, King & Hebl, 2013), production (e.g., Jackson & Zedeck, 1982) and the environment (e.g., Baca-Motes, Brown, Gneezy, Keenan & Nelson, 2012). Goal setting is a commonly used behavior change technique: A recent review of interventions designed to increase physical activity found that goal setting was the third most often used technique with 34% (26 out of 76) of the interventions including a goal setting component (Conn, Hafdahl, Phillips, Ruppard and Chase, 2014). However, despite the popularity of goal setting as a technique to be included in behavior change interventions, and several meta-analyses that explore the effects of goal setting on behavior change (Chidester & Grigsby, Conn et al., 2014; 1984; Kleingeld, van Mierlo, & Arends, 2011; Mento, Steele, & Karren, 1987; Neubert, 1998; Tubbs, 1986; Wood, Mento, & Locke, 1987), it is not yet clear what are the unique effects of goal setting across multiple behaviors, as previous meta-analyses were largely based on the organizational psychology literature, nor how goal setting can be optimized to maximize behavior change. The aims of the present systematic review and meta-analysis are to discover: (a) the unique effects of goal setting on

behavior change across a range of behaviors, and (b) under what circumstances and for whom goal setting works best.

Goal Setting Theory

Goal setting theory (Locke & Latham, 2002; Locke & Latham, 2006) was derived from a series of industrial / organizational psychology experiments regarding work-related task performance (Locke & Latham, 2002). The original theory posits that goal setting will promote behavior change when two conditions are met: (a) the goal must be conscious and specific, and (b) the goal must be sufficiently difficult (i.e., over and above what is usually achieved).

The idea that goals should be “conscious and specific” (e.g., “reduce hill running time by 7 seconds”) can be contrasted with general intentions or vague goals such as “do your best” goals (e.g., “I will do my best at hill running”). Reviews of studies that compared specific goals with “do your best” or no goals found a medium sized effect (the overall effect sizes found by the various meta-analyses range from $d = .42$ to $d = .56$) for goal setting on behavior or performance (Chidester & Grigsby, 1984; Kleingeld et al., 2011; Mento et al., 1987; Tubbs, 1986; Wood et al., 1987). The idea that goals should be “sufficiently difficult” is supported by evidence showing medium to large effects on behavior/ performance (the overall effect sizes found by meta-analyses range from $d = .44$ to $d = .82$) of setting difficult goals compared with setting easy goals (Chidester & Grigsby, 1984; Kleingeld et al., 2011; Mento et al., 1987; Tubbs, 1986; Wood et al., 1987).

Theoretical Moderators

Goal setting theory proposes four moderators of the goal setting-behavior relationship (Latham & Seijts, 2016; Locke & Latham, 2002; Locke & Latham, 2006). Thus, the positive relationship between goal setting and behavior is hypothesized to be enhanced when: (a) people are more committed to the goal, (b) the task is low in complexity (i.e., the number of acts and decisions required to reach the goal is low; Wood 1986), (c) feedback is received regarding progress towards the goal (Locke & Latham, 2002) and (d) there are adequate situational resources / few situational constraints (Latham & Seijts, 2016).

To date, the effect of goal commitment and situational constraints / resources on goal setting have not been subject to meta-analytic review, but task complexity and feedback have. Task complexity has been the focus of two reviews, one of which found that increased task complexity decreased the effect of goals on individual performance (Wood et al., 1987). The second review found that task complexity was not a moderating factor for goals that were set for groups rather than individuals (Kleingeld et al., 2011). The implication is that the combined capabilities of people in groups exceeds that of solo individuals, meaning that groups are better equipped to handle complex tasks; this reflects the premise that the moderating effect of task complexity is only likely to occur when the person does not have sufficient ability (Locke & Latham, 1990).

Feedback has also been found to be a significant moderator of the relationship between goal setting and behavior change when studies compare a goal setting plus feedback condition with a goal setting only condition (the overall effect sizes found by the two meta-analyses are $d = .56$ and $d = .63$; Neubert, 1998; Tubbs, 1986). In contrast with the research reviewed above, in

which provision of feedback was experimentally manipulated, meta-analyses that coded for the presence or absence of feedback produced mixed results. For example, Mento et al. (1987) found no effects of feedback whereas Chidester and Grigsby (1984) found strong positive effects of accompanying goal setting with feedback.

The Present Review

Reviews to date suggest that goal setting may be effective in changing behavior, but suffer a number of limitations, including: (a) focusing on a limited range of studies (i.e., a selected behavior, such as work-related goals, health / therapy goals, or only group goals; Chidester & Grigsby, 1984; Kleingeld et al., 2011; Matre, Dahl, Jensen & Nordhahl, 2013; Mento et al., 1987; Shilts, Townsend, & Dishman, 2013; Tubbs, 1986; Wood et al., 1987), (b) including correlational studies so causation cannot be inferred (Chidester & Grigsby, 1984; Kleingeld et al., 2011; Mento et al., 1987; Tubbs, 1986), (c) including only published studies meaning that publication bias might account for the patterns of findings, and (d) not exploring a range of theoretical and practical moderators. The present meta-analysis addresses these issues by assessing studies that have uniquely tested goal setting on behavioral or performance tasks, and excluding correlational studies from the analyses.

For a behavior change technique to be optimal it is important to determine under which circumstances and for whom goal setting is most effective in changing behavior. This might include exploring the effect of different types of goals, the correspondence between the goal and dependent variable and the effect of adding other behavior change techniques related to

goal setting. The following discussion considers the potential moderators of the effects of goal setting on behavior/performance.

Proposed Moderators

Behavioral versus outcome goals. Goal setting theory (Locke & Latham, 2002; Locke & Latham, 2006) makes a distinction between goals that focus on behavior and goals that focus on outcomes. For example, someone who wishes to lose weight may set a behavioral goal of not snacking between meals or an outcome goal of losing 1lb of weight per week. More recently, experts involved in the development of the Behavior Change Technique Taxonomy version 1 (BCTTv1; Michie et al., 2013) make a similar distinction between these two types of goal setting. However, the taxonomy is limited in so far as the reasons for the proposed distinction between outcome goals and behavioral goals are not made explicit and no evidence is presented with regards to the effectiveness of outcome goals or behavioral goals (or indeed other behavior change techniques). One aim of the present research is to address these limitations by examining the proposed distinction between behavioral goals and outcome goals.

Correspondence between goal and action. According to Ajzen and Fishbein's (1977) principle of correspondence, the effectiveness of a set goal on the dependent variable (i.e., behavior or outcome) is likely to be related to how closely the set goal resembles the measured behavior or outcome. Thus, goals that are directly related to the dependent variable (e.g., a goal of completing five pages of arithmetic problems each day and a dependent variable that measures the number of pages completed) are likely to have larger effect sizes than goals and dependent variables that are indirectly related (e.g., a goal of completing five pages of arithmetic problems each day and a dependent variable that measures

an arithmetic test score). Perhaps surprisingly, the effect of correspondence between goal set and behavior/outcome has not yet been tested.

Complementary behavior change techniques. With the exception of feedback (Chidester & Grigsby, 1984; Mento et al., 1987; Tubbs, 1986), there has been little exploration of the effect of pairing additional complementary behavior change techniques with goal setting. It is clear that there are other behavior change techniques that would increase the effectiveness of goal setting on changing behavior. To self-regulate their behavior a person compares their current state with a personally desired state (i.e., commitment; BCTTv1 number 1.9) and if a discrepancy is detected this motivates people to perform a behavior that reduces the discrepancy (i.e., discrepancy between current behavior and goal; BCTTv1 number 1.6). The process is iterative so feedback is necessary in order to review progress (i.e., feedback on behavior BCTTv1 number 2.2; feedback on outcomes of behavior BCTTv1 number 2.7). In addition, a person is more likely to choose a behavior in order to pursue a goal if their expectations of success are sufficient therefore reviewing goals to ensure they are achievable could increase goal setting effectiveness (i.e., review behavior goals BCTTv1 number 1.5; review outcome goals BCTTv1 number 1.7). Furthermore, witnessed behavioral contracts (BCTTv1 number 1.8) can only be signed once a goal has been set. The effectiveness of these techniques to enhance the effect of goal setting has thus far not been explored in previous reviews of goal setting (with the exception of feedback), yet each might be expected to augment the effects of simply setting a goal.

Rationales

The present review will explore the tenets of goal setting theory and extend the existing literature on goal setting by: (a) including unpublished studies to address any publication bias; (b) including only randomized controlled trials and excluding correlational studies; (c) including all behaviors, as opposed to focusing on specific domains; (d) evaluating a more comprehensive list of moderators (e.g., exploring the effects of goal setting for behavior versus goal setting for outcomes on behavior change); and (e) conducting a secondary analysis to explore the potential additive effects of other behavior change techniques that are intrinsically linked with goal setting (i.e., commitment to the goal, review of goals, behavioral contract, discrepancies and feedback).

Method

Selection of Studies and Inclusion Criteria

Studies were located using a search of four electronic databases (Web of Knowledge, PsycINFO, PubMed, ProQuest Dissertation Databases), using four search filters, and including all years until 4 November 2015. The first filter, for goal setting and related behavior change techniques (behavioral contract, commitment, and review goals), used the search terms *goal set* OR goal target OR contract OR commitment OR goal review OR self standard*. The second filter was for study design to capture randomized controlled trials: *(random* AND intervention) OR (random* AND experiment) OR (random* AND trial)*. The third filter referred to dependent variables: *goal OR behav* OR perform* OR outcome OR consum**. The fourth filter was used to exclude “*commitment therapy*”. To supplement the search of computerized literature databases and obtain additional studies, the reference sections of the selected articles were also examined.

There were three inclusion criteria for the review. First, studies had to test the unique effects of goal setting meaning that a condition including goal setting had to be compared with a control condition that was identical minus the goal setting component (for a secondary analysis, papers were also included where the control and intervention conditions differed in goal setting and one of the related techniques of commitment, review of goals, discrepancies, behavioral contract or feedback). Second, the studies had to randomize participants to condition. Third, the dependent variable was behavior or outcome (i.e., an action depicted in the goal e.g., resisting unhealthy food or an outcome associated with such an action e.g., weight loss) – studies that only measured variables related to the goal setting process itself (e.g., satisfaction, ability to form goals) were excluded.

Figure 1 shows the flow of papers throughout the review (Moher, Liberati, Tetzlaff, & the PRISMA Group, 2009). The literature search identified 5,059 potentially relevant references and 133 references were obtained from other sources (i.e., reference lists of included articles, reviews of goal setting, recent edited books / chapters of goal setting e.g., Locke & Latham, 2013). After eliminating duplicate references ($n = 628$), the remaining 4,564 references were screened for eligibility. Studies that did not meet the inclusion criteria from the abstract ($n = 4,274$) were excluded at this stage, leaving 290 articles for which full texts were obtained and assessed. Principal reasons for exclusion, at the abstract stage, were that the paper did not report a goal setting intervention ($n = 2,218$), was not an empirical study ($n = 1,742$), and conditions differed by a behavior change technique that was not goal setting (or was not related to goal setting as per the secondary analysis; $n = 246$). Examination of the full texts led

to the exclusion of a further 111 articles. The principal reason for exclusion at this stage was that conditions differed by a behavior change technique that was not related to goal setting ($n = 56$). The remaining articles ($n = 141$) met the inclusion criteria for the main analysis, reporting 384 tests of the impact of goal setting on behavior. A secondary analysis was conducted on articles that had included a behavior change technique that complemented goal setting ($n = 38$; 85 cases).

Study Coding

For studies that compared multiple goal setting conditions with a control condition an effect size was calculated for each experimental condition compared with the control condition (with the n for the control group adjusted for multiple comparisons) (see Appendix S1). For example, Bar-Eli et al. (1993) compared a measurement only control group with four experimental groups who were asked to set “easy goals,” “moderate goals,” “difficult goals,” and “very difficult goals.” Four effect sizes were calculated using the control group (n divided by 4) as the comparison.

Where studies did not report data separately for multiple goal setting conditions the effect size was calculated so that it compared the combined goal setting conditions with the control condition (see Appendix S1). For example, Rosswork (1977) compared four goal setting conditions with four control conditions and so for the present analyses the effect size was calculated on the basis of all four intervention conditions compared with all four control conditions.

Where studies reported data from several sub-samples, an effect size was calculated for each sub-sample and the sub-samples were treated as separate

tests in the meta-analysis to form the basis for moderator analyses (see Appendix S1). For example, Schnoll and Zimmerman (2001) compared two goal setting conditions (goal setting with self monitoring and goal setting alone) with two similar control conditions; two tests were coded separately for the meta-analysis to provide an effect size for goal setting only versus control and an effect size for goals setting plus monitoring versus monitoring only control.

Where studies included multiple control/ comparison groups the effect size in the analysis was calculated using data from the comparison group that most closely matched the goal setting condition (see Appendix S1). For example, Nemeroff and Cosentino (1979) compared three conditions: (a) goal setting and feedback, (b) feedback only, and (c) control; the feedback condition was used as the comparison condition to the goal setting and feedback condition.

