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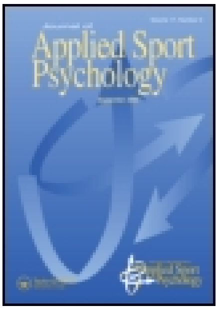

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The profile of mood states and athletic performance: Two meta-analyses

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The Profile of Mood States and Athletic Performance: Two Meta-analyses

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The present study comprised two meta-analyses of published studies that used the Profile of Mood States (POMS) to investigate relationships between mood and athletic achievement (n = 13) and between mood and performance outcome (n = 16). Results showed that effect sizes (ESs) for the level of achievement meta-analysis were minimal (*Weighted Mean ES* = .10, *SD* = .07), a finding consistent with a previous meta-analysis by Rowley, Landers, Kyllo, and Etnier (1995). Larger effects were found for the performance outcome meta-analysis (*Weighted Mean ES* = .31, *SD* = .12). Effects were moderate for vigor, confusion, and depression, small for anger and tension, and very small for fatigue. All effects were in the direction predicted by Morgan's (1985) Mental Health Model. Effects were larger in sports of short duration, in sports involving open skills, and where performance was judged using self-referenced criteria. Findings suggest that the POMS has utility in the prediction of performance outcome but not in the prediction of level of achievement.

There is a strong intuitive and anecdotal association between mood states and sport performance. Such anecdotal association is given credence by research in general psychology which has found in many laboratory-based studies that mood states influence perception, cognition, and behavior (see Ekman & Davidson, 1994). However, empirical support for mood-performance relationships in sport has been equivocal, despite the fact that more than 250 published studies have examined mood responses in sport and exercise settings (LeUnes & Burger, 1998).

The equivocality of research findings in sport may be related to the field settings in which mood-performance relationships have been investigated (i.e., often during high-level sport competitions, including Olympic events). Although such settings have greater ecological validity, the

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variables of interest are more difficult to control and measure than in a laboratory environment. It has also been proposed (Terry, 1995a) that mood-performance relationships may be strongly influenced by moderating variables related to the particular sport in which the relationship is investigated and to conceptual factors such as the operationalization of performance outcome. It is also possible that the nature of the mood construct (i.e., transitory, subjective, and difficult to distinguish from other constructs such as emotion) may have been interpreted differently by different researchers. The present study attempted to identify certain variables that may have led to equivocality among research findings.

Sport psychology researchers have relied almost exclusively upon the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971) as the measure of mood when examining links with athletic performance. The use of the POMS in sport was pioneered by Morgan and his coworkers (e.g., Morgan, 1974; Morgan & Johnson, 1978; Morgan & Pollock, 1977; Nagle, Morgan, Hellickson, Serfass, & Alexander, 1975) who demonstrated that, when compared to population norms, the mood profiles of athletes particularly at the elite level were characterized by above average vigor scores and below average scores for tension, depression, anger, fatigue, and confusion. Morgan termed such a pattern of mood responses an iceberg profile and proposed that it was reflective of positive mental health (Morgan, 1980, 1985).

There have been many specific research questions addressed within the area of mood and sport. Three of the most frequently investigated have been: (a) Can mood responses differentiate the athlete from the non-athlete? (b) Can mood responses differentiate athletes of varying levels of achievement? and (c) Can mood responses differentiate performance outcome among athletes of similar ability? With respect to the first research question, qualitative reviews of the extant literature by LeUnes, Haywood, and Daiss (1988), Renger (1993), and Vanden Auweele, De Cuyper, Van Mele, and Rzewnicki (1993) have demonstrated clearly that athletes typically report iceberg profiles, which by definition vary from population norms derived largely from nonathletes. Furthermore, recently published normative data based on the mood responses of 2,086 participants in sport and exercise confirmed that an iceberg profile is "normal" for athletes, thereby supporting Morgan's Mental Health Model (Terry & Hall, 1996; Terry & Lane, 2000).

With respect to discrimination between athletes of different ability on the basis of mood scores, reliable conclusions have been far more elusive. Terry (1995a) proposed that individual differences in skill and conditioning make it "entirely unreasonable" (p. 310) to expect mood to predict athletic achievement and Renger (1993) went as far as calling for researchers to "abandon the POMS" (p. 83) in research on successful and unsuccessful athletes. However, given that some findings are supportive of the differentiation of athletic achievement from mood scores (e.g., Morgan, Brown, Raglin, O'Connor, & Ellickson, 1987; Terry & Hall, 1996; Trafton, Meyers, & Skelly, 1998), it appears that this research question has yet to be answered fully.

