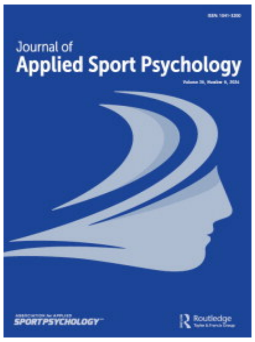

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How do goal orientations and motivational climate interact to affect short-term performance and self-confidence in sport? A test of the matching hypothesis across three studies

Kasey Philyaw[a,b], Judith Covey[b], and Daniel T. Smith[b]

[a]Hope International University, Fullerton, USA; [b]Durham University, Durham, UK

ABSTRACT

Achievement Goal Theory (AGT) is an interactionist theory that predicts that motivation is determined by the interaction of dispositional goals and the motivational climate. The 'matching hypothesis' predicts that that motivation is optimal when there is congruency between dispositional goal orientation (DGO) and motivational climate (MC). The matching hypothesis is tacitly accepted as an important element in goal setting interventions by many practitioners, but few studies have tested the short-term motivational effects of matching on sport tasks. This issue was addressed by examining the interaction between DGO and MC on objective measures of performance of 138 advanced athletes (Experiment 1) and 139 recreational athletes (Experiment 2) on a 400 m run, and on 154 recreational athletes' ability to shoot basketball free-throws (Experiment 3). Moderated hierarchical regression revealed that the ego MC improved performance of more advanced athletes by 2 seconds, irrespective of their DGO (Experiment 1) and improved performance of recreational athletes by 2.4 seconds, unless the athletes had both high task and low ego DGO (Experiment 2). The MC had no effect on free-throw performance, but the ego MC significantly reduced confidence (Experiment 3). The facilitatory effect of ego climate on performance was mediated by the value athletes attached to ego goals, such that bigger improvement was seen in athletes who most valued ego goals. The parsimonious interpretation of these data is that aligning MC with DGO does not optimize short-term motivation. However, an ego MC can elicit enhanced performance in short duration tasks that rely on cardiovascular effort.

Lay summary: Many coaches, athletes and psychologists believe that sportspeople perform best when aspects of the environment are aligned with the athletes' personality. Contrary to this belief, we found that 400 m runners ran faster when the environment promoted competition, even when they preferred noncompetitive environments. Alignment between environment and personality made no difference to free-throw performance in basketball players, and the competitive environment undermined players self-confidence, even when they preferred a competitive environment. Matching environment to personality is not necessary to produce best

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CONTACT Daniel T. Smith daniel.smith2@durham.ac.uk Dept of Psychology, Durham University, South Road, Durham, DH1 3LE, UK.

performance. However, placing athletes in an environment that promotes competition can be beneficial for short duration tasks that rely on cardiovascular effort.

IMPLICATIONS FOR PRACTICE

- It is not necessary for coaches to match motivational climate with dispositional goals to optimize performance in 400m running or free throws
- Ego-oriented goals might be useful when the aim of the activity is to get the athlete to exert maximum effort in the short term
- Ego-oriented goals may also be valuable for people doing short but intense exercise activities such as HIIT
- The athlete must value the achievement of an ego-oriented goal as a valid measure of competence to obtain the maximum benefit of the ego-oriented goal.
- Ego-oriented goals may not be appropriate for low-confidence athletes or tasks that require a high degree of precision such basketball free throws
- The use of short term, ego-oriented goals during training should be carefully balanced with other goal types to ensure the benefits of a task MC are maintained for long-term motivation.

Introduction

Lay psychological beliefs often make the assumption that optimal psychological functioning on a given task is only possible when aspects of the task align with a person's personality. For example, the widely held but discredited idea of 'learning styles' holds that optimal learning occurs when material is presented in a way that aligns with the learners' preferences. This assumption can also be found in psychological theories in the form of 'person-environment fit' perspective (Buch et al., 2016; Pervin, 1968) also referred to as the 'matching hypothesis' (Newton & Duda, 1999). The matching hypothesis holds that motivation is optimal when the environmental cues signaling what criterion should be adopted to evaluate mastery (the motivational climate; MC), aligns with an athlete's dispositional goal orientation (DGO) or beliefs about what constitutes successful demonstration of competence (i.e., the types of goals a person will spontaneously adopt in achievement settings). However, while there is good evidence for the validity of the matching hypothesis in domains such as the workplace and education (Barron & Harackiewicz, 2001; Kristof-Brown & Stevens, 2001; Murayama & Elliot, 2009) the evidence for its usefulness in the domain of sport and exercise psychology is less clear cut.

In the domain of sport and exercise psychology utility of the matching hypothesis for promoting long term flourishing has been explored within the context of achievement goal theory (AGT: Duda & Nicholls, 1992; Harwood et al., 2015; Lochbaum & Sisneros, 2024; Nicholls, 1984). AGT proposes two broad DGOs which describe the types of goals a person will spontaneously adopt in achievement settings. Task DGO reflects a propensity to adopt self-referential goals, such that success is evaluated with respect to effort, enjoyment, or skill acquisition. In contrast, ego DGO reflects a propensity to adopt externally referential goals such as relative placing, winning, social status and the acquisition of rewards such money or prizes. Task DGO is positively associated with a number of psychological processes associated with success and enjoyment of sport, including sport satisfaction (Balaguer et al., 1999; Smith et al., 2006), intrinsic motivation (Duda, 1989) and sport confidence (Machida et al., 2012; Magyar & Feltz, 2003). In contrast, ego DGO is associated with more maladaptive psychological states including lower confidence, higher anxiety, and lower long-term motivation (Hall & Kerr, 1997; Hogue, Fry, Fry, & Pressman, 2013; Ntoumanis & Biddle, 1998; Ommundsen & Pedersen, 1999). These DGOs are orthogonal (Lochbaum et al., 2016; Treasure & Roberts, 1998), so it is possible to have a high propensity to adopt both task and ego goals. However, a widely held view is that task DGO fosters more positive motivational, affective, and behavioral states than ego DGO (Newton & Duda, 1999).