Where studies measured behavior at multiple time points, we adopted the conservative strategy of calculating the effect size only for the measure at the final time-point (e.g., Epton et al., 2015; Sheeran, Harris & Epton, 2013). For example, Weinberg et al. (1991) measured sit ups once each week over 4 weeks after the goal setting exercise manipulation; the fourth week measure was used to calculate the effect size reported in the present analyses.

If multiple behavioral dependent variables were reported, then an effect size was calculated for each and a mean was used in the analysis. For example, in Alexy's (1985) study participants each set a number of health goals (e.g., weight loss, seatbelt use) and so an effect size was calculated for each type of goal and the mean used in the present analyses.

Moderator Variables

Information about potential moderator variables was extracted from each study (see Tables S2 – S3 in Supplementary Materials). The variables reported were chosen for their theoretical importance or practical relevance and described features of: (a) the sample, (b) the goal setting intervention, (c) other included behavior change techniques, (d) the study design and delivery, (e) quality of the study, (f) the behavior targeted, and (g) the level of correspondence between the set goal and the dependent variable.

Samples were coded with respect to: (a) gender (percentage of the sample that was female), (b) mean age, (c) ethnicity (percentage of the sample describing themselves as white, black, Hispanic, Asian or other), and (d) the population from which the sample was drawn (e.g., university students, general population, school children).

The type of goal setting intervention was coded as: (a) behavior (e.g., eat 5 pieces of fruit and vegetables per day) or outcome (e.g., weight loss), (b) whether the basis of the goal was set relative to the participant's current standing (e.g., one more portion of fruit per day) or to an external standard (e.g., eat 5 portions of fruit and vegetables per day), (c) the number of different goals set, (d) the number of times goal setting was repeated, (e) if training in goal setting was provided, (f) the difficulty of the goal (i.e., easy, moderate, difficult)², (g) task complexity³, and (h) whether commitment was measured (rather than manipulated) in the experimental group.

The interventions were assessed for: (a) the inclusion of behavior change techniques in both the intervention and comparison groups, and (b) the number of behavior change techniques used.

Features coded under study design and delivery were: (a) the type of control group (i.e., measurement only / alternative intervention, “do your best” goal); (b) how the goal setting exercise was delivered (i.e., participant verbalizes, participant writes, other verbalizes, other writes); (c) the privacy of the goal setting (i.e., private, shared with intervention deliverer only, public); (d) if the goal was an individual goal or group goal; (e) by whom the goal was set (i.e., self, other, collaboratively); (f) if the timing of the goal was proximal (i.e., was to be completed within a couple of weeks) or distal (was to be completed over a longer time period); (g) if the goal was set by the person whose outcomes were measured or by an external agent; (h) who delivered the goal setting intervention (i.e., researcher, clinician, instructor/ teacher, was not delivered in person); (i) the setting (i.e., university, worksite, school); and (j) the interval between goal setting and outcome measurement.

Study quality was assessed using five indices: (a) publication status, which was coded as peer reviewed (i.e., published or in-press papers) versus not peer reviewed (i.e., theses), (b) attrition rate, (c) the randomization procedures, (d) blinding of participants and investigators, and (e) treatment of participant attrition (Chalmers et al., 1990).

The dependent variables were also categorized as directly, indirectly or marginally related to the goal. The nature of the targeted behavior was also assessed (e.g. health, educational, sport performance, motor function, reaction time, social, performance on video game, cognitive, profit, production, environmental, keeping appointment, job related goals, negotiation).

Coding Reliability

All study characteristics were coded by the first and third authors (both hold PhDs in Health Psychology). Inter-coder reliabilities were calculated using Kappa (K) or intra-class correlation (ICC), and were acceptable for both categorical ($M_K = .983$, range = .887 to 1.00) and continuous variables ($M_{ICC} = .989$, range = .860 to 1.00). Disagreements were resolved through discussion between the authors.

Meta-Analytic Strategy

The effect size metric employed in the analyses was d . Means, standard deviations, and N s for the experimental versus the comparison condition were used to calculate the effect size whenever possible (baseline values on behavior measures where controlled for wherever possible). Where these statistics were not published or provided by the authors, the effect size was calculated using χ^2 contingency tables for the experimental and comparison groups, or derived from F ratios, t values, χ^2 values or p values. If comparisons were reported as “statistically significant” without further information, an effect size was calculated assuming $p = .049$. If comparisons were reported as non-significant or not mentioned as significant these were treated in two ways: (a) non-significant results were assumed to have an effect size of 0, and (b) an effect size was calculated assuming $p = .50$.

A random effects model, weighted by sample size, was used to calculate an overall effect size, plus 95% Confidence Intervals (CI), significance of heterogeneity (Q) and the extent of heterogeneity (I^2) for the outcome variables, using the revised *metan* command in STATA Version 11 (Stata-Corp, 2009). To explore the influence of moderators, each outcome was regressed onto each potential moderator using the revised *metareg* command in a random effects

model with restricted maximum likelihood estimation and the improved variance estimator (Knapp & Hartung, 2003). The estimated increase in the effect size per unit increase in the covariate (regression coefficient β) and the percentage of heterogeneity explained by the covariate (adjusted R^2) were calculated.

Where subsets of studies were compared (e.g., easy, moderate and difficult goals) the effect sizes, and standard error of the effect size for each subset were meta-analysed (as above) and the Q statistic examined – if there was significant heterogeneity then a significant difference between the subsets was evident.

Results

Characteristics of Studies in the Main Analysis

The 141 papers that met the inclusion criteria for the main meta-analysis included 155 studies (384 cases) for which effect sizes were calculated (see Table S1 in supplementary materials). The papers consisted of 128 (91%) published articles and 13 theses (9%). The quality of the design of the studies/ reporting of the studies varied in ratings of blinding, randomization and attrition (Chalmers et al., 1990). The majority of cases received low ratings on blinding and randomization; i.e., 91% were rated as “blinding was not possible or unclear if blinded” and 98% were rated as “randomized but method not described and experimenter was not blinded to condition”. Ratings regarding attrition and how the studies dealt with this varied, with the majority of studies (67%) receiving the highest rating “attrition did not occur or all those assigned to condition analyzed”; however, a large proportion of studies received a lower rating (31%) as “attrition was not mentioned or completers only were analyzed”.

The cases varied in the type of populations sampled. Sixty-seven percent recruited university students, 12% recruited the general population, and 13% recruited school children. On average, the samples were approximately equal regarding gender (49.50% female, $SD = 24.09$), of mostly white ethnicity ($M = 61.23\%$, $SD = 29.46$) and were 23.71 years old ($SD = 11.01$).

The goal setting interventions differed in the type of behavior targeted; 49% were cognitive goals (e.g., complete maze in a certain number of moves), 22% were sporting goals (e.g., performance at archery), 7% were production goals (build Lego models), 6% were health related goals (e.g., weight loss), and 6% were educational goals (e.g., increase study time). The majority of studies asked participants to set goals related to outcomes (70%; e.g., lose 1lb of weight per week) as opposed to behaviors (29%; e.g., eat 5 portions of fruit and vegetables daily), or both (1%). The majority of goals were set in relation to external standards (71%; e.g., do 50 sit ups), as opposed to setting goals relative to the participant's current status (28%; e.g., improve sit-up total by 20%) or both (1%). The mean number of goals set was 1.35 ($SD = 1.21$), the average number of repetitions of setting a goal was 3.82 ($SD = 10.22$) and training was given for goal setting in 3% of the cases. The difficulty of goals varied: easy goals (12%), moderately difficult goals (19%), and difficult goals (33%). The mean task complexity was 3.58 ($SD = 1.97$).

The experimental and the comparison interventions included a range of behavior change techniques other than goal setting that were present in both the intervention and comparison groups. These included behavioral practice or rehearsal (69%), feedback on outcomes or behavior (40%), instruction on how to perform the behavior (18%), self-monitoring of outcomes or behavior (12%),

demonstration of the behavior (10%), and monitoring of outcome or behavior by others without feedback (6%). The mean number of behavior change techniques was 1.74 ($SD = 1.14$).

The control groups were mainly “do your best” goals (i.e., a vague goal) (66%), and measurement only/ other intervention (31%). A researcher (56%) typically delivered the goal setting intervention, in a university setting (64%).

The goals were set by varied means; the main means were experimenter verbalizes the goal (27%), participant writes goal (14%) and written goal provided (22%). In a large number of cases the goal was shared with the intervention deliverer only (28%). The goals were mainly individual goals (88%) but also included group goals (9%) or both (3%). Goals were typically set by someone else (74%), but also included self set goals (18%), collaboratively set goals (24%) and a combination of self and other set (1%). The timing of the goals were mainly proximal (81%), with some distal (15%) and few containing both kinds of goals (4%). The mean follow up period was 2.10 ($SD = 5.36$) weeks after the goal setting intervention.

Impact of Goal Setting on Behavior

Across 384 tests ($N = 16,523$) goal setting had statistically significant effects on behavior ($d = .34$, $CI = .28$ to $.41$). According to Cohen’s criterion (1992) the effect size is small (whereby $d = .20$ is small and $d = .50$ is a medium sized effect). The analysis was repeated with winsorized data to assess the effect of extreme outliers (i.e., $\pm 3 SD$; 8 values were adjusted) and the effect remained the same ($d = .34$, $CI = .28$ to $.39$). The analyses were repeated: (a) excluding the studies that had not provided enough data to calculate an accurate effect size ($k = 332$, $d = .40$, $CI = .33$ to $.47$), and (b) by replacing the estimates for

non-significant results with a value calculated from $p = .50$ ($k = 384$, $d = .34$, $CI = .28$ to $.41$).

The Fail Safe N , a calculation of the number of studies with an effect size of zero that would be needed to make the effect non-significant, is 269 (Orwin, 1983). An examination of the funnel plots (see Figure S1) and the *metabias* command in STATA using the Egger test were used to determine the presence of small study effects; a significant skew was found, $B = .66$, $SE = .27$, $p = .013$. The publication bias for small samples with significant results leads to an excess of underpowered studies, leading to an overestimation of the effect size (Kraimer, Gardner, Brooks, & Yesavage, 1998). Therefore sensitivity analysis using studies that meet a 55% power threshold was conducted (recommended by Coyne, Thombs, & Hagerdoorn, 2010). For 55% power to detect a medium effect size ($d = .50$) a sample of 35 or more participants per cell was required (Epton et al., 2015). The effect of goal setting on behavior remained significant ($k = 69$, $d = .38$, $CI = .26$ to $.50$) when this criterion was used⁴.

Moderator Analyses

The studies were significantly heterogeneous, $Q = 1199.05$, $p < .001$, and the variance attributable to heterogeneity was large, $I^2 = 68.1\%$ (see Table S2 and Table S3 in Supplementary Materials for details of moderator analyses).

Sample. The studies included in the present review indicated that goal setting was more effective in changing behavior when the samples had a greater number of males ($\beta = -.01$, $p = .001$, $k = 268$), were younger ($\beta = -.01$, $p = .006$, $k = 123$), had a greater number of Asian participants ($\beta = .08$, $p = .005$, $k = 13$), and were recruited from the general population ($\beta = .36$, $p = .001$, $k = 375$ of which k

= 45 were general population), or were children ($\beta = .27, p = .008, k = 375$ of which $k = 51$ were children), and were not university students ($\beta = -.25, p = .001, k = 375$ of which $k = 258$ were university students).

Goal setting intervention. The type of goal setting intervention, i.e., if outcome ($k = 383$ of which $k = 271$ were outcome) or behavior ($k = 383$ of which $k = 116$ were behavior), based on the participant's current status ($k = 383$ of which $k = 112$ were current status) or external standard ($k = 383$ of which $k = 276$ were external standard), number of different goals set ($k = 379$), number of times goal setting was repeated ($k = 378$), and task complexity ($k = 225$) did not moderate the effect of goals setting on behavior. There were too few studies ($k = 10$) to analyze if providing training in goal setting was a moderator.

Goal difficulty was a significant moderator ($\beta = .18, p = .005, k = 244$) suggesting that increased goal difficulty leads to increased goal success. Exploring the breakdown of easy, moderate and difficult goals; easy ($k = 45, d = .25, CI = .14$ to $.37$) and moderate goals ($k = 72, d = .25, CI = .17$ to $.33$) had small effects in contrast to the medium effect of difficult goals ($k = 127, d = .45, CI = .39$ to $.51$); there were significant differences between difficult and easy goals, $Q_b = 41.09, p < .001$, and difficult and moderate goals, $Q_b = 21.33, p < .001$.

Several studies included a measure of goal commitment that participants completed after setting a goal but prior to performing the task; measuring goal commitment in this way led to a smaller effect of goal setting on behavior ($\beta = -.19, p = .030, k = 384$ of which $k = 74$ measured commitment).

Additional behavior change techniques. There were sufficient cases to explore the moderating effect of behavioral practice / rehearsal (BCTTv1 number 8.1; $k = 384$ of which $k = 265$ used rehearsal), feedback (BCTTv1 number 2.2 & 2.7; $k = 384$ of which $k = 154$ used feedback), instruction on how to perform behavior (BCTTv1 number 4.1; $k = 384$ of which $k = 65$ used instruction), self-monitoring of behavior or outcome (BCTTv1 number 2.3 & 2.4; $k = 384$ of which $k = 45$ used self-monitoring), demonstration of behavior (BCTTv1 number 6.1; $k = 384$ of which $k = 38$ used demonstration) and social comparison (BCTTv1 number 6.2; $k = 384$ of which $k = 17$ used social comparison)– there were no moderating effects of these variables of goal setting on behavior. The only additional behavior change technique (see Table S2) that increased the effect of goal setting alone was monitoring of the behavior or outcomes by others without feedback (BCTTv1 number 2.1 and 2.5) ($\beta = .60, p < .001, (k = 384$ of which $k = 22$ used monitoring without feedback).