The suggestion that POMS scores are predictive of performance among athletes of relatively homogeneous ability is perhaps the most intuitively reliable association, yet a definitive answer to this research question has also proved elusive. Terry (1995a) proposed that the prediction of performance from mood is maximized when situational variables which potentially moderate the mood-performance link are considered. Salient factors include the duration of the event, the type of skills involved, the number of co-acting performers, and the measure of performance used. A quantitative assessment of the effectiveness of mood measures to predict performance outcome, where potential moderating variables are considered, has not yet been accomplished.

The most notable attempt at a quantitative summary of findings in the area of mood and performance was Rowley et al.'s (1995) meta-analysis of whether the iceberg profile is related to athletic success. A meta-analysis (Glass, 1977) is a statistical procedure for integrating the findings of studies which seek to answer the same research question. If sufficient data are reported, a meta-analysis permits the estimation of effect sizes (ESs) for each comparison in a study. An ES is a standard metric that facilitates direct comparison of effects across studies. ESs also represent data points which may be subjected to further statistical analysis. Having located 33 studies considered appropriate for inclusion in a meta-analysis, Rowley et al. reported an overall ES of .15 which, although statistically different from zero, is considered small according to the criteria advanced by Thomas and Nelson (1996; an ES of > .8 is large, around .5 is moderate and < .2 is small). Rowley et al. concluded that the iceberg profile accounted for less than 1% of the variance in performance outcome.

The present study extended the work of Rowley et al. in at least five ways. First, since the cut off date for their meta-analysis (January, 1992) over 100 additional studies using the POMS in a sport-related investigation have been published. A further meta-analysis was warranted to encompass this recent research. Second, the present study placed studies that sought to identify mood differences among athletes of different levels of achievement in one meta analysis, and studies that used mood to predict performance outcome among athletes of similar levels of achievement in another separate analysis. Rowley et al. grouped together all studies investigating mood-performance relationships regardless of the specific research question addressed.

Third, the present study explored relationships between individual subscales of the POMS and performance, whereas Rowley et al. assessed the predictive effectiveness of the iceberg profile as a total entity and, by reporting a single ES for each study, may have masked the direction and magnitude of effects for individual subscales. Given their purpose of assessing the extent to which successful athletic performance is associated with an iceberg profile, the *a priori* assumption made by Rowley et al. was that vigor would facilitate performance but all other mood dimensions would be debilitative of performance. Hence, effects supporting Morgan's proposal were coded as positive and effects running counter to the proposal were coded as negative. For example, a study yielding effect sizes of tension = .30, depression = .35, anger = −.70, vigor = .65, fatigue = .30, confusion = .20 (where the negative ES for anger indicates that successful athletes reported higher scores than less successful athletes) would be combined to show a small overall ES of 0.18. However, it is possible that higher reports of anger by successful athletes may reflect its facilitative effect upon performance in the situation in question. If all mood dimensions were conceptualized as potentially facilitative *or* debilitative of performance (i.e., the ES for anger becomes +.70), an overall ES of .42 would result from the above example. The rationale for investigating mood dimensions separately rather than collectively is strengthened by evidence that successful athletes report higher anger scores than unsuccessful athletes in karate (McGowan & Miller, 1989; McGowan, Miller, & Henschen, 1990; Terry & Slade, 1995) and higher tension and anger scores in cross country running (Cockerill, Nevill, & Lyons, 1991). It is acknowledged that assessing the effects of six subscales independently inflates the risk of a Type 1 error. However, it is proposed that this method is far more sensitive to mood-performance relationships than the calculation of a single overall effect size for each study.

Fourth, the present study examined the possible moderating influence of type and duration of sport upon mood-performance relationships. In the Rowley et al. meta-analysis, the influence of type of sport was examined by coding sports as "aerobic" or "strength," the latter category comprising all sports that did not fall into the former category. It was concluded that the type of sport did not significantly moderate mood-performance relationships. However, the categorization of sports as either aerobic or strength placed sports such as wrestling, shooting, and soccer in the same category (strength sports) and took limited account of the actual nature of the sport (e.g., open versus closed skills, long versus short duration events, team versus individual sports). Given the tentative evidence that these variables do moderate the influence of mood on performance (Terry, 1995a), a more sensitive classification of type and duration of sport is warranted.

Fifth, the present study extended previous investigations of the impact of the specific performance measure used on the mood-performance relationship. There is consensus in the literature that the operational definition of success is central to any attempt to link mood scores with successful performance (Renger, 1993; Rowley et al., 1995; Terry, 1995a). For example, Rowley et al. (1995) found that studies in which the categorization of performance was unclear reported larger effects than studies using clear performance criteria, although unfortunately they did not fully explain what constituted clarity in this respect. Terry (1995a) proposed that a self-referenced performance criterion, such as percentage of personal best or the achievement of performance goals, would be a more sensitive measure of the quality of performance than objective criteria such as win/loss or selected/not selected and therefore would yield larger effects. This proposal has not yet been tested empirically.