AGT further proposes that DGO interacts with motivational climate (MC) which is the social or environmental situation created by the teacher or coach. The MC can be divided into two different types: a mastery or task-oriented MC where the emphasis is on the mastery of skills and trying hard, and a performance or ego-oriented MC where the emphasis is on comparisons with and performing better than others (Ames, 1995). A task MC can enhance athletes' enjoyment, and engagement in sport, whereas an ego MC can increase anxiety and reduce self confidence (Cecchini et al., 2004; Curran et al., 2015; Fry et al., 2021; Hogue et al., 2013; Machida et al., 2012; Magyar & Feltz, 2003; Morales-Sánchez et al., 2022; Ntoumanis & Biddle, 1998; Pensgaard & Roberts, 2000). Given the apparently beneficial effects of task MC and maladaptive effects of ego MC for long-term motivation and affect the matching hypothesis has been largely rejected in favor or emphasizing the utility of creating a task-oriented climate (Curran et al., 2015; Fry et al., 2021; Harwood et al., 2015; Lochbaum & Sisneros, 2024; Newton & Duda, 1999).

However, while the matching hypothesis may not be tenable for enhancing long term motivation, it remains possible that acute motivational gains can be achieved by aligning the motivational climate with an athlete's DGO during a specific or one-off sports activity. Indeed, prior studies of the long-term motivational consequences of matching MC and DGO in sport and exercise primarily focus on affect, intentions and other mental states, rather than objective measures of sports performance. From a theoretical perspective it might be predicted that congruency between MC and DGO reinforces the individual's perception that achieving the goal demonstrates competence, so the person is likely to attribute a high 'subjective task value' to the goal which will increase effort, and therefore improve performance in the short term (Eccles et al., 2005). In contrast, incongruency between MC and DGO will lower subjective task value, reduce effort, and compromise performance because it undermines the perception that achievement is a demonstration of competence. From a practical perspective the possibility that acute motivational gains can be achieved using a strategy of matching MC with an athlete's DGO using techniques such as goal setting would be valuable for coaches trying to extract maximum effort from their athletes in one-off sports activities (e.g. in a particular race or training activity such as HIIT).

To-date the results of the small number of studies that have examined interactions between MC and DGO on performance in one-off sporting activities are not consistent (Brockbank, 2022; Buch et al., 2016; Tok et al., 2020). Buch and colleagues reported that congruence between the perceived MC and DGO was positively associated with better aerobic performance measured in the form of VO_{2max} in a physical fitness task on a treadmill in Norwegian army cadets. In accordance with predictions derived from

AGT they reported that the effect of a mastery (task) climate on VO_{2max} was stronger in army cadets with a high mastery (task) orientation and low performance (ego) orientation, whereas the effect of a performance (ego) climate was stronger in cadets with a high performance (ego) orientation and low mastery (task) orientation. These data seem consistent with the person-environment fit perspective, but it should be noted that this sample was predominantly male (90%) and composed of army cadets who were exercised to exhaustion. These factors mean some caution is necessary when generalizing to other tasks and groups such as females or more expert athletes. Furthermore, Buch and colleagues analyzed the cadets' perceptions of the motivational climate rather than directly manipulating the MC, so the study did not speak directly to the effect of acute, experimental manipulations of MC on performance.

Subsequent experiments conducted by Tok et al. (2020) and Brockbank (2022) partially addressed some of these issues by experimentally manipulating the MC in more diverse samples. Contrary to Buch et al. (2016), Tok et al. (2020) report that inducing an ego MC increased the maximal voluntary muscle contraction (MVC) in a bicep curl task whereas task MC reduced MVC, but no matching effect was found. Similarly, Brockbank (2022) found that inducing an ego MC enhanced performance of amateur athletes on computer-based and BATAK-style agility tasks, compared to a task MC.

On first inspection these studies seem to suggest that a person-environment fit does not necessarily produce optimal athletic performance. However, some caveats should be considered before rejecting the matching hypothesis on the basis of these studies. Firstly, although Tok et al. (2020) achieved a better gender balance than Buch et al. (2016) they did not explicitly assess the goals of the participants, so it is unclear how effective their manipulation was at inducing the desired goal states. Secondly, the sample reported by Tok et al. (2020) is rather small (n = 53, divided into two groups) compared to that of Buch et al. (2016) (n = 123), which raises the possibility that the study was underpowered to detect three-way interactions between task DGO, ego DO and MC. Brockbank (2022) addressed some of these methodological issues by recruiting a larger sample than Tok et al., (n = 98), utilizing a within-participants design and reporting the effect of instructions on goal adoption. Similar to Tok et al. (2020), they reported beneficial effects of an ego instruction but no matching effect. However, closer inspection of data in chapters 4 and 5 of their thesis indicates the presence of a weak matching effect for participants with high performance (ego) DGO when given performance-oriented instructions, which is more similar to the findings of Buch et al. (2016). Finally, none of the studies examined matching effects in expert or advanced athletes. This is an important issue as because advanced athletes are likely to have high task DGO and high ego DGO, and place high value on outperforming others as an indicator of competence (Mallett & Hanrahan, 2004). Indeed, Mallett and Hanrahan (2004) argue that, for these athletes, achievement of ego-oriented goals provides feedback on competence. As a result they promote an internal locus of control and therefore enhance intrinsic motivation. In this case one might predict that matching an ego climate to ego DGO will increase motivation and therefore performance.