Other behavior change techniques that were used alongside goal setting but used too infrequently to analyze were information about antecedents (BCTTv1 number 4.2, $k = 9$), rewards (BCTTv1 numbers 10.2, 10.3 & 14.5, $k = 7$), prompts / cues (BCTTv1 number 7.1, $k = 7$), social support (BCTTv1 numbers 3.1, 3.2, & 3.3, $k = 7$), incentives (BCTTv1 numbers 10.1 & 10.6, $k = 7$), information about health consequences (BCTTv1 number 5.1, $k = 4$), salience of consequences (BCTTv1 number 5.2, $k = 4$), problem solving (BCTTv1 number 1.2, $k = 4$), valued self identity (BCTTv1 number 13.4, $k = 3$), add object to environment (BCTTv1 number 12.5, $k = 3$), action planning (BCTTv1 number 1.4, $k = 1$) and self-talk (BCTTv1 number 15.4, $k = 1$).

Study design and delivery. There were no differences in effect size with regards to “do your best” comparison groups ($k = 384$ of which $k = 253$ had “do your best” comparison) or measurement only / alternative intervention comparison groups ($k = 384$ of which $k = 120$ used measurement only / alternative intervention comparison). There were no differences in behavior due to the means with which the goal was set for other verbalizing the goal ($k = 267$ of which $k = 103$ had another person verbalizing the goal), other writing the goal ($k = 267$ of which $k = 87$ had another person writing the goal), and participant writing the goal ($k = 267$ of which $k = 54$ had the participant writing the goal) . There were no differences if the goal was proximal ($k = 380$ of which $k = 324$ were proximal) or distal ($k = 380$ of which $k = 70$ were distal). There were no differences due to the time interval between the goal setting and the measurement of the dependent variable ($k = 378$). There were too few cases to analyze differences due to if the goal was made by the person whose behavior or outcomes were measured as opposed to if the goal setting was directed at a person whose behavior was not measured (e.g., physiotherapist set a goal for how to treat a patient but the behavior measured was patient outcomes).

The present dataset showed that goal setting interventions were more effective if the goal: (a) was set publicly ($\beta = .41, p < .001, k = 255$ of which $k = 58$ were public) (b) was a group goal ($\beta = .48, p < .001, k = 384$ of which $k = 48$ were group goals) rather than an individual goal ($\beta = -.29, p = .018, k = 384$ of which $k = 349$ were individual goals); (c) was set face-to-face (rather than online or computerized; $\beta = -.46, p = .003, k = 276$ of which $k = 20$ were set online/computerized); and (d) was set in a workplace ($\beta = .44, p < .001, k = 345$ of which

$k = 30$ were set in a workplace), or school ($\beta = .23, p = .021, k = 345$ of which $k = 47$ were set in a school) and not a university ($\beta = -.23, p = .003, k = 345$ of which $k = 247$ were set in a university).

Study quality. Study quality did not moderate the effect of goal setting on behavior; there were no moderating effects of randomization rating ($k = 384$), blind rating ($k = 384$), attrition rating ($k = 384$), actual attrition ($k = 288$), whether or not the study was peer reviewed ($k = 384$ of which $k = 346$ were peer reviewed), or date of study ($k = 384$).

Type of behavior. The largest effect sizes were for environmental goals (e.g., increasing recycling; $k = 2, d = .57, CI = .07$ to 1.07), health ($k = 21, d = .44, CI = .31$ to $.56$), sporting goals ($k = 83, d = .41, CI = .33$ to $.49$), production goals (e.g., building Lego models; $k = 25, d = .36, CI = .19$ to $.52$), education goals ($k = 21, d = .30, CI = .16$ to $.44$), and cognitive goals ($k = 188, d = .28, CI = .23$ to $.32$). Other significant effects were found for keeping appointments ($k = 2, d = .26, CI = .03$ to $.49$; see Table S3).

Correspondence between goal and dependent variables. The effect size differed with regards to how closely the goal that was set corresponded with the outcome. Direct goals (e.g., goal set was regarding weight loss and outcome was weight loss; $k = 337, d = .37, CI = .31$ to $.44$) had a greater effect on behavior than when the outcome measure differed from the goal that was set (e.g., the goal set was regarding resisting food and outcome was weight loss; $k = 99, d = .18, CI = .05$ to $.31$) and when the measure was marginally related to the goal ($k = 5, d = .10, CI = -.21$ to $.40$), $Q_b = 29.73, p < .001$.

Secondary Analysis of Studies that used Behavior Change Techniques

Complementary to Goal Setting

Across 27 tests ($N = 5,751$) that had combined goal setting with commitment (BCTTv1 number 1.9) there were significant effects on behavior ($d = .20$, $CI = .14$ to $.26$); however, this was significantly lower than the effect of the studies with goal setting alone ($d = .34$, $CI = .28$ to $.41$), $Q_b = 15.08$, $p < .001$.

Studies that paired feedback and goal setting (BCTTv1 numbers 2.2 & 2.7) were not effective compared to the control conditions ($k = 25$, $N = 1071$, $d = .01$, $CI = -.27$ to $.29$). Studies that paired goal setting with a review of behavior or outcome goals (i.e., discuss and consider modifying goals in light of progress or lack of progress; BCTTv1 numbers 1.5 & 1.7) were not effective in comparison to the control conditions ($k = 12$, $N = 343$, $d = .17$, $CI = -.05$ to $.40$). Studies that paired goal setting with a behavioral contract (i.e., a written specification of the goal that is witnessed by another; BCTTv1 number 1.8) were no more effective than the control condition ($k = 21$, $N = 791$, $d = .11$, $CI = -.09$ to $.30$). However, it should be noted that the sample sizes for these analyses were small. There were no studies that combined a goal setting intervention with discrepancies (i.e., drawing a discrepancy between current behavior and a previously set goal).

Discussion

Encouraging people to set goals is a technique that is used widely to promote behavior change, and the present review showed a positive effect on behavior. Relative to participants in comparison conditions, participants in goal setting conditions showed greater behavior change across a wide range of behaviors.

Various analyses and tests indicate that the effect is robust. The small sized effect ($d = .34$) was retained when: (a) extreme outliers were dealt with ($d = .34$), and (b) estimates based on an effect size of zero were replaced with values calculated from $p = .50$ ($d = .34$). The small sized effect was marginally increased when: (a) studies were excluded that had been estimated based on an effect size of zero ($d = .40$), and (b) studies were excluded that did not reach a stated power threshold ($d = .38$). Publication bias was addressed by including papers from unpublished sources, although the Egger test did show that there was skewness. The overall effect found in the present review is smaller than the medium effect sizes of previous reviews (the overall effect sizes found by the previous meta-analyses range from $d = .42$ to $d = .56$; Chidester & Grigsby, 1984; Kleingeld, van Mierlo, & Arends, 2011; Mento, Steele, & Karren, 1987; Tubbs, 1986; Wood, Mento, & Locke, 1987). However, the present review is arguably more robust because it excluded correlational studies, included unpublished dissertations and studies that had reported a non-significant result but did not provide data.

Although the effect of goal setting on behavior is small, it is comparable with reviews of other individual behavior change techniques such as those that reflect on a valued self-identity ($d = .32$; Epton et al., 2015; BCTTv1 number 13.4) and action planning ($d = .31$; Belanger-Gravel, Godin, & Amireault, 2013; BCTTv1 number 1.4). The implication is that goal setting is one of the building blocks for designing effective behavior change interventions. However, behavior change techniques that we identified as complementary to goal setting, namely, feedback, commitment, behavioral contracts, and reviewing goals seemed to add

little to the effect of goal setting per se. These findings contradict predictions made by goal setting theory (Locke & Latham, 2002) that feedback, commitment, reviewing goals and behavioral contracts would increase the effectiveness of goal setting. However, this lack of effect may be due to the small number of studies included in this analysis (it should be noted that review of behavior or outcome goals had a small sample size of $k = 12$, that behavioral contract and feedback had modest sample sizes of $k = 21$ and $k = 25$, respectively). It is noteworthy that a comparison of current standing and the goal (i.e., discrepancy) was not used in the studies included in this analysis or at least not explicitly detailed.

Theoretical Moderators

Goal setting theory (Locke & Latham, 2002; Locke & Latham, 2006) postulates that goals are optimally effective if: (a) the goal is sufficiently difficult, (b) people are committed to the goal, (c) the task complexity is not too high, (d) feedback on goal progress is provided, and (e) there are adequate situation resources / few situational constraints.

Difficulty. The studies in the present review provided evidence that goal difficulty (i.e., the extent to which the goal that was set exceeded that which would be typically achieved) moderated the effect of goal setting on outcomes with more difficult goals having a stronger effect than easier goals. The analysis showed that easy and moderate goals were effective but only had a small effect compared to the larger effect of difficult goals; this is comparable to what had been found in previous reviews and is consistent with goal setting theory (Locke & Latham, 2002; Locke & Latham, 2006). However, it is important to note that

improbable difficult goals may be detrimental; most goals coded as difficult in this meta-analysis were still achievable ($k = 10$ were coded as improbable so it was not possible to analyze the effect of this). It is important to note that goals should still be set within an achievable range for that person, as although improbable goals may still have a positive influence on motivation (Weinberg, Bruya, Garland & Jackson, 1990), they may reduce achievement (Bar-Eli et al., 1997).

Commitment. Manipulating goal commitment was associated with a small but significant effect; however, the size of this effect ($d = .20$; $k = 27$) was significantly lower than the effect of those studies that used goal setting alone ($d = .34$). Goal theory (Locke & Latham, 1990; Locke & Latham, 2002; Locke & Latham, 2006) states that goal commitment is a necessary prerequisite for goal attainment when the goals are difficult. There were too few studies to explore the effect of manipulating goal commitment only when goal difficulty was high ($k = 1$). However, this result suggests that manipulating goal commitment has a negative effect on goal progress when the goals are easy or moderate.

Furthermore, studies that measured goal commitment (after setting the goal but prior to the goal setting task) resulted in less positive outcomes than those studies that did not ask participants about their commitment ($k = 74$). This negative effect may be due to participants recognizing that they are not committed to the goal, and thus spend little effort on pursuing the goal. However, there are debates around the measurement of goal commitment even using established scales, as these scales included items that reflect outcome expectancies and items that lower the scale consistency (Klein & Wright, 2001);

as most studies were conducted prior to new scale development it is not possible to explore the effect of measurement errors.

Task complexity. The present meta-analysis suggests that task complexity does not moderate the effectiveness of goal attainment. This mirrors the results of the meta-analysis of Kleingeld et al. (2011) who also found no effect but contrasts with the meta-analysis of Wood et al. (1987) who found that increased complexity reduced performance. Kleingeld et al. (2011) suggests three reasons why a significant effect of task complexity was not found in their meta-analysis: (i) that the groups' goal setting in their meta-analysis showed superior ability to overcome the problems with task complexity than the individuals in Wood et al.'s (1987) review, (ii) that only six studies used a highly complex task in their analysis so may not be reliable, and (iii) the moderating effect in Wood et al.'s meta-analysis may have been overstated as the difference between the effect sizes for low, moderate and high complexity was only small. The present meta analysis included studies that mainly sampled university students who would be expected to have sufficient skills and knowledge to conduct complex tasks; however, the review also found that goal setting was less effective in student samples suggesting that high ability might not be the cause of a lack of a moderating effect of task complexity.

Given that the present review has a modest but larger number of studies ($k = 64$) with a high task complexity, than Kleingeld et al. and Wood et al., this suggests that either (a) the analysis in the present study may also not be reliable or (b) the moderating effect of Wood et al.'s meta-analysis may have been overstated. It is notable that Wood et al. did not conduct a statistical test of the

differences between levels of task complexity. The results of the present review ($d = .26$; $k = 107$ for low, $d = .22$, $k = 54$ for medium, $d = .22$, $k = 64$ for high) show that the effects of low, medium and high task complexity were much smaller than those of Kleingeld et al. (2011; $d = .32$ to $.56$ for low, $d = .48$ to $.87$ for medium, $d = .33$ to 1.08 for high) and Wood et al. (1987; $d = .69$ for low, $d = .50$ for medium, $d = .48$ for high); however, this could be due to the inclusion of studies in the present analyses that reported a non-significant results with no data to calculate an effect size. An additional factor that may account for the mixed results is the fact that task complexity has typically been operationalized objectively (i.e., the number of task components) but may include subjective components such as the capability of the individual to perform the task. Indeed, later versions of goal setting theory suggest that if the complexity of a task exceeds the person's ability then a learning goal rather than a performance goal should be set (Locke & Latham, 2006).