Given these five modifications, the purpose of the present study was to provide an objective summary of research investigating mood and performance relationships using meta-analysis techniques. The analyses assessed mood-performance relationships for each subscale of the POMS separately. Based on Terry's (1995a) theoretical proposals it was hypothesized that mood scores would not discriminate between athletes of different levels of achievement but would demonstrate significant effects in terms of predicting performance from mood among athletes of similar ability. It was further hypothesized that predictive effectiveness is moderated by the duration and type of sport and by the performance measure used. When discussing mood it should be noted that there is considerable debate in the general psychology literature relating to the exact nature of the mood construct and its delineation from related constructs such as affect and emotion (see Ekman & Davidson, 1994; Lane & Terry, 2000). It should be noted that the term "mood" in the present study refers to the mood construct as operationalized by the authors of the POMS.

Method

Selection of Studies

Studies for potential inclusion in two meta-analyses were identified from three sources: computer searches, manual searches, and journal searches. The computer searches included ERIC, Medline, PsychLIT, and SPORTdiscus. Keywords used in the computer searches included *Profile of Mood States, POMS,* and *Mood.* Manual searches were conducted through the reference lists of several comprehensive bibliographies and empirical or narrative reviews of the use of the POMS in sport (LeUnes et al., 1988; LeUnes & Berger, 1998; Renger, 1993; Rowley et al., 1995; Terry, 1995a; Vanden Auweele et al., 1993). Journal searches to locate recent studies not yet included in the computerized databases were also conducted in 15 relevant journals: *British Journal of Psychology, British Journal of Sports Medicine, International Journal of Sports Medicine, International Journal of Sport Psychology, Journal of Applied Psychology, Journal of Applied Sport Psychology, Journal of Science and Medicine in Sport, Journal of Sport & Exercise Psychology, Journal of Sport Behavior, Journal of Sports Sciences, Medicine and Science in Sport and Exercise, Perceptual and Motor Skills, Sports Medicine, Research Quarterly for Exercise and Sport,* and *The Sport Psychologist.* All studies published prior to October 1998 were considered for inclusion.

Clearly, the result of an objective summary of findings from the literature is directly linked to which studies are included in the meta-analysis. Glass (1977) recommended that meta-analysts should integrate as much suitable research as possible but should account for differences in approach and methodology. In the present study, the principal difference accounted for was the nature of the research question investigated. Therefore, the first inclusion criterion was that a study used the POMS to either (a) discriminate between at least two groups of athletes where a clear difference in level of achievement existed, such as expert versus novice, or (b) predict performance outcome among athletes of similar achievement levels. Studies that reported appropriate data were considered eligible for inclusion even if the primary aim of the study was other than to examine the effects of mood upon performance (e.g., Berger & Owen, 1983). Studies satisfying criterion (a) "level of achievement" were analyzed in Meta-Analysis 1 (MA1), whilst studies satisfying criterion (b) "performance outcome" were analysed in Meta-Analysis 2 (MA2). On the basis of this criterion, studies were excluded which had investigated fundamentally different research questions, such as comparing mood responses across different sports, comparing athletes with nonathletes, and comparing athletes with population norms.

The inclusion or exclusion of unpublished studies in a meta-analysis is a thorny issue. It has been proposed that published studies tend to report larger effects than unpublished studies (North, McCullagh, & Tran, 1990), the inference being that the exclusion of unpublished studies may inflate mean effect sizes. On the other hand, unpublished studies are not subject to peer review and may not be of sufficient scientific merit to warrant inclusion. Given that Rowley et al. (1995) reported no difference in overall effect size between published and unpublished studies in the area of mood research, it was judged that unpublished studies should be excluded from the present meta-analysis.

Another issue, also raised by Rowley et al. (1995), is the timing of mood assessment relative to the performance in question. The prediction of performance from mood as summarized by MA2, assumes that performance may be influenced by an athlete's mood at the *pre*-performance period or the *mid*-performance period (although none of the studies in the present analysis assessed mid performance mood), but not at the *post*-performance period. Clearly post-performance mood may be influenced by the preceding performance but the reverse cannot be true. Also, some studies have assessed pre-performance mood retrospectively (i.e., after performance) and this data may be contaminated by the effects of performance outcome. Therefore, all studies where participants reported mood at the post-performance stage were excluded from MA2.

The above criteria excluded 12 of the studies included in Rowley et al.'s (1995) meta-analysis: Bell and Howe (1986); Boyce (1987); Cavanaugh (1982); Frazier (1986); Frazier and Nagy (1989); Hagberg, Mullin, Bahrke, and Limburg (1979); Harris (1985); Lindstrom (1990); Miller and Edgington (1984); Poole, Henschen, Schultz, Gordon, and Hill (1986); Ramadan, (1984); and Toner (1981).

Inadequate reporting by researchers of the data necessary to calculate ESs presents the meta-analyst with a major methodological problem. Attempts via personal