To summarize, of the three previous studies that tested the matching hypothesis in the context of acute motivation, Buch et al. (2016) found strong evidence for the matching hypothesis for short term motivation in run-to-exhaustion task, Brockbank (2022) reported weak matching effect for people with high ego DGO and relatively low task DGO in an agility task, and Tok et al. (2020) reported an advantage for ego-oriented climate using a strength task. Given the heterogeneity of the methods, samples and findings it remains unclear whether compatibility between induced MC and DGO produces benefits for short-term motivation and sports performance in expert athletes.

The primary purpose of the three experiments reported in this paper was therefore to conclusively establish whether a matching effect could be observed in a more diverse sample of athletes completing more ecologically valid tasks. Experiments 1 and 2 used a task that relied on cardiovascular effort, but was designed to more closely mimic a real athletics environment than prior studies: a 400 m run on a track. The experiments were conducted on either expert (Experiment 1) or recreational (Experiments 2 and 3) athletes. Experiment 3 used an ecologically valid basketball free-throw shooting task. This task was included to examine the extent to which results of Experiment 1 and 2 generalized beyond running to a task that required motor skill, agility and coordination rather than cardiovascular effort.

As noted earlier, ego-oriented climates are associated with increased anxiety (Lochbaum & Sisneros, 2024) and reduced confidence (Morales-Sánchez et al., 2022; Papaioannou & Kouli, 1999). Confidence is hypothesized to be an important factor in mediating the effect of competitive state anxiety on performance (Burton, 1998; Craft et al., 2003; Hanton et al., 2004; Lochbaum et al., 2022; Martens et al., 1990), but few studies have measured the mediating effect of self-confidence on the relationship between MC and performance. A secondary goal of Experiment 3 was to use an exploratory mediation analysis to evaluate the extent to which the effect of MC on performance was mediated by self-confidence.

Critically all three Experiments used a mixed design in which the MC was manipulated on a within-participant basis. This type of goal setting approach has been shown to successfully modulate perceptions of MC in an athletics context (Standage et al., 2007) and was well suited to our goal of establishing the impact of short-term manipulations of the congruency of DGO and MC on athletes' performance.

The athletes' task DGO and ego DGO scores were treated as moderator variables. In all three Experiments we measured participants performance at the task. In Experiments 1 and 2 the athletes' performance was measured in terms of their 400 m run-time in seconds (to nearest hundredth of a second) and in Experiment 3 the basketball players' performance was measured in terms of their free throw success rate.

It was predicted in line with the matching hypothesis that the DGO would moderate the effects of the MC on performance, such that (i) ego MC will be more beneficial to performance relative to task MC in those who are high in ego DGO and relatively low in task DGO, and (ii) task MC will be more beneficial to performance relative to ego MC in those who are high in task DGO and relatively low in ego DGO.

As noted previously it was argued that congruency between MC and DGO improves performance as a result of the athletes attributing a higher subjective task value on the goal and putting in more effort. This mechanism was explored in all three Experiments through mediation analysis whereby we assessed the extent to which any changes in performance due to the manipulation of MC could be explained by changes in subjective task value. In Experiment 3 where the performance was skill rather than effort-based we also examined the mediating effects of self-confidence.

Method

Participants

The minimum required sample size for these Experiments (N = 138) was based on a power calculation using G*Power for the post-hoc paired t-tests between the ego and task MC conditions that would need to be conducted if the predicted three-way interactions from mixed ANOVAs were statistically significant at alpha .05 with .8 power. The effect size used for our sample size calculation (d = 0.43) was informed by research conducted for the first author's (KP) previous master's degree.

Experiment 1 (400 m sprint/advanced athletes)

One hundred and forty professional or semiprofessional level athletes took part in Experiment. Following the framework proposed by Lochbaum and Sisneros (2024) these athletes were classified as 'Advanced'. They were aged between 18-30 years (M = 21.7, SD = 2.4); 91 were male and 49 were female. They were competing in American Division 1 universities (N = 72), Team Durham 1st teams (N = 66) or Team GB (N = 2). Athletes were from a range of sports including basketball (N = 40), volleyball (N = 32), baseball (N = 26), softball (N = 21), American football (N = 15), water polo (N = 2), rowing (N = 2), surfing (N = 1), and lacrosse (N = 1).

Experiment 2 (400 m sprint/recreational athletes)

One hundred and forty recreational athletes took part in Experiment 2. They were aged between 18 and 68 years (M = 25.2, SD = 9.62); 70 were male and 70 were female. They were recruited from recreational sports clubs, including a runner's club (N = 21), Zumba class (N = 5), UFC gym members (N = 18) and a range of intramural sports clubs including basketball (N = 43), volleyball (N = 27), football (N = 20), and ultimate frisbee (N = 6). Following Lochbaum and Sisneros (2024) these athletes were classified as 'Recreational'.

Experiment 3 (basketball free throws)

One hundred and fifty-four Durham University basketball players from all levels (college and university 1st, 2nd and 3rd teams) took part in Experiment 3. They were aged between 18 and 27 years (M = 21.26, SD = 2.30); 76 were male and 77 were female (1 participant did not provide their gender). Following Lochbaum and Sisneros (2024) these athletes were classified as 'Recreational'

All three Experiments were approved by the Department of Psychology Ethics Committee at Durham University (Experiment 1 Ref 15/22, Experiment 2 Ref 16/22a; Experiment 3 Ref PSYCH-2019-04-23T20_45_45-cmkc76).