Feedback. The present analyses did not add support to the claim of goal setting theory that feedback increases the effectiveness of goal setting as including feedback ($k = 25$) was not associated with a significant effect on behavior and outcomes ; however the sample size was moderate so strong conclusions cannot be drawn.

Situational resources / constraints. The review found no studies that had met the inclusion criteria that had explicitly manipulated resources or constraints. Moreover, there was not enough detail reported in the studies to develop a coding frame to explore this variable. It would be valuable in future

research to investigate empirically the effects of situational resources/ constraints on the effects of goal setting.

Other moderators

Sample. The studies in the present review indicated that goal setting was particularly effective for males, younger participants and samples from the general population or children recruited from schools. It is notable that effect sizes for behavior change were smaller among student samples; given that 67% of the studies reported in the present analyses were carried out with university student participants, the possibility arises that goal setting-based interventions could be particularly effective outside this narrow population base. Moreover, goal setting was most effective for Asian participants, although the analyses should be interpreted with caution due to the small number of studies containing this information. Nevertheless, it would be valuable in future research to investigate further the effects of goal setting on a wider demographic outside of the undergraduate student body.

Type of goal setting intervention. The data in the present review suggest that goal setting was equally effective irrespective of: whether the basis of the goal was participant's current standing or external standard; the number of different goals set; or the number of times the goal setting was repeated. Moreover, there were no differences in goal attainment dependent upon whether the goal targeted behavior or outcomes – goals regarding behavior and goals regarding outcomes both had small but significant effects on behavior. Our moderator analyses do not provide strong support for a distinction between setting behavioral goals versus setting outcome goals: further analysis shows

that setting behavioral goals had slightly stronger effects on behavior than on outcomes; setting outcome goals had slightly larger effects on outcomes than on behaviors. That said, our data are correlational and no studies to date have directly assessed the effects of setting behavioral goals versus setting outcome goals on behaviors versus outcomes.

Behavior change techniques. Monitoring of behavior or outcome by others without feedback improved the effect of goal setting over and above an intervention that monitored behavior/outcome but without goal setting; however this was based on a modest sample size ($k = 22$). Interestingly, goal setting was just as effective when it was used in isolation than when it was combined with all the other behavior change techniques that have thus far been tested when compared to a control group that also included that technique. A relatively large number of studies were included for several behavior change techniques (i.e., behavioral practice / rehearsal, feedback, instruction on how to perform the behavior, self-monitoring of behavior or outcome, and demonstration of the behavior) suggesting that these do not augment the effectiveness of goal setting when compared to a comparison group that just used these behavior change techniques without goal setting.

Fifty six out of the 93 techniques in the BCTTv1 have not yet been combined with goal setting. Other behavior change techniques that are successful in changing behavior, such as providing a reward if progress towards the goal is made (BCTTv1 numbers 10.1 to 10.10), may further augment the effect of goal setting (Shilts et al., 2013).

Study design and delivery. The present meta-analysis indicates that optimal goal setting interventions should be: (a) set publicly, (b) set by someone else, and (c) set for a group. There is also evidence that goal setting interventions should be set face to face rather than online or computerized; however, the number of studies that did not set goals face to face was modest. These results seem to suggest that an actual or inferred social presence maximizes the effect of goal setting.

The studies included in the present review show clear evidence that there are no differences dependent upon if the goals were set by someone else, self set or participatively set goals. This is in contrast to: (a) predictions made by theories such as self determination theory that suggests the autonomy from self set goals should increase motivation and thus improve behavior change (Deci & Ryan, 2000), and (b) recommendations that collaborative goals should be used in clinical settings (Matre et al., 2013; Shilts et al., 2013). The results of the present review may be attributable to the participants making goals of insufficient quality when self-setting or collaboratively setting goals in the studies included in this review; furthermore the goal interventions may have not allowed the time necessary for forming effective collaboratively set goals (e.g., guided goal setting; Shilts et al., 2013). It is notable that instruction in goal setting (only 10 studies provided training in goal setting).

Goal setting is also more effective if set in a school or workplace (rather than a university). Coupled with the moderating effect of sample type (i.e., that goal setting is more effective for school children and the general population and less effective in university students), the findings suggest that there may be

differences between studies set in universities with students and other studies. This could be due to the type of behavior targeted as there were substantially fewer studies targeting health and education (that had strong effects) that used university students.

Correspondence between goal and dependent variable. The level of correspondence between the goal and the dependent variable was a significant moderator. Goals that were directly related to the dependent variable had a significantly larger effect size than those that were more indirectly related. This finding is consistent with Ajzen and Fishbein's (1977) principle of correspondence, which is normally associated with attitude-behavior relations but clearly applies equally to relations between goal setting and behavior change.

Type of behavior. Goal setting was shown to be effective for a range of behaviors; in particular health, sport, production tasks, education and cognitive tasks. Goal setting has been used rarely for other tasks such as social and environmental issues so conclusions cannot be drawn about the effectiveness of goal setting for these behaviors. Nevertheless, the broad applicability of goal setting implies that it may constitute a key building block of successful behavior change interventions.

Complementary Goal Setting Behavior Change Techniques

The addition of behavior change techniques proposed by the BCTTv1 (Michie et al., 2013) that we hypothesized as enhancing the effects of goal setting, namely, behavioral contract and reviewing outcome or behavioral goals

were ineffective. This suggests that goal setting is an effective and robust behavior change technique in and of itself; however due to the modest sample sizes more studies are needed to provide a more conclusive answer.

Research Implications

The review highlights numerous important areas for further research into goal setting that have hitherto received relatively little attention. We would like to draw particular attention to six areas that we believe would benefit from further research. First, it is notable that observations of the unique effects of goal setting on behavior have been restricted to the short-medium term: No studies eligible for inclusion in the present review have yet established whether the effects of goal setting are sustained beyond 12 months post-intervention. Second, the unique effects of goal setting have not yet been fully tested in several important behavioral domains (e.g., environmental behavior), among key target populations (e.g., low socioeconomic status) and in key contexts (e.g., primary care). Third, the behaviour change technique taxonomy (Michie et al., 2013) and the broader goal setting literature (e.g., Kim, 1984) describe a potentially important distinction between setting goals to achieve outcomes (e.g., weight loss) versus setting goals to achieve behaviors (e.g., increased physical activity), yet there is little experimental research that explores this distinction. Fourth, it is not clear how people should be encouraged to set goals, for example, whether it is sufficient for people to be given a goal or whether they should be trained to set goals and what roles new technologies have to play in helping people to set goals. Fifth, 56 out of the 93 behavior change techniques identified to date (Michie et al., 2013) have not yet been paired with goal setting and it is plausible

that lack of power might account for at least some of the null effects reported in the present meta-analysis. Sixth, mediators of goal setting have been proposed by goal setting theories (e.g., Locke & Latham, 2002), however, very few studies report the relationship between the mechanisms of action and changes in behavior.

Conclusion

The present meta analysis provides an examination of the unique effects of goal setting on behavior change across a variety of domains, populations and contexts. Goal setting was shown to exert small but robust effects on behavior change. Moreover, the analyses support the two central tenets of goal setting theory (Locke & Latham, 2002; Locke & Latham, 2006), namely, that setting specific and difficult goals are effective at increasing behavior change. However, there was no evidence to support the hypotheses that task complexity, feedback and commitment boost the effects of goal setting. Instead, the present findings show that for the studies included in this review goal setting is optimally effective when: (a) it is set face-to-face, (b) it is set publicly, (c) it is a group goal, and (d) it is coupled with monitoring of the behavior or outcome by another person without feedback. Further primary research is required to see whether goal setting theory (Locke & Latham, 2002; Locke & Latham, 2006) needs updating and to ascertain whether as-yet untested behavior change techniques can complement the effects of goal setting on behavior change.

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Footnotes

¹ This is a conscious manipulation of goal commitment rather than the particular level of commitment to which goal setting theory (Locke & Latham, 2002) refers.

²Goal difficulty was defined in terms of how far above “baseline” a goal was set. “Baseline” could be derived from standard deviations of a pretest, control group performance, previous studies, and pilot study scores. Where this information wasn’t available the percentage of people achieving the goal in the goal setting group or in a pilot test was used. Goal difficulty was coded using Kleingeld et al.’s (2011) system: “Difficult goals” were set at least one standard deviation above baseline performance or less than 15% of participants achieved the goal; “moderate goals” were set lower than one standard deviation above baseline performance or 15 to 50% of participants achieved the goal; and “easy goals” were set at zero or below baseline performance or over 50% of people achieved the goal. Baseline performance was ascertained from performance in control groups ($n = 74$), pretests/ pilots ($n = 103$), and previous studies ($n = 14$). Where standard deviation data wasn’t available to calculate baseline performance the percentage of people who attained the goal from performance in the goal setting group ($n = 28$), from previous studies ($n = 3$) and from pilot studies ($n = 12$) was used. Where statistical data were not available qualitative judgments reported in the text were used ($n = 9$). Data, either for the exact goal or the comparison was not available for 134 cases.

³Task complexity was scored based on the Wood et al. (1987) scale: reaction time (1), brainstorming / simple maths / perceptual speed (2), toy assembly/ anagrams/ typing (3), sewing/ production work/ floor plan analysis (4), school

and college course work (5), supervision/ middle management/ technician work (6), and science and engineering (7).

⁴ To aid the moderator analyses some studies had been broken down into separate cases e.g., males and females. However, as this led to many cases with relatively low *N*s these cases were recombined (i.e., a mean of the effect size for the males and females was calculated and included as one case) for this sub-analysis to maximize the number of cases that achieved 55% power (i.e., had $n = 35$ per condition).

Cases from the same studies, that had been treated as separate cases to enable the main analysis to explore moderators, were combined for this sub-analysis to increase the number of studies that achieved 55% power.

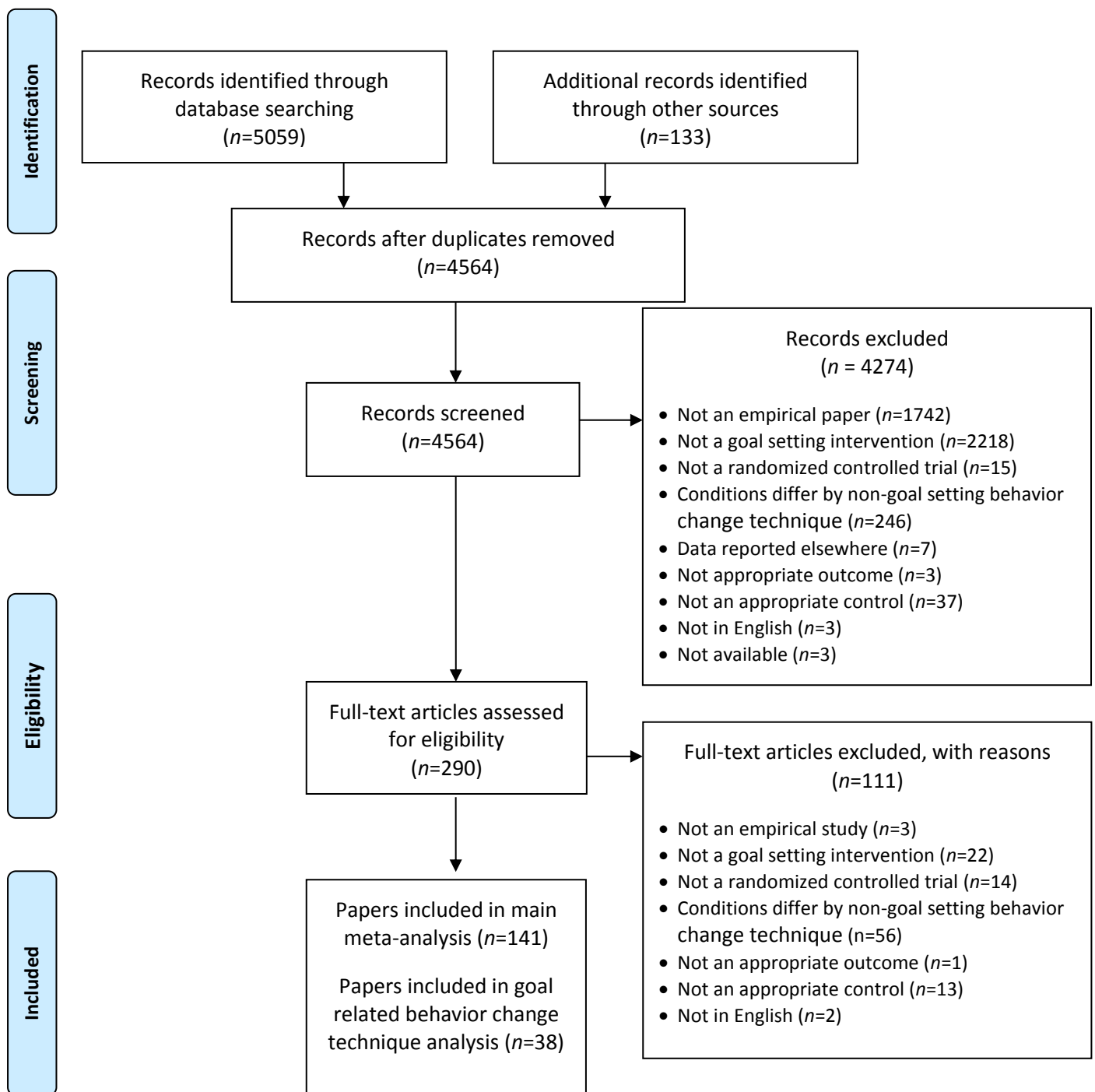


Figure 1. Flow diagram of papers included in the meta-analysis

Supplementary Materials

Table S1

Effect Sizes for Behavior and Sample Sizes

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Alexy, 1985 - collaborative goal setting	Health	23	54	.28	
Alexy, 1985 - provider goal setting	Health	23	52	.06	
Anshel, Weinberg and Jackson, 1992 - difficult goals	Sport	4	13	-.10	
Anshel, Weinberg and Jackson, 1992 - easy goals	Sport	4	13	-.05	
Anshel, Weinberg and Jackson, 1992 - own goals	Sport	4	13	-.32	
Baca-Motes, Brown, Gneezy, Keenan and Nelson, 2012 - general commitment	Environmental	223	287	.07	C
Baca-Motes, Brown, Gneezy, Keenan and Nelson, 2012 - general commitment /pin	Environmental	341	318	.12	C
Baca-Motes, Brown, Gneezy, Keenan and Nelson, 2012 - specific commitment	Environmental	223	458	.03	C
Baca-Motes, Brown, Gneezy, Keenan and Nelson, 2012 - specific commitment /pin	Environmental	171	258	.17	C