Measures

Dispositional goal orientation (DGO)

In all three Experiments the athletes' DGO was measured using the Task and Ego DGO in Sport Questionnaire: TEOSQ (Duda, 1989). Previous reliability and validity tests of the TEOSQ concluded the test is useful and appropriate as a measure of DGO in athletes (Whitehead & Duda, 1998). Cronbach's alpha coefficient scores from all Experiments demonstrated high internal consistency for the TEOSQ's ego DGO scores (Experiment 1 $\alpha = .83$; Experiment 2 $\alpha = .80$; Experiment 3 $\alpha = .85$) and task DGO scores (Experiment 1 $\alpha = .86$; Experiment 2 $\alpha = .82$; Experiment 3 $\alpha = .84$).

Motivational climate (MC)

In Experiment 1 and 2 for promoting the ego MC, the participants were shown a leader board chart of either top 400 m running times (Experiments 1 and 2) or free throw makes (Experiment 3) and instructed "how high up this leader board can you come based on your current level of fitness? Set yourself someone to beat off this leader board." (Experiments 1 and 2) or "how high up this leaders' board can you come based on your ability? Please focus on how many free throws you can make" (Experiment 3). As ego MCs are defined as elements of social-comparison and competition, these instructions focused the participants on the objective of referencing their goal in terms of beating others. For promoting the task MC, the instruction was "how fast can you run based on your current level of fitness? Set yourself a good time to beat" (Experiments 1 and 2) or "do your best with the free throws. Please focus on good technique and consistent form" (Experiment 3). As task MCs are defined as efforts to strive for personal bests and self-improvement, these instruction focused the participants on setting a self-referenced goal.

Performance

In Experiments 1 and 2 the primary outcome measure of performance on the 400 m sprint was measured by the time, in seconds to the hundredth, taken to run a single 400 m lap on a standard running track. Two secondary outcome measures were obtained of the athletes' level of exertion during the run. An objective measure of their peak heart rate during the 400 m sprint using a Wahoo TICKR X Heart Rate Monitor, and a subjective measure of exertion using the Borg Rating of Perceived Exertion (RPE) Scale (Borg, 1998). The results from these secondary outcome measures are reported in KP's doctoral thesis (2021).

In Experiment 3 performance on the basketball free throw task was measured by the number of successful throws out of 15.

Subjective task value (STV)

The Subjective Task Value in Sport Questionnaire (STVSQ) is an 11-item questionnaire that was created specifically for these Experiments and based on the Expectancy Value Questionnaire (Eccles et al., 2005; Eccles & Wigfield, 1995). The full questionnaire along with details of how it was created can be found in Appendix B of KP's doctoral thesis

(Philyaw, 2021). Question 1 was a free response question, "What is your goal?" This allowed us to establish what the athletes' adopted goals were which we expected to be a function of both their DGO and the MC. For questions 2-11, the athletes were presented with a series of statements to rate on 7-point Likert scales. Example questions include "Please rate the value you put on this goal" "How hard will you try to achieve this goal?" "How important is it to you to be successful at this goal?." Cronbach's alpha coefficient scores for the STVSQ from the Experiment 1 data in both the task instruction (α = .822) and ego instruction (α = .867) conditions demonstrated high internal consistency. The subjective task value (STV) score was therefore based on the average rating across all 10 items.

Self-confidence

In Experiment 3 the Competitive State Anxiety Inventory-2 Revised (CSAI-2R) (Cox et al., 2003) was used to measure participants' level of self-confidence in their ability to be successful. Cronbach's alpha coefficient scores for the self-confidence subscale demonstrated high internal consistency in both MC conditions (task MC α = .84; ego MC α = .90).

Procedure

Each participant took part in both the ego MC and task MC conditions of the Experiment. The two conditions were separated by about a week in Experiments 1 and 2 (Experiment 1: M = 7.38 days, SD = 0.78; Experiment 2: M = 7.72 days, SD = 1.31) and by a short break in Experiment 3. The order of the two MC conditions was counterbalanced so that in each Experiment half of the participants undertook the ego MC condition first and half undertook the task MC condition first.

The Experiments began with the participant completing the TEOSQ. After the TEOSQ had been completed, either the ego or the task instructions were read to promote the MC. The participant then completed the STVSQ to measure the value of the goal to them.

In Experiments 1 and 2 the participants were accompanied to the running track where they were fitted with the heart rate monitor and given free range to stretch and warm-up if desired. The participant was then read the task or ego instructions again. They then ran the 400 m lap. Their finishing time in seconds to the nearest hundredth and peak heart rate in beats per minute from the monitor were recorded. They then filled out the Borg RPE scale. The second session followed the same procedure. The only difference was that they were asked to read whichever MC instruction they not received in the first session. Each sessions took around 15-20 minutes from start to finish.

In Experiment 3 the basketball players were read the task or ego MC instruction, completed the STVSQ, then completed the CSAI-2R to measure their level of competitive anxiety and self-confidence. They were permitted 5 warm up shots before they performed their 15 basketball free throw shots. Following a short break they received the ego or task MC instruction they had not received yet and the procedure was repeated. It took approximately 15-20 minutes to complete the Experiment.

Data analysis

The data collected from the performance measure was examined for outliers. Outliers were defined as participants whose difference in run-times or number of basketball shots, between their first and second condition, were greater than 3 standard deviations above or below the mean difference. Using a set number of standard deviations to detect outliers is considered one of the most popular detection methods (Tabachnick & Fidell, 2013). The decision to detect and remove outliers at this level was done to account for things such as incident, injury or change of weather conditions in between the MC conditions that could have drastically impacted performance beyond the scope of the Experiment. This was particularly important for the 400 m runs which were undertaken one week apart and subject to outdoor weather conditions. This process led to the exclusion of one participant from Experiment 1, two participants from Experiment 2, and no participants from Experiment 3.

To test our predictions, hierarchical multiple regression analyses were undertaken on each dependent variable using the MIXED linear model command in SPSS. To account for clustering in the data Participant ID was set as a random 'subject' variable. The type of MC instruction, ego DGO and task DGO were modeled as fixed effects. The effect coded MC instruction variable (i.e., ego MC = −1, task MC = 1) was entered in step 1; mean centered ego DGO and task DGO scores were entered in step 2; all possible two-way interaction effects were entered in step 3 (i.e., ego DGO x task DGO, instruction x ego DGO and instruction x task DGO); and the three-way interaction term was entered in step 4 (instruction x ego DGO x task DGO). Three-way interactions were then analyzed using simple slope analysis. Predictors were effect coded or mean centered to provide us with true estimates of the main effects when interaction terms were included in the model.

To explore mediation effects from a repeated measures or within-participant design we adopted the path analytic framework proposed by Montoya and Hayes (2017) to estimate the extent to which subjective task value and self-confidence acted as mechanisms by which the MC instruction affects performance. Their approach draws upon the methods set out by Judd et al. (2001) for testing mediation in designs like ours where the same individuals are measured on the mediator (M) and dependent variable (Y) in each of two conditions (X). Montoya and Hayes (2017) have translated the mathematics of the Judd et al. (2001) method into a path-analytic form shown in Figure 1. This approach yields a formal estimate of the indirect effect (i.e., $a \times b$) that, for two-condition within-participant designs like ours, can either be implemented using the PROCESS macro for SPSS and SAS introduced by Hayes (2013) (www.processmacro.org), or the dedicated MEMORE (MEdiation and MOderation analysis for REpeated measures design) macro (www.afhayes.com). We used PROCESS in SPSS.

Results

Outliers

In Experiment 1 one outlier (the difference in run-time between their first and second run was greater than 3 standard deviations above the mean difference) was identified

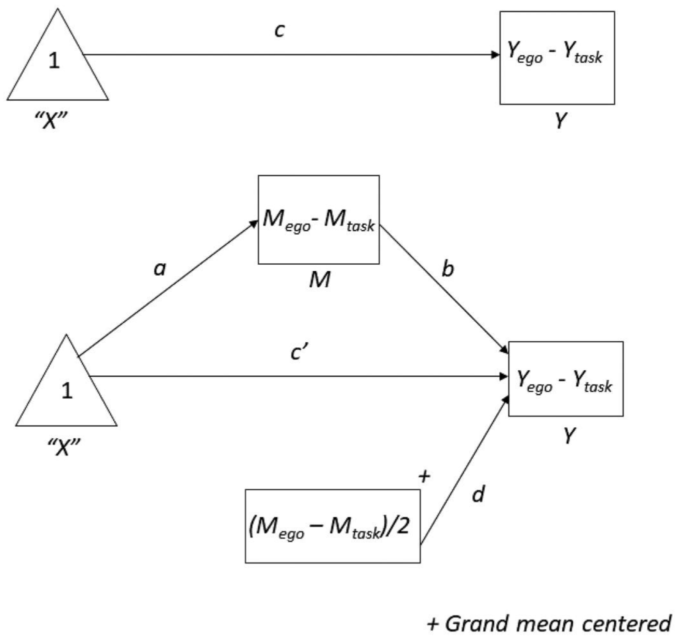

Figure 1. Path-analytic form of within-participant mediation analysis (adapted from Montoya & Hayes, 2017).

and removed, reducing the overall sample size from 140 to 139. Two outliers were detected and removed in Experiment 2 reducing the sample size from 140 to 138. No outliers were detected in Experiment 3.

Goal adoption

For the free response question of the STVSQ, "What is your goal?" it was determined that the majority of participants responded respond with a goal congruent to the instruction they were given. For the ego MC instruction condition, chi-square goodness of fit tests confirmed a statistically significant difference in the type of goal set with the majority of participants setting ego goals (≥ 68.3%) (Experiment 1 $X^2(3, N = 139) = 162.8$, $p < .001$; Experiment 2: $X^2(3, N = 138) = 218.3$, $p < .001$; Experiment 3 $X^2(2, N = 154) = 147.91$, $p < .001$). For the task MC instruction condition, a chi-square goodness of fit test also confirmed a statistically significant difference in the type of goal set with the majority of participants setting task goals (≥65.9%). (Experiment 1 $X^2(3, N = 139) = 186.15$, $p < .001$; Experiment 2 $X^2(3, N = 138) = 136.73$, $p < .001$; Experiment 3 $X^2(1, N = 154) = 72.96$, $p < .001$)

Descriptive statistics

In Experiment 1 participants' average ego orientation score was M = 3.06 (SD = 0.83) and average task orientation score was M = 4.42 (SD = 0.52). In Experiment 2 participants' average ego orientation score was M = 2.88 (SD = 0.83) and average task orientation score was M = 4.25 (SD = 0.61). In Experiment 3 participants' average ego orientation score was M = 3.05 (SD = 0.84) and average task orientation score was M = 4.16 (SD = 0.60). Table 1 shows descriptive statistics (means, standard deviations, and paired samples effect sizes) for the ego and task MC conditions for subjective task value and performance for Experiments 1 – 3, and confidence for Experiment 3.