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Bachman and Katzev, 1982 - commitment	Environmental	18	16	1.23	C
Bachman and Katzev, 1982 - commitment and free tickets	Environmental	20	16	.57	C
Bandura and Cervone, 1983 - goals and feedback	Health	23	22	.22	
Bandura and Cervone, 1983 - goals only	Health	23	22	.00	
Bandura and Schunk, 1981 - distal	Educational	5	10	.75	
Bandura and Schunk, 1981 - proximal	Educational	5	10	1.22	
Bar-Eli, Levy-Kolker, Tenenbaum and Weinberg, 1993 - difficult goals	Sport	7	30	.00	
Bar-Eli, Levy-Kolker, Tenenbaum and Weinberg, 1993 - easy goals	Sport	7	30	.00	
Bar-Eli, Levy-Kolker, Tenenbaum and Weinberg, 1993 - moderate goals	Sport	7	30	.00	
Bar-Eli, Levy-Kolker, Tenenbaum and Weinberg, 1993 - very difficult goals	Sport	7	30	.00	
Bar-Eli, Tenenbaum, Pie, Btेश and Almog, 1997 - difficult 4 weeks	Sport	11	25	1.94	
Bar-Eli, Tenenbaum, Pie, Btेश and Almog, 1997 - difficult 6 weeks	Sport	7	25	2.32	
Bar-Eli, Tenenbaum, Pie, Btेश and Almog, 1997 - difficult 8 weeks	Sport	7	25	.63	

Authors	Behavior	N_c	N_e	d	<i>Goal related BCTs</i>
Bar-Eli, Tenenbaum, Pie, Btsh and Almog, 1997 - easy 4 weeks	Sport	11	22	.67	
Bar-Eli, Tenenbaum, Pie, Btsh and Almog, 1997 - easy 6 weeks	Sport	7	24	1.23	
Bar-Eli, Tenenbaum, Pie, Btsh and Almog, 1997 - easy 8 weeks	Sport	7	16	.75	
Bar-Eli, Tenenbaum, Pie, Btsh and Almog, 1997 - improbable 4 weeks	Sport	11	19	1.66	
Bar-Eli, Tenenbaum, Pie, Btsh and Almog, 1997 - improbable 6 weeks	Sport	7	19	.81	
Bar-Eli, Tenenbaum, Pie, Btsh and Almog, 1997 - improbable 8 weeks	Sport	7	15	.78	
Barnett and Stanicek, 1979	Sport	12	18	.48	
Baron and Watters, 1981 - difficult goal	Health	4	13	.84	
Baron and Watters, 1981 - low goal	Health	4	14	1.07	
Baron and Watters, 1981 - moderate goal	Health	4	14	1.06	
Baron and Watters, 1982 - difficult goal	Health	5	12	.00	
Baron and Watters, 1982 - low goal	Health	5	14	.00	
Baron and Watters, 1982 - moderate goal	Health	5	13	.00	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Bass, 1986 - hard goal, proximal, positive feedback	Cognitive	5	10	.18	
Bass, 1986 - hard goal, proximal, negative feedback	Cognitive	5	10	-.32	
Bass, 1986 - easy goal, proximal, positive feedback	Cognitive	5	10	-.03	
Bass, 1986 - easy goal, proximal, negative feedback	Cognitive	5	10	-.28	
Bass, 1986 - hard goal, distal, positive feedback	Cognitive	5	10	.17	
Bass, 1986 - hard goal, distal, negative feedback	Cognitive	5	10	.60	
Bass, 1986 - easy goal, distal, positive feedback	Cognitive	5	10	-.89	
Bass, 1986 - easy goal, distal, negative feedback	Cognitive	5	10	.40	
Bazerman, Magliozzi, and Neale, 1985	Cognitive	44	46	.68	
Becker, 1978 – easy goal	Environmental	33	16	.50	F
Becker, 1978 – difficult goal	Environmental	33	16	.72	F
Bischoff, 2010	Health	22	21	.00	R
Bower, McLellan, Arney and Campbell, 1996	Motor function	22	22	.52	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Bower, Michell, Burnett, Campbell and McLelan, 2001	Motor function	28	28	.13	R
Boyce, 1990 - difficult goal	Sport	15	30	.35	
Boyce, 1990 - moderate goal	Sport	15	30	.59	
Boyce, 1992a - long term goal	Sport	15	45	1.08	
Boyce, 1992a - short plus long term goal	Sport	15	46	.78	
Boyce, 1992a - short term goal	Sport	15	45	.87	
Boyce, 1992b - assigned short term and long term goals	Sport	46	23	.35	F
Boyce, 1992b - self set short term and assigned long term goals	Sport	46	23	.35	F
Boyce, 1994	Sport	15	15	-.68	
Boyce and Wayda, 1994 - assigned goals	Sport	42	84	.29	
Boyce and Wayda, 1994 - self set goals	Sport	42	84	.00	
Boyce, Wayda, Johnston, Bunker, and Eliot 2001 - instructor set	Sport	26	50	.24	
Boyce, Wayda, Johnston, Bunker, and Eliot 2001 - self set	Sport	26	55	.29	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Brett, Pinkley and Jackofsky, 1996 - goal alone	Negotiation	15	15	.60	
Brett, Pinkley and Jackofsky, 1996 - goal and self-efficacy	Negotiation	15	15	-.40	
Brett, Pinkley and Jackofsky, 1996 - goal, alternative and self efficacy	Negotiation	15	15	-.26	
Brett, Pinkley and Jackofsky, 1996 - goal and alternative	Negotiation	15	15	.82	
Brown and Latham, 2002 - behavioral outcome goal	Social	8	17	1.26	
Brown and Latham, 2002 - learning goal	Social	8	17	.13	
Brown and Latham, 2006 - no verbal self guidance	Social	33	33	-.36	
Brown and Latham, 2006 - verbal self guidance	Social	33	33	.38	
Buchkoski, 1983	Cognitive	38	38	.03	
Bycura, 2009 - goal commitment	Health	15	29	-.18	C, B
Callahan, 1991 - with feedback	Cognitive	17	17	.00	
Callahan, 1991 - without feedback	Cognitive	17	15	.00	
Chapman & Jeffrey, 1978	Health	19	18	.56	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Chen, Pei, Chan and Yan, 2012 - decrease reaction time	Reaction time	6	11	.23	
Chen, Pei, Chan and Yan, 2012 - increase reaction time	Reaction time	6	11	-.65	
Cianci, Schaubroeck, and McGill, Study 1, 2010 - learning goal	Cognitive	9	18	.27	
Cianci, Schaubroeck, and McGill, Study 1, 2010 - performance goal	Cognitive	9	18	.32	
Cianci, Schaubroeck, and McGill, Study 2, 2010 - learning goal	Cognitive	10	20	.82	
Cianci, Schaubroeck, and McGill, Study 2, 2010 - performance goal	Cognitive	10	20	-.05	
Cobern, Porter, Leeming and Dwyer, 1995	Environmental	40	40	.18	B
Colineau and Paris, 2011	Cognitive	14	14	.28	
Crown, 2007a - group goal collectivist in group	Cognitive	18	35	3.51	
Crown, 2007a - group goal collectivist out group	Cognitive	18	35	2.70	
Crown, 2007a - group goal heterogeneous	Cognitive	18	35	1.21	
Crown, 2007a - groupcentric individual goal + group goal heterogeneous	Cognitive	18	35	4.30	
Crown, 2007a - groupcentric individual goal +group goal collectivist in group	Cognitive	18	35	3.19	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Crown, 2007a - groupcentric individual goal +group goal collectivist out group	Cognitive	18	35	4.11	
Crown, 2007 - group goal	Cognitive	35	70	.03	
Crown, 2007 - individual goal	Cognitive	35	70	-.07	
Crown, 2007 - group goal plus individual goal	Cognitive	35	70	-.24	
Crown and Rosse, 1995 - egocentric individual goal	Cognitive	14	70	- 2.80	
Crown and Rosse, 1995 - egocentric individual plus group goal	Cognitive	14	70	- 1.08	
Crown and Rosse, 1995 - group goal	Cognitive	14	70	1.33	
Crown and Rosse, 1995 - groupcentric individual goal	Cognitive	14	70	.03	
Crown and Rosse, 1995 - groupcentric individual plus group goal	Cognitive	14	70	2.34	
Curtin, Stephens & Bonenberger, 2001 - feedback, distal goal	Health	7	13	-.01	R
Curtin, Stephens & Bonenberger, 2001 - feedback, proximal goal	Health	7	13	-.53	R
Curtin, Stephens & Bonenberger, 2001 - no feedback, distal goal	Health	7	13	.18	R

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Curtin, Stephens & Bonenberger, 2001 - no feedback, proximal goal	Health	7	13	.83	R
DeShon and Alexander, Study 1, 1996 - difficult goal	Cognitive	20	41	.00	
DeShon and Alexander, Study 1, 1996 - moderate goal	Cognitive	20	41	.11	
DeShon and Alexander, Study 2, 1996 - difficult goal	Cognitive	21	42	.55	
DeShon and Alexander, Study 2, 1996 - moderate goal	Cognitive	21	42	.40	
Dossett, Latham and Mitchell, Study 1, 1979 - assigned goals	Cognitive	10	20	.71	
Dossett, Latham and Mitchell, Study 1, 1979 - participative goals	Cognitive	10	20	.47	
Dossett, Latham and Saari, 1980 - five days	Keeping appointment	54	107	.21	
Dossett, Latham and Saari, 1980 - two days	Keeping appointment	54	102	.31	
Drach-Zahavy and Erez, 2002 - difficult goals	Cognitive	25	51	-.14	
Drach-Zahavy and Erez, 2002 - strategy goals	Cognitive	25	51	- 1.37	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Earley, Connolly and Ekegren, Study 2, 1989 - 10 dollars	Profit	4	17	-.53	
Earley, Connolly and Ekegren, Study 2, 1989 - 20 dollars	Profit	4	17	-.19	
Earley, Connolly and Ekegren, Study 2, 1989 - 30 dollars	Profit	4	17	.05	
Earley, Connolly and Ekegren, Study 2, 1989 - decreasing	Profit	4	17	-.28	
Earley and Erez, 1991 - difficult goal, goal followed by norm, high norm	Cognitive	8	15	.90	
Earley and Erez, 1991 - difficult goal, goal followed by norm, low norm	Cognitive	8	15	-.39	
Earley and Erez, 1991 - difficult goal, norm followed by goal, high norm	Cognitive	8	15	.63	
Earley and Erez, 1991 - difficult goal, norm followed by goal, low norm	Cognitive	8	15	1.18	
Earley and Erez, 1991 - easy goal, goal followed by norm, high norm	Cognitive	8	15	.58	
Earley and Erez, 1991 - easy goal, goal followed by norm, low norm	Cognitive	8	15	-.16	
Earley and Erez, 1991 - easy goal, norm followed by goal, high norm	Cognitive	8	15	-.96	
Earley and Erez, 1991 - easy goal, norm followed by goal, low norm	Cognitive	8	15	-.96	
Earley, Northcraft, Lee and Lituchy, 1990 - general proc & outcome feedback	Profit	10	10	-.18	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Earley, Northcraft, Lee and Lituchy, 1990 - general proc & specific outcome fback	Profit	10	10	.89	
Earley, Northcraft, Lee and Lituchy, 1990 - specific proc & gen outcome feedback	Profit	10	10	.92	
Earley, Northcraft, Lee and Lituchy, 1990 - specific process / outcome feedback	Profit	10	10	1.58	
Earley and Perry, Study 1, 1987 - unobtrusive priming	Cognitive	18	18	1.76	
Earley and Perry, Study 1, 1987 - obtrusive priming	Cognitive	18	18	-.51	
Elliot and Harackiewicz, 1994 - performance goals	Performance on video game	12	24	.00	F
Elliot and Harackiewicz, 1994 - mastery goals	Performance on video gae	12	24	.00	F
Erbaugh and Barnett, 1986 - goal setting	Sport	12	15	.57	
Erbaugh and Barnett, 1986 - goal setting and modeling	Sport	13	12	.21	
Erez and Somech, 1996 - individual goal	Cognitive	17	46	.63	
Erez and Somech, 1996 - group goal	Cognitive	17	41	1.23	
Erez and Zidon, 1984	Cognitive	36	104	.86	

Authors	Behavior	N_c	N_e	d	<i>Goal related BCTs</i>
Ford, 1983 - assigned difficult / cognitive monitoring	Cognitive	14	13	1.76	
Ford, 1983 - assigned difficult / physical monitoring	Cognitive	14	13	.41	
Ford, 1983 - assigned difficult / purposeful monitoring	Cognitive	14	13	.64	
Frierman, Weinberg and Jackson, 1990 - long term goal	Sport	6	18	.13	
Frierman, Weinberg and Jackson, 1990 - short and long term goal	Sport	6	18	.30	
Frierman, Weinberg and Jackson, 1990 - short term goal	Sport	6	18	-.01	
Frost and Mahoney, 1976 - task A	Cognitive	20	120	.25	
Frost and Mahoney, 1976 - task B	Cognitive	20	120	.31	
Garland, 1985 - personal goal	Cognitive	36	8	-.16	
Garland, 1985 - personal goal and easy assigned	Cognitive	35	8	-.09	
Garland, 1985 - personal goal and medium assigned	Cognitive	34	8	.18	
Garland, 1985 - personal goal and hard assigned	Cognitive	36	8	.62	
Gao and Podlog, 2012 - difficult goals	Sport	16	33	1.19	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Gao and Podlog, 2012 - easy goals	Sport	16	33	.81	
Gauggel and Billino, 2002	Cognitive	35	34	-.18	
Gauggel and Fischer, 2001	Motor function	23	22	.04	
Gauggel, Hoop and Werner, 2002 - assigned goals	Cognitive	15	30	-.14	
Gauggel, Hoop and Werner, 2002 - self set goals	Cognitive	15	28	-.41	
Gauggel, Leinberger and Richardt, 2001 - orthopedic group	Reaction time	23	24	.10	F
Gauggel, Leinberger and Richardt, 2001 - brain damaged group	Reaction time	30	32	.05	F
Goudas, Ardamerinos, Vasilliou and Zanou, 1999 - difficult assigned goal	Reaction time	3	10	.51	
Goudas, Ardamerinos, Vasilliou and Zanou, 1999 - easy assigned goal	Reaction time	3	10	.00	
Goudas, Ardamerinos, Vasilliou and Zanou, 1999 - personal goal	Reaction time	3	10	.00	
Gowen, 1985	Cognitive	46	92	1.25	
Hall and Byrne, 1988 - long term goals	Sport	4	13	.30	
Hall and Byrne, 1988 - long term goals and experimenter-set subgoals	Sport	4	13	.64	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Hall and Byrne, 1988 - long term goals and self-set subgoals	Sport	4	13	.52	
Hancock, 2005 - absolute goal	Health	27	48	.73	
Hancock, 2005 - relative goal	Health	27	62	.78	
Harackiewicz and Elliot, 1998 - performance goals	Performance on video game	12	21	.00	F
Harackiewicz and Elliot, 1998 - mastery goals	Performance on video game	12	21	.00	F
Harkins and Lowe, Study 1, 2000 - Experimenter set / experimenter evaluation	Cognitive	7	21	.14	
Harkins and Lowe, Study 1, 2000 - Experimenter set /no experimenter evaluation	Cognitive	7	21	.00	
Harkins and Lowe, Study 1, 2000 - Experimenter suggestion & evaluation	Cognitive	7	21	.07	
Harkins and Lowe, Study 1, 2000 - Expt suggestion/no experimenter eval	Cognitive	7	21	.00	
Harkins and Lowe, Study 1, 2000 - Self set / experimenter evaluation	Cognitive	7	21	.00	
Harkins and Lowe, Study 1, 2000 - Self set /no experimenter evaluation	Cognitive	7	21	.00	
Harkins and Lowe, Study 2, 2000 - Experimenter set/ experimenter evaluation	Cognitive	6	17	.08	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Harkins and Lowe, Study 2, 2000 - Experimenter set/ no experimenter evaluation	Cognitive	8	17	.00	
Harkins and Lowe, Study 2, 2000 - Self set/ experimenter evaluation	Cognitive	9	17	.04	
Harkins and Lowe, Study 2, 2000 - Self set/ no experimenter evaluation	Cognitive	8	17	.00	
Haslam, Wegge and Postmes, Study 1, 2009 - imposed goals	Cognitive	16	34	.20	
Haslam, Wegge and Postmes, Study 1, 2009 - participative goals	Cognitive	16	34	1.15	
Haslam, Wegge and Postmes, Study 2, 2009 - imposed easy goals	Cognitive	12	41	.93	
Haslam, Wegge and Postmes, Study 2, 2009 - imposed hard goals	Cognitive	12	50	.32	
Haslam, Wegge and Postmes, Study 2, 2009 - participative easy goals	Cognitive	12	38	.96	
Haslam, Wegge and Postmes, Study 2, 2009 - participative hard goals	Cognitive	12	47	1.07	
Hayes et al., Study 2, 1985 - private goal setting	Cognitive	4	7	.00	
Hayes et al., Study 2, 1985 - public goal setting	Cognitive	4	7	.57	B
Hilary, 1994	Misc	48	48	-.16	
Hinsz, 1991 - group goals / difficult tasks / error checking	Cognitive	8	30	.00	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Hinsz, 1991 - group goals / difficult tasks / problem solving	Cognitive	8	30	.00	
Hinsz, 1991 - group goals / easy tasks / error checking	Cognitive	8	30	.00	
Hinsz, 1991 - group goals / easy tasks / problem solving	Cognitive	8	30	.00	
Hinsz, 1991 - individual goals / difficult tasks / error checking	Cognitive	7	30	.00	
Hinsz, 1991 - individual goals / difficult tasks / problem solving	Cognitive	7	30	.00	
Hinsz, 1991 - individual goals / easy tasks / error checking	Cognitive	7	30	.00	
Hinsz, 1991 - individual goals / easy tasks / problem solving	Cognitive	7	30	.00	
Hinsz, 1995 - assigned goals	Cognitive	24	96	.30	
Hinsz, 1995 - self set goals	Cognitive	24	96	.00	
Hinsz, Kalnbach and Lorentz, Study 1, 1997 - anchored	Cognitive	14	32	.00	
Hinsz, Kalnbach and Lorentz, Study 1, 1997 - self set	Cognitive	15	29	.00	
Hinsz, Kalnbach and Lorentz, Study 2, 1997 - 10 uses	Cognitive	8	30	-.55	
Hinsz, Kalnbach and Lorentz, Study 2, 1997 - 120 uses	Cognitive	8	30	.00	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Hinsz, Kalnbach and Lorentz, Study 2, 1997 - 140 uses	Cognitive	8	30	.00	
Hinsz, Kalnbach and Lorentz, Study 2, 1997 - self set	Cognitive	8	30	-.55	
Hinsz, Kalnbach and Lorentz, Study 3, 1997 - anchored	Cognitive	8	30	.00	
Hinsz, Kalnbach and Lorentz, Study 3, 1997 - assigned 240	Cognitive	8	32	.00	
Hinsz, Kalnbach and Lorentz, Study 3, 1997 - self set	Cognitive	8	33	.00	
Hinsz, Kalnbach and Lorentz, Study 3, 1997 - yoked	Cognitive	8	33	.00	
Hollingsworth, 1975	Sport	29	29	.33	
Huber, 1985 - easy goal / difficult task	Performance on video game	5	16	.06	B
Huber, 1985 - easy goal / easy task	Performance on video game	5	16	-.55	B
Huber, 1985 - hard goal / difficult task	Performance on video game	5	16	-.66	B
Huber, 1985 - hard goal / easy task	Performance on video game	5	16	-.64	B

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Huber, 1985 - moderate goal / difficult task	Performance on video game	5	16	-.04	B
Huber, 1985 - moderate goal / easy task	Performance on video game	5	16	-.74	B
Huber and Neale, 1987 - easy goals	Cognitive	6	6	.33	
Huber and Neale, 1987 - moderate goals	Cognitive	6	6	.67	
Huber and Neale, 1987 - difficult goals	Cognitive	6	6	.98	
Jackson and Zedeck, 1982 - difficult goal, high variety	Production	17	35	.24	
Jackson and Zedeck, 1982 - difficult goal, low variety	Production	11	29	.62	
Jackson and Zedeck, 1982 - easy goal, high variety	Production	17	28	.01	
Jackson and Zedeck, 1982 - easy goal, low variety	Production	11	33	.46	
Johnson, Ostrow, Perna and Etzel, 1997 - group goal	Sport	2	4	.86	
Johnson, Ostrow, Perna and Etzel, 1997 - individual goal	Sport	6	12	.24	
Jung, Schneider and Valacich, Study 2, 2010 - no feedback	Cognitive	51	51	-.65	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Jung, Schneider and Valacich, Study 2, 2010 - feedback	Cognitive	51	51	.75	
Katzev and Johnson, 1984 - commitment and questionnaire	Environmental	16	13	.00	C, B
Katzev and Johnson, 1984 - commitment only	Environmental	16	15	.00	C, B
Katzev and Pardini, 1988 - commitment	Environmental	15	15	.00	C, B
Katzev and Pardini, 1988 - commitment and token	Environmental	15	15	.47	C, B
Kennedy, 1968	Educational	12	24	.13	R
Kolovelonis, Goudas and Dermitzaki, 2011 - performance goal w/o monitoring	Sport	5	15	.67	
Kolovelonis, Goudas and Dermitzaki, 2011 - process / perf goal w/o monitoring	Sport	5	15	.79	
Kolovelonis, Goudas and Dermitzaki, 2011 - process goal without monitoring	Sport	5	15	1.42	
Kolovelonis, Goudas and Dermitzaki, 2012 - performance goal	Sport	8	17	.80	
Kolovelonis, Goudas and Dermitzaki, 2012 - process goal	Sport	8	17	1.30	
Kulik and Carlino, 1987	Health	41	41	.23	C
LaPorte and Nath, 1976 - easy goal	Cognitive	16	32	.00	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
LaPorte and Nath, 1976 - hard goal	Cognitive	16	32	.20	
Larson and Schaumann, 1993 - high co-ordination demand plus planning meeting	Cognitive	21	21	.82	
Larson and Schaumann, 1993 - high co-ordination demand with no comm	Cognitive	21	21	.00	
Larson and Schaumann, 1993 - low co-ordination demand	Cognitive	21	21	.76	
Latham and Brown, 2006 - distal goals	Educational	16	29	-.47	
Latham and Brown, 2006 - proximal and distal goals	Educational	16	28	.73	
Latham, Erez and Locke, Study 1, 1988 - assigned	Cognitive	15	38	1.41	
Latham, Erez and Locke, Study 1, 1988 - participative	Cognitive	15	29	1.89	
Latham, Erez and Locke, Study 2, 1988 - assigned	Cognitive	6	20	1.41	
Latham, Erez and Locke, Study 2, 1988 - participative	Cognitive	6	18	1.83	
Latham, Mitchell and Dossett, Study 2, 1978 - assigned goals	Job related goals	21	36	.48	
Latham, Mitchell and Dossett, Study 2, 1978 - participative goals	Job related goals	21	40	.90	
Latham and Saari, 1979a - assigned	Cognitive	10	20	.87	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Latham and Saari, 1979a - participative	Cognitive	10	20	.81	
Latham and Saari, 1979b - assigned goals	Cognitive	15	30	.07	
Latham and Saari, 1979b - participatively set goals	Cognitive	15	30	.61	
Latham and Seijts, 1999 - distal and proximal goals	Profit	7	13	.96	
Latham and Seijts, 1999 - distal goal	Profit	7	13	- 1.06	
Latham and Steele, 1983 - assigned decision making / assigned goal	Production	6	12	.54	
Latham and Steele, 1983 - assigned decision making / participative goal	Production	6	12	.87	
Latham and Steele, 1983 - participative decision making / assigned goal	Production	6	12	.55	
Latham and Steele, 1983 - participative decision making / participative goal	Production	6	12	.66	
Latham and Yukl, 1975 - educated crew, assigned goal	Production	4	8	.00	
Latham and Yukl, 1975 - educated crew, participative goal	Production	4	8	.00	
Latham and Yukl, 1975 - uneducated crew, assigned goal	Production	4	8	.00	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Latham and Yukl, 1975 - uneducated crew, participative goal	Production	4	8	1.07	
Laube, 1999 - no reward / easy goal / team	Production	3	6	.36	
Laube, 1999 - no reward / easy goal / work alone	Production	3	6	.65	
Laube, 1999 - no reward / hard goal / team	Production	3	6	.85	
Laube, 1999 - no reward / hard goal / work alone	Production	3	6	1.02	
Laube, 1999 - reward / easy goal / team	Production	3	6	1.30	
Laube, 1999 - reward / easy goal / work alone	Production	3	6	-.35	
Laube, 1999 - reward / hard goal / team	Production	3	6	.25	
Laube, 1999 - reward / hard goal / work alone	Production	3	6	.79	
Lerner and Locke, 1995 - no competition high goal	Sport	8	15	1.35	
Lerner and Locke, 1995 - no competition medium goal	Sport	8	15	1.06	
Lerner, Ostrow, Yura and Etzel, 1996	Sport	4	4	.22	R

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Levy, 1977 - verbal & written commitment	Keeping appointment	9	13	.87	C, B
Levy, 1977 - verbal commitment	Keeping appointment	9	12	.15	C
Levy and Clark, 1980	Keeping appointment	62	61	.17	B
Levy, Yamashita, and Pow, 1979	Health	434	269	.29	C
Liu, Zhou, Ji and Watson, 2012	Sport	30	30	.63	F
Locke, 1967	Cognitive	18	18	.13	
Lozano and Stephens, 2010 - assigned goal	Health	18	45	.65	
Lozano and Stephens, 2010 - participatively set goal	Health	18	45	.90	
Lutz, Ammerman, Atwood, Campbell, DeVellis and Rosamond, 1999	Health	136	146	.12	
Madera, King and Hebl, 2013 - mentors	Social	40	39	.41	C
Madera, King and Hebl, 2013 - students	Social	40	39	.39	C

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Madjar and Shalley, 2008 - non-creative task goal	Cognitive	29	87	.00	
Madjar and Shalley, 2008 - creative task goal + non-creative task goal	Cognitive	29	87	.31	
Manderlink and Harackiewicz, 1984 - distal 50th percentile	Cognitive	3	11	-.55	
Manderlink and Harackiewicz, 1984 - distal 80th percentile	Cognitive	3	11	-.60	
Manderlink and Harackiewicz, 1984 - proximal 50th percentile	Cognitive	3	11	-.33	
Manderlink and Harackiewicz, 1984 - proximal 80th percentile	Cognitive	3	11	-.99	
McCalley and Midden, 2002 - self set goals	Cognitive	12	25	.81	
McCalley and Midden, 2002 - assigned goals	Cognitive	12	25	.59	
McCaul and Kopp, 1982 - private, females	Environmental	18	12	.56	
McCaul and Kopp, 1982 - private, males	Environmental	19	16	.57	
McCaul and Kopp, 1982 - public, females	Environmental	12	20	.11	C,B
McCaul and Kopp, 1982 - public, males	Environmental	16	7	.30	C, B
Meeker et al., 2014	Health	7	7	2.85	B

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Mento, Locke and Klein, Study 1, 1992 - 4 uses	Cognitive	9	28	-.40	
Mento, Locke and Klein, Study 1, 1992 - 7 uses	Cognitive	9	28	.13	
Mento, Locke and Klein, Study 1, 1992 - 12 uses	Cognitive	9	28	.37	
Mitchell and Silver, 1990 - group goal	Cognitive	8	24	.00	
Mitchell and Silver, 1990 - individual and group goal	Cognitive	8	24	.00	
Mitchell and Silver, 1990 - individual goal	Cognitive	8	24	-.60	
Mone and Baker, 1989 - 3 goals	Cognitive	12	39	.08	
Mone and Baker, 1989 - 2 goals	Cognitive	12	44	.43	
Mone and Baker, 1989 - 1 goals	Cognitive	12	43	.12	
Mone and Shalley, 1995 - simple	Cognitive	15	15	.54	
Mone and Shalley, 1995 - complex	Cognitive	15	15	-.60	
Moon, Study 1, 2013 - difficult goal	Health	7	19	.65	
Moon, Study 1, 2013 - easy goal	Health	7	19	.17	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Moon, Study 1, 2013 - improbable goal	Health	7	19	.76	
Mooney and Mutrie, 2000 - difficult goals	Sport	8	15	.48	
Mooney and Mutrie, 2000 - easy goals	Sport	8	15	.57	
Morgan, 1987 - self monitoring and subgoals	Educational	36	36	.17	
Morgan, 1987 - subgoals	Educational	36	36	.76	
Mossholder, 1980 - boring task	Production	20	20	.32	C
Mossholder, 1980 - interesting task	Production	20	20	.23	C
Mulvey and Ribbens, 1999 - assigned goal	Production	27	29	.53	
Mulvey and Ribbens, 1999 - assigned goal and competition	Production	31	30	.02	
Neale and Bazerman, 1985 - compromise goal	Cognitive	13	39	.24	
Neale and Bazerman, 1985 - challenging goal	Cognitive	13	39	.88	
Neale and Bazerman, 1985 - difficult goal	Cognitive	13	39	1.34	
Neale and Northcraft, 1986 - experts	Cognitive	40	40	.45	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Nemeroff and Cosentino, 1979	Social	45	49	.36	
Northcraft, Neale and Earley, 1994 - training / easy goal	Cognitive	13	23	.71	
Northcraft, Neale and Earley, 1994 - training / difficult goal	Cognitive	13	25	1.27	
Northcraft, Neale and Earley, 1994 - no training / easy goal	Cognitive	12	30	-.57	
Northcraft, Neale and Earley, 1994 - no training / difficult goal	Cognitive	12	27	.75	
Ozuna, 2015	Educational	12	11	-.03	
Pardini and Katzev, 1983 - Strong commitment	Environmental	5	9	.99	C, B
Pardini and Katzev, 1983 - Weak commitment	Environmental	5	9	.00	C
Pastore, 1994	Educational	50	50	.38	
Phillips and Freedman, 1988 - competence	Cognitive	25	25	.91	
Pisano, 1991 - assigned goals	Educational	20	10	.22	
Pisano, 1991 - self set goals	Educational	20	10	-.07	
Polzer and Neale, Study 1, 1995 - dyad had same goal	Cognitive	24	24	.22	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Polzer and Neale, Study 1, 1995 - dyad had mixed goals	Cognitive	24	24	-.95	
Punnett, 1986a	Educational	15	15	.01	
Punnett, 1986b	Production	30	30	.43	
Rosswork, 1977	Educational	40	40	.75	
Roulier, 1999 - self set	Educational	13	6	.39	F
Roulier, 1999 - assigned	Educational	13	6	.24	F
Rudisill, 1989 - competitive group	Sport	3	10	1.87	
Rudisill, 1989 - mastery group	Sport	3	10	.66	
Rudisill, 1989 - self goal group	Sport	3	10	.44	
Sagie, 1996 - assigned goal setting	Cognitive	9	18	-.03	
Sagie, 1996 - participative goal setting	Cognitive	9	18	.04	
Sagotsky, Patterson and Lepper, 1978 - goal setting	Educational	18	16	.00	
Sagotsky, Patterson and Lepper, 1978 - goal setting and self monitoring	Educational	16	16	.00	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Sawchuk et al., 2011	Health	19	17	.11	R
Schiebener, Wegmann, Pawlikowski and Brand, 2012	Profit	25	25	.10	
Schnoll and Zimmerman, 2001 - no monitoring	Health	26	29	.86	
Schnoll and Zimmerman, 2001 - plus monitoring	Health	29	29	1.43	
Schunk, 1983 - goals only	Educational	10	10	-.28	
Schunk, 1983 - Information and goals	Educational	10	10	.92	
Schunk, 1985 - assigned	Educational	5	10	.44	
Schunk, 1985 - self set	Educational	5	10	2.11	
Schunk and Swartz, Study 1, 1993 - product goal	Educational	15	15	.33	
Schunk and Swartz, Study 2, 1993 - product goal	Educational	10	10	1.21	
Seijts and Latham, 2001 - outcome goal distal	Cognitive	8	16	- 1.20	
Seijts and Latham, 2001 - outcome goal proximal	Cognitive	8	16	-.52	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Seijts and Latham, 2001 - learning goal distal	Cognitive	8	16	.17	
Seijts and Latham, 2001 - learning goal proximal	Cognitive	8	16	.56	
Seijts, Latham, Tasa and Latham, 2004 - performance goal	Cognitive	29	61	-.16	
Seijts, Latham, Tasa and Latham, 2004 - learning goal	Cognitive	29	59	.41	
Senecal, Loughhead and Bloom, 2008	Sports	42	42	.76	F
Shantz and Latham, Study 3, 2009	Cognitive	40	40	.56	
Shih, 1999 - self-comparison	Educational	21	21	-.19	
Shih, 1999 - social comparison	Educational	21	21	.15	
Shoenfelt, 1996	Sports	6	6	1.07	F
Simmons, 1986 - self appraisal, authoritarian	Job related	2	4	-.97	
Simmons, 1986 - self appraisal, non-authoritarian	Job related	10	9	-.47	
Simmons, 1986 - traditional appraisal, authoritarian	Job related	6	7	.98	
Simmons, 1986 - traditional appraisal, non-authoritarian	Job related	9	8	-.23	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Smith and Lee, 1992 - private goal	Sport	8	17	.80	
Smith and Lee, 1992 - public goal	Sport	8	17	.77	
Stadtländer and Coyne, 1990 - young adults	Cognitive	20	20	.63	F
Stadtländer and Coyne, 1990 - older adults	Cognitive	20	20	.52	F
Stajkovic, Locke and Blair, 2006 - easy goals	Cognitive	8	19	-.51	
Stajkovic, Locke and Blair, 2006 - difficult goals	Cognitive	8	19	.27	
Strang, 1981	Reaction time	24	24	.76	
Strang, Lawrence and Fowler, 1978 - easy goal no feedback	Cognitive	25	12	-.27	
Strang, Lawrence and Fowler, 1978 - hard goal no feedback	Cognitive	25	12	-.27	
Strang, Lawrence and Fowler, 1978 - easy goal feedback	Cognitive	25	12	.01	
Strang, Lawrence and Fowler, 1978 - easy goal feedback	Cognitive	25	12	.46	
Strickland and Galimba, 2001	Cognitive	58	58	-.46	

Authors	Behavior	N_c	N_e	d	Goal <i>related</i> <i>BCTs</i>
Tanes and Cho, Study 1, 2013 - assigned	Performance on video game	25	50	-.14	
Tanes and Cho, Study 1, 2013 - self set	Performance on video game	25	50	.08	
Tanes and Cho, Study 2, 2013 - assigned	Performance on video game	25	50	-.06	
Tanes and Cho, Study 2, 2013 - self set	Performance on video game	25	50	-.29	
Tasa, Celani and Bell, Study 1, 2013 - learning goal	Cognitive	45	91	.12	
Tasa, Celani and Bell, Study 1, 2013 - performance goal	Cognitive	45	91	.06	
Tenenbaum, Pinchas, Elbaz, Bar-Eli and Weinberg, Study 1, 1991 - long term	Sport	16	33	.08	
Tenenbaum, Pinchas, Elbaz, Bar-Eli and Weinberg, Study 1, 1991 - long + short	Sport	17	57	.78	
Tenenbaum, Pinchas, Elbaz, Bar-Eli and Weinberg, Study 1, 1991 - short term	Sport	17	29	.35	
Tenenbaum, Pinchas, Elbaz, Bar-Eli and Weinberg, Study 2, 1991	Sport	45	57	.87	
Terborg and Miller, 1978 - quality	Production	10	20	.12	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Terborg and Miller, 1978 - quantity	Production	10	20	.13	
Van Mierlo and Kleingeld, Study 1, 2010 - group goal	Misc	6	18	- 1.26	F
Van Mierlo and Kleingeld, Study 1, 2010 - individual goal	Misc	6	18	- 1.71	F
Van Mierlo and Kleingeld, Study 1, 2010 - individual and group goal	Misc	6	18	-.17	F
Van Mierlo and Kleingeld, Study 2, 2010 - group goal	Misc	14	42	- 1.14	F
Van Mierlo and Kleingeld, Study 2, 2010 - individual goal	Misc	14	42	- 1.89	F
Van Mierlo and Kleingeld, Study 2, 2010 - individual and group goal	Misc	14	42	- 1.01	F
Van Ypren, Study 1, 2003	Cognitive	27	54	.00	
Warner, 1984	Educational	79	79	.02	B
Warner and De Jung, 1971	Educational	40	40	.15	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Wegge and Haslam, 2005 - directive goal setting	Cognitive	2	8	1.30	
Wegge and Haslam, 2005 - participative goal setting	Cognitive	2	10	.58	
Wegge and Haslam, 2005 - participative with individual goal setting	Cognitive	2	6	.68	
Weinberg, Bruya and Jackson, 1990 - difficult	Sport	11	23	.44	
Weinberg, Bruya and Jackson, 1990 - moderate	Sport	11	31	.23	
Weinberg, Bruya and Jackson, Study 1, 1985 - long term	Sport	4	13	.10	
Weinberg, Bruya and Jackson, Study 1, 1985 - long term plus short term	Sport	5	13	-.04	
Weinberg, Bruya and Jackson, Study 1, 1985 - short term	Sport	4	13	-.24	
Weinberg, Bruya and Jackson, Study 2, 1985 - long term	Sport	4	11	-.35	
Weinberg, Bruya and Jackson, Study 2, 1985 - long term plus short term	Sport	4	11	-.09	
Weinberg, Bruya and Jackson, Study 2, 1985 - short term	Sport	3	11	-.15	
Weinberg, Bruya, Garland and Jackson, Study 1, 1990 - improve 30	Sport	7	14	.53	
Weinberg, Bruya, Garland and Jackson, Study 1, 1990 - improve 60	Sport	7	14	.06	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Weinberg, Bruya, Garland and Jackson, Study 2, 1990 - improve 160	Sport	10	30	.13	
Weinberg, Bruya, Garland and Jackson, Study 2, 1990 - improve 40	Sport	10	30	.18	
Weinberg, Bruya, Garland and Jackson, Study 2, 1990 - improve 80	Sport	10	30	.22	
Weinberg, Bruya, Jackson and Garland, Study 2, 1987 - improve 40	Sport	20	41	.22	
Weinberg, Bruya, Jackson and Garland, Study 2, 1987 - improve 60	Sport	21	41	.17	
Weinberg, Bruya, Longino and Jackson, 1988 - long term	Sport	20	58	.48	
Weinberg, Bruya, Longino and Jackson, 1988 - long term plus short term	Sport	20	59	.54	
Weinberg, Bruya, Longino and Jackson, 1988 - short term	Sport	20	58	.81	
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 1, 1991 - improve 20	Sport	21	62	-.30	
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 1, 1991 - improve 40	Sport	21	62	-.17	
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 1, 1991 - improve 60	Sport	21	62	-.31	
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 2, 1991 - difficult goals	Sport	5	20	-.28	
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 2, 1991 - easy goals	Sport	5	20	.00	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 2, 1991 - improbable goals	Sport	5	20	-.32	
Weinberg, Fowler, Jackson, Bagnall and Bruya, Study 2, 1991 - moderate goals	Sport	5	20	.24	
Weinberg, Stitcher and Richardson, 1994	Sport	12	12	.00	R, B
West, Welch and Thorn. 2001 - older adults	Cognitive	38	38	.33	C
West, Welch and Thorn. 2001 - younger adults	Cognitive	34	34	.47	C
White, Kjelgaard and Harkins, Study 1, 1995 - experimenter assigned	Cognitive	9	27	.26	
White, Kjelgaard and Harkins, Study 1, 1995 - experimenter suggested	Cognitive	9	27	.26	
White, Kjelgaard and Harkins, Study 1, 1995 - self-set	Cognitive	9	27	.26	
White, Kjelgaard and Harkins, Study 2, 1995 - assigned 30	Cognitive	18	36	.46	
White, Kjelgaard and Harkins, Study 2, 1995 - assigned 40	Cognitive	18	36	.46	
White, Kjelgaard and Harkins, Study 3, 1995 - assigned 30	Cognitive	18	36	.46	
White, Kjelgaard and Harkins, Study 3, 1995 - assigned 40	Cognitive	18	36	.46	
White, Mitchell and Bell, 1977	Cognitive	52	52	.11	

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Whitney, 1994 - difficult goal/ high efficacy	Cognitive	9	18	.07	
Whitney, 1994 - difficult goal/ moderate efficacy	Cognitive	9	18	1.36	
Whitney, 1994 - moderate goal/ high efficacy	Cognitive	9	18	-.52	
Whitney, 1994 - moderate goal/ moderate efficacy	Cognitive	9	18	.05	
Wilson and Brookfield, 2009 - outcome goal	Health	15	15	.00	R
Wilson and Brookfield, 2009 - process goal	Sport	15	15	1.20	R
Winters and Latham, 1996 - outcome/ complex task	Cognitive	9	19	.49	
Winters and Latham, 1996 - outcome/ simple task	Cognitive	9	19	.96	
Winters and Latham, 1996 - learning/ complex task	Cognitive	9	19	.85	
Winters and Latham, 1996 - learning/ simple task	Cognitive	9	19	.64	
Wurtele, Galanos, and Roberts, 1980 - verbal commitment	Keeping appointment	326	629	.20	C
Wurtele, Galanos, and Roberts, 1980 - written commitment	Keeping appointment	326	664	.24	C

Authors	Behavior	N_c	N_e	d	Goal related BCTs
Zagumny and Johnson, 1992	Cognitive	22	22	-.25	

Note. $N_c = n$ for control condition; $N_e = n$ for experimental condition; BCTs = behavior change techniques; C = commitment, R = review of behavioral or outcome goals; B = behavioral contract; F = feedback

Table S2

Potential Moderators of the Effect of Goal Setting on Behavior

	k	k Yes	N	β	SE	CI	I^2	$Adj R^2$
Sample								
Gender (% Female)	268	n/a	12299	-.01	.00	-.01 to -.00	73.67	3.34
Age	123	n/a	5322	-.01	.00	-.02 to -.00	59.53	8.31
Ethnicity white (%)	19	n/a	1175	.00	.00	-.01 to .01	64.19	-8.31

	<i>k</i>	<i>k Yes</i>	<i>N</i>	β	<i>SE</i>	<i>CI</i>	<i>F</i> ²	<i>Adj R</i> ²
Ethnicity black (%)	13	n/a	749	-.00	.00	-.01 to .01	61.51	-8.95
Ethnicity Hispanic (%)	13	n/a	749	.01	.02	-.04 to .06	55.95	-4.96
Ethnicity Asian (%)	13	n/a	749	.08	.02	.03 to .13	13.40	90.02
Sample is university students	375	258	16159	-.25	.07	-.40 to -.10	68.04	3.22
Sample is school children	375	51	16159	.27	.10	.07 to .47	68.08	1.96
Sample is general population	375	45	16159	.36	.11	.15 to .56	67.94	4.21
Goal Setting intervention								
Goal is outcome (1.3)	383	271	16500	-.12	.08	-.27 to .03	67.93	0.84
Goal is behavior (1.1)	383	116	16500	.12	.07	-.03 to .27	67.94	0.82
Goal based on external standard	383	276	16500	-.04	.08	-.09 to .11	67.94	-0.11
Goal based on participant's current status	383	112	16500	.02	.08	-.13 to .17	68.07	-0.27
Goal number	379	n/a	16281	-.01	.03	-.08 to .05	38.50	-0.50
Goal repetition	378	n/a	16254	-.00	.00	-.01 to .00	68.53	-0.02

	<i>k</i>	<i>k Yes</i>	<i>N</i>	β	<i>SE</i>	<i>CI</i>	<i>F</i> ²	<i>Adj R</i> ²
Goal difficulty	244	n/a	10025	.18	.06	.06 to .30	71.78	3.30
Task complexity	225	n/a	9146	-.01	.02	-.04 to .03	54.29	-0.80
Commitment measured	384	74	16523	-.19	.09	-.36 to -.02	67.94	1.41
Behavior change techniques								
Behavioral practice / rehearsal (8.1)	384	265	16523	-.05	.07	-.19 to .10	68.14	-0.39
Feedback (2.2, 2.7)	384	154	16523	-.11	.07	-.25 to .02	68.05	0.36
Instruction on how to perform the behavior (4.1)	384	65	16523	.03	.09	-.14 to .21	68.14	-0.43
Self-monitoring of behavior or outcome (2.3; 2.4)	384	45	16523	.12	.11	-.09 to .33	37.88	0.27
Demonstration of the behavior (6.1)	384	38	16523	.13	.12	-.11 to .36	68.10	-0.08
Monitoring of behavior or outcomes by other without feedback (2.1; 2.5)	384	22	16523	.60	.14	.32 to .88	67.38	5.31
Social comparison (6.2)	384	17	16523	-.21	.17	-.56 to .13	68.07	0.12
Number of behavior change techniques	384	n/a	16523	.01	.03	-.04 to .07	68.12	-0.37

	<i>k</i>	<i>k Yes</i>	<i>N</i>	β	<i>SE</i>	<i>CI</i>	<i>F</i> ²	<i>Adj R</i> ²
Control								
“Do your best”	384	253	16523	-.00	.07	-.14 to .14	68.14	-0.45
Intervention / measurement only	384	120	16523	-.00	.07	-.15 to .14	68.14	-0.45
Delivery								
Other verbalizes goal	267	103	11178	-.03	.06	-.15 to .09	43.04	-0.47
Other writes goal	267	87	11178	-.01	.06	-.13 to .11	43.04	-0.85
Participant writes goal	267	54	11178	.04	.07	-.10 to .18	42.77	0.12
Goal is set privately but intervention deliverer knows	255	108	10894	-.14	.09	-.32 to .04	70.83	0.46
Goal is set privately	255	89	10894	-.18	.09	-.36 to .01	70.67	1.16
Goal is set publicly	255	58	10894	.41	.10	.20 to .61	69.96	6.50
Individual goal	384	349	16523	-.29	.12	-.53 to -.05	67.68	1.94
Group goal	384	48	16523	.48	.10	.28 to .68	66.76	7.26
Other set goal	383	290	16500	.12	.08	-.04 to .28	67.95	0.69

	<i>k</i>	<i>k Yes</i>	<i>N</i>	β	<i>SE</i>	<i>CI</i>	<i>F</i> ²	<i>Adj R</i> ²
Self set goal	383	74	16500	-.16	.09	-.33 to .01	67.79	1.38
Collaboratively set goal	383	69	16500	-.17	.09	-.34 to .01	67.78	1.38
Timing of goal is proximal	380	324	16440	-.09	.10	-.29 to .10	68.19	-0.05
Timing of goal is distal	380	70	16440	.08	.09	-.10 to .25	68.18	-0.09
Intervention delivered by researcher	276	215	11057	.13	.10	-.06 to .32	64.72	-0.43
Intervention is delivered by an instructor	276	27	11057	.09	.13	-.17 to .34	64.64	-0.36
Intervention was not delivered in person (e.g., online, computerized)	276	20	11057	-.46	.15	-.76 to -.16	63.86	3.52
Setting is university	345	247	14383	-.23	.08	-.38 to -.08	64.61	3.28
Setting is school	345	47	14383	.23	.10	.04 to .43	64.64	1.60
Setting is workplace	345	30	14383	.44	.12	.20 to .69	64.34	5.11
Interval between goal setting and measurement of outcome	378	n/a	16285	.00	.01	-.01 to .01	68.41	-0.48

	<i>k</i>	<i>k Yes</i>	<i>N</i>	β	<i>SE</i>	<i>CI</i>	<i>I</i> ²	<i>Adj R</i> ²
Quality								
Attrition	288	n/a	12323	-.00	.01	-.02 to .01	71.51	-0.46
Peer Reviewed	384	346	16523	.09	.12	-.16 to .33	68.12	-0.23
Randomization Rating	384	n/a	16523	-.35	.26	-.86 to .16	68.08	-0.22
Blind Rating	384	n/a	16523	.09	.12	-.16 to .33	68.12	-0.18
Attrition Rating	384	n/a	16523	-.02	.04	-.09 to .05	38.01	-0.15
Date of study / publication date	384	n/a	16523	.00	.00	-.00 to .01	68.11	-0.55

Note. *k* = number of studies; *k Yes* = the number of studies that were coded positively for the attribute; *N* = number of participants; β = regression coefficient; *SE* = standard error; *CI* = confidence interval; *I*² = extent of heterogeneity; *Adj R*² = % of heterogeneity explained by the covariate.

Table S3

The Effect of Type of Outcome Measure and Type of Behavior on the Effect of Goal Setting on Behavior

	<i>k</i>	<i>N</i>	<i>d</i>	<i>CI</i>	<i>Q</i>	<i>I</i> ²
Correspondence between goal and dependent variables						
Directly related to goal	337	14451	.37	.31 to .44	1019.86***	61.7
Indirectly related to goal	99	4514	.18	.05 to .31	359.77***	72.8
Marginally related to the goal	5	176	.10	-.21 to .40	0.40	00.0
Goal setting and complementary behavior change techniques						
Feedback	25	1071	.01	-.27 to .29	105.15***	77.2
Commitment	27	5751	.20	.14 to .26	28.24	7.90
Review of behavior or outcome goals	12	343	.17	-.05 to .40	11.70	06.0
Contract	21	791	.11	-.09 to .30	29.84	33.0
Behavior						

Cognitive	188	8839	.28	.23 to .32	864.56***	78.4
Sport	83	3162	.41	.33 to .49	144.77***	43.4
Production	25	610	.36	.19 to .52	13.06	00.0
Health	21	1149	.44	.31 to .56	38.37**	47.9
Education	21	856	.30	.16 to .44	36.41*	45.1
Profit	11	254	.22	-.06 to .49	24.28**	58.8
Job related goal	6	173	-.11	-.66 to .43	11.57	56.8
Reaction time	6	121	.32	-.07 to .70	6.23	19.8
Social issues	5	276	.23	-.01 to .47	11.43*	65.0
Performance on video game	4	300	-.10	-.34 to .14	1.20	00.0
Miscellaneous	4	192	-.18	-.48 to .13	1.43	00.0
Negotiation	4	120	.18	-.19 to .54	8.01	62.6
Environmental	2	65	.57	.07 to 1.07	0.00	00.0
Keeping appointment	2	317	.26	.03 to .49	0.16	00.0
Motor function	2	89	.27	-.15 to .69	1.27	21.2

Note. k = number of studies; N = number of participants; d = effect size; CI = confidence interval; Q = heterogeneity statistic; I^2 = extent of heterogeneity.

Figure S1

Funnel Plot