Hierarchical multiple regression analyses

The results of the hierarchical multiple regression analyses conducted on the data from the three Experiments are shown in Tables 2-4. Main effects and interactions not involving the factor of Instruction are not shown in these tables because they are not of relevance to our hypotheses but are available in KP's doctoral thesis (Philyaw, 2021) and at https://osf.io/spmdh/.

As shown in Table 1 the three-way instruction x ego DGO x task DGO interaction on performance predicted by hypotheses (i) and (ii) was only significant in Experiment 2 ($b = -1.77$, $t(134) = -2.53$, $p = .013$). There was no support for the hypotheses in Experiments 1 or 3. Performance on the 400 m run by expert athletes and basketball throw task was not significantly better in the ego MC condition in those who were high in ego DGO and low in task DGO (hypothesis i), and similarly performance was not

Table 1. Descriptive statistics for Experiments 1–3.

Measure	Expt 1 (expert) Run-time (s) N = 139			Expt 2 (recreational) Run-time (s) N = 138			Expt 3 (recreational) Number of Successful Free-throws N = 154		
	Ego MC	Task MC	Cohen's d	Ego MC	Task MC	Cohen's d	Ego MC	Task MC	Cohen's d
Performance	81.03 (14.6)	83.13 (14.5)	−0.22	82.49 (19.1)	84.96 (19.3)	−0.58	9.82 (3.31)	10.03 (2.89)	−0.08
Subjective Task Value	4.14 (0.98)	4.25 (0.86)	−0.13	4.24 (0.91)	4.94 (0.88)	−0.91	4.90 (0.78)	4.97 (0.71)	−0.14
Self confidence							27.05 (7.31)	27.99 (6.37)	−0.19

Table 2. Moderated hierarchical regression analysis for predicting performance.

Unstandardized coefficient b	Expt 1 (expert) Run-time N = 139	Expt 2 (recreational) Run-time N = 138	Expt 3 (recreational) Free-throws N = 154
Step 1			
MC[a]	−2.10*	−2.47***	−0.20
Step 2 (ego DGO and task DGO added to the model[b])			
MC	−2.10*	−2.47***	−0.20
Step 3 (All two way interaction effects added to the model)			
MC	−2.10*	−2.47***	−0.20
MC x ego DGO	−1.43	−0.27	−0.08
MC x task DGO	−1.21	1.26*	−0.40
Step 4 (Three-way interaction effect added to the model)			
MC	−2.09*	−2.40***	−0.21
MC x ego DGO	−1.44	−0.01	−0.09
MC x task DGO	−1.24	1.13	−0.39
MC x ego DGO x task DGO	0.44	−1.77*	−0.09

†p < .10, *p<.05; **p<.01; ***p<.001.
[a]A negative b coefficient means that the score on the dependent measure was lower in the ego MC condition than the task MC condition. In Experiments 1 and 2 this indicates better performance (i.e., shorter run-time) whereas in Experiment 3 a lower score indicates worse performance (fewer successful free-throws).
[b]Main effects and interactions not involving the factor of Instruction are not shown in this table.

Table 3. Simple slope analysis of the effects of MC for high and low values of task and ego DGO (i.e., @ 1 SD above and below the mean).

Unstandardized b coefficient[a]	Low task DGO	Mean task DGO	High task DGO
Expt 1			
Low ego DGO	−0.059	0.92	−1.74
Mean ego DGO	−1.47	−2.09*[b]	−2.73*
High ego DGO	−2.82†	−3.28**	−3.73*
Expt 2			
Low ego DGO	−3.97***	−2.24***	−0.87
Mean ego DGO	−3.23***	−2.40***[b]	−1.71**
High ego DGO	−2.20**	−2.70***	−2.61**
Expt 3			
Low ego DGO	0.063	−0.13	−0.32
Mean ego DGO	0.040	−0.21[b]	−0.44
High ego DGO	−0.003	−0.27	−0.56

†$p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$.

[a]In Experiments 1 and 2 unstandardized coefficients (b) represent the difference in run-times in seconds between the ego and task MC conditions. A negative value indicates a shorter run-time in the ego MC condition than the task MC condition. In Experiment 3 unstandardized coefficients (b) represent the difference in the number of successful free-throws between the ego and task MC conditions. A positive value indicates a larger number of successful free-throws in the ego MC condition.

[b]The b coefficients at the mean ego and task DGO values are the overall effects of MC reported in Table 1.

Table 4. Estimated path coefficients of the mediation models.

Mediator (M)	Total effect[a] (*c*)	Direct effect (*c′*)	*a*	*b*	Indirect effect[b] *(a x b)* [LLCI, ULCI]
Subjective task value					
Expt 1	−2.10*	−2.25**	−0.11	−1.41	0.156 [−0.092, 0.549]
Expt 2	−2.47***	−3.25***	−0.65***	−1.21*	0.783 [0.144, 1.36]
Expt 3	−0.20	−0.23	−0.07	−0.41	0.028 [−0.030, 0.107]
Self-confidence					
Expt 3	−0.20	−0.25	−0.94*	−0.05	0.045 [−0.034, 0.168]

†$p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$.

[a]The total effect (c) is equivalent to the effect of Instruction from Step 1 of moderated hierarchical regression analysis shown in Table 1.

[b]Lower and upper limits of the bootstrap 95% confidence intervals from 10,000 random samples are reported for the indirect effects. If the LLCI and ULCI do not include zero we can be 95% confident that the indirect effect does not equal zero.

better in the task MC condition in those who were high in task DGO and low in ego DGO (hypothesis ii).

Simple slopes analysis undertaken on the significant three-way interaction found in Experiment 2 (see Table 3) showed that the ego MC instruction condition produced significantly shorter run-times for the recreational athletes in all combinations of ego and task DGO apart from athletes who were low in ego DGO and high in task DGO (low task DGO/low ego DGO: b = −3.97, t(134) = 5.62, p < .001; low task DGO/high ego DGO: b = −2.20, t(134) = −2.74, p = .007; high task DGO/high ego DGO: b = −2.61, t(134) = −4.01, p < .001; low ego DGO/high task DGO: b = −0.82, t(134) = −1.20, p = .233). Although this provides some support for hypothesis (ii) in that the ego MC instruction did not benefit athletes who were high in task DGO and low in ego DGO, we were not able to demonstrate that the ego MC instruction was the most beneficial in those who were high in ego DGO and low in task DGO. The finding that the ego MC instruction was the most beneficial to those who were low in ego DGO and low in task DGO is not compatible with hypothesis (i).

It is notable that in Experiments 1 and 3 the effects of the MC instruction on performance was unrelated to the athletes' task DGO and ego DGO scores. In Experiment 1, the average run-time of all the expert athletes, irrespective of their ego or task DGO scores, was 2 seconds shorter in the ego MC condition than the task MC condition ($b = -2.10$, $t(136) = -2.58$, $p = .01$). In Experiment 3 the type of instruction did not significantly affect the number of successful free throws made by the basketball players ($b = -0.20$, $t(151) = -0.93$, $p = .352$).

Although the congruency between MC and DGO was not found to improve performance in any of the three Experiments, mediation analysis using the PROCESS macro was undertaken to evaluate the extent to which changes in performance due to the manipulation of MC could be explained by changes in subjective task value (Experiments 1 – 3) or self-confidence (Experiment 3). The estimated parameters of the mediation models and bootstrapped confidence intervals for the indirect effects are shown in Table 4.

There was no evidence that the effect of ego instruction on improving performance could be explained by the indirect effect of ego instruction on increasing either subjective task value (Experiments 1–3) or self-confidence (Experiment 3). There is actually some evidence in Experiment 2 of inconsistent mediation or a suppressor effect (MacKinnon et al., 2010). This is indicated by the significant indirect effect showing a different sign to the total effect (i.e., the total effect was negative and the indirect effect was positive). Notably the negative effect that the ego instruction had on subjective task value (path a is negative $a = -0.65$) appears to have suppressed the positive effect of the ego instruction on run-time (the total negative effect is smaller $c = -2.47$ than the direct effect $c' = -3.25$). This tells us that the ego instruction is improving the athletes' performance through mechanisms unrelated to subjective task value.

Discussion

The matching hypothesis or 'person-environment fit' perspective holds that motivation and performance increases when there is congruency between the motivational climate (MC) and an individual's dispositional goal orientation (DGO). Contrary to the matching hypothesis, moderated hierarchical regression revealed no interaction between MC and DGO for running time in the advanced athletes (Experiment 1) or for the number of free-throws (Experiment 3). There was, at best, weak support for the matching hypothesis in the experiment conducted on recreational athletes (Experiment 2). The performance on the 400 m run in athletes who had both high task DGO and low ego DGO did not improve in the ego MC condition. However, given that the benefits of an ego MC were evident even in athletes with low task DGO and low ego DGO, a more parsimonious explanation is that aligning MC with DGO is not sufficient to optimize performance and the matching hypothesis does not reliably apply to sport.

While the results of these experiments do not support the matching hypothesis, the finding that an ego-oriented MC produced better performance in a 400 m sprint would is consistent with prior experimental evidence that an ego/performance-oriented MC is positively associated with aspects of sports performance. For example, Brockbank (2022) found an advantage for performance-approach goals in a speeded agility task and Tok et al. (2020), report ego goals improve performance on a bicep curl task. The null result for free-throw performance in Experiment 3 also aligns with previous studies that report either null or negative effects of performance oriented MC on tasks that require more fine motor control, such as basketball dribbling (Cury et al., 2002; Elliot et al., 2006), dribbling a soccer ball (Chalabaev et al., 2008), dart throwing (Ntoumanis et al., 2009) and golf putting (Kavussanu et al., 2009), although the latter noted that participants practiced less in the performance climate but achieved the same level of performance as those in the mastery climate, which may suggest a subtle advantage for performance goals. Thus, it seems that a critical factor in determining the impact of an ego-oriented MC is the nature of the skill needed in the moment or the current training goal. When success depends on maximal exertion of effort an ego MC is beneficial, such as getting the most out of conditioning sprints when athletes are fatiguing. In contrast, when success relies on the execution of highly skilled motor acts, such as free-throws, an ego MC has a much weaker effect on performance.

Our results did however show that the ego MC may negatively affect potential contributors to performance on a task like basketball free-throw that relies on skill and composure under pressure. Specifically, Experiment 3 replicated the well-established finding that self-confidence predicts performance in skilled tasks (Craft et al., 2003; Lochbaum et al., 2022), irrespective of the MC. Notably, the ego MC reduced players' levels of self-confidence, although the effects on self-confidence were not strong enough to produce worse performance on average in the ego MC condition than the task MC condition. Thus, ego MC undermines confidence but does not compromise performance, suggesting that ego MC is not ideal for this task. This result suggests that other mediating factors that were not measured in this study may be offsetting the compromising effects on performance of reduced self-confidence.

Subjective task value ratings were significantly lower in the ego MC condition in Experiment 2 even though run-times were shorter in that condition. One possible explanation for the inconsistency between the subjective task value and running time data is that the subjective task value scores may be influenced by the preexisting beliefs that task-oriented goals are 'better'. The idea that a task MC is preferable and associated with more adaptive motivational patterns is widely endorsed as part of current sports coaching practice (Lochbaum & Sisneros, 2024). In other words, finding that subjective task value is higher in the task MC result might be the result of the perceived social desirability of endorsing task-oriented goals.

One potential limitation of the study is that we did not explicitly measure perceived motivational climate. While the majority participants reliably reported setting the goal that was aligned with the instruction, there were a minority of athletes who did not identify goals that corresponded with the MC instruction. There may (as Buch et al., 2016 found) have been a stronger interplay between the individual's DGO and the MC that was masked by analyzing the induced MC rather than the perceived MC. However, measuring the perceived MC at the time may have rendered the induced MC less salient during the run and our ability to draw conclusions about which type of induced MC enhances performance would have been compromised. A suggestion for future research is therefore to test whether the measurement of perceived MC impacts the potency of an induced MC using a split sample design in which half the athletes are asked to complete a measure of perceived MC directly after the MC has been induced, and the other half do not complete the measure. It might also be argued that although the task-oriented instructions used in Experiments 1 and 2 encouraged self-referential criteria for success, they also emphasized attainment of a specific performance standard, rather than focusing on effort, enjoyment and improvement. It is therefore possible that this manipulation was not sufficiently salient to provide a true test of the matching hypothesis for task-oriented goals. However, the instructions for Experiment 3 emphasized technique rather than a performance standard and found no evidence for a matching effect in the task MC. Furthermore, the ego instructions unambiguously emphasized an external, performance-based criteria of success and reliably modulated performance in Experiments 1 and 2, and confidence in Experiment 3 but did not elicit a matching effect. Therefore, it is unlikely that the data can explained solely in terms of weak goal manipulations.

A further important question that is not addressed by the current study is at what point simple and immediate ego-inducing or task-inducing goal instruction becomes part of a perceived general long-term climate. There may also be other individual difference variables which moderate the effects of the MC. It therefore remains possible that some athletes may for various reasons still respond better to a task MC than an ego MC (or vice versa) but we can confidently conclude from the results of these Experiments that their DGO is not the differentiating factor.

Conclusions and implications

Goal setting is a widely used intervention strategy by coaches and sport psychology professionals to enhance athlete motivation and performance (Bird et al., 2024). In practice, long-term interventions make use of daily, short-term MC goals to foster long-term results (Bird et al., 2024; Cecchini et al., 2014). Professional organizations such as the AASP encourage practitioners to "*keep in mind that goals should be internalized by athletes by considering athlete personality in the goal setting process (*Monsma, n.d.). In other words, the matching hypothesis is tacitly accepted as an important element in goal setting interventions by many practitioners.

The results of Experiments 1 and 2 were contrary to a strong version of the matching hypothesis in the context of AGT, as best running performance occurred when participants were exposed to the ego-oriented MC, irrespective of their DGO. In Experiment 3 the MC did not affect performance on a basketball free-throw task but did reduce self-confidence. However, there was some support for the idea that athletes need to internalize goals to gain maximum benefit, particularly in recreational athletes (Experiment 2), such that athletes who placed higher STV on ego goals ran faster than athletes who placed a lower value on ego-oriented goals. Together these data suggest that athletes and practitioners should consider personality, task and confidence when deciding whether to set ego or task-oriented goals in the short-term. An ego MC may elicit acute motivational gains for confident athletes who place a high value on the attainment of ego-oriented goals as a source of feedback on competence when performing tasks that rely on speed-endurance and power. In contrast, a task MC may be preferred when the athlete is not confident, places low value on ego-oriented goals and/or when more complex, self-paced actions are required.

How might these broad principles inform goal setting in sports and exercise settings? There is broad agreement that long term motivation, confidence, and enjoyment are fostered by task MCs (Cecchini et al., 2014), so the use of short term, ego-oriented goals during training should be carefully balanced with other goal types to ensure the benefits of a task MC are maintained. Given this caveat, ego-oriented goals might be useful when the aim of the activity is to get the athlete to exert maximum effort. In the competitive context, transition from task to ego-oriented goals in the final stages might provide a motivational 'edge' when success depends on maximum exertion. In the context of training, the use of ego-oriented goals for activities such as interval training for athletes, or in the context of exercise activities such as HIIT, may also afford more intense effort. Ego goals might also be useful when the person trains/exercises alone and so does not have teammates or other athletes around them to provide external comparators, or has a tendency to set self-referential goals that are relatively easy to achieve. However, it is important to emphasize that the athlete themself must value the achievement of an ego-oriented goal as a valid measure of competence to obtain the maximum benefit of the ego-oriented goal. These principles also suggest that ego-oriented goals may not be appropriate for low-confidence athletes, tasks that require a high degree of precision such basketball free throws, tennis serves, penalty kicks etc, or tasks where self-pacing is important to overall performance (e.g. distance running). Under these circumstances task-oriented goals are more likely to support confidence and enjoyment of the task.

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

Data availability statement

The data that support the findings of this study are openly available in OSF at https://osf.io/spmdh/ DOI 10.17605/OSF.IO/SPMDH

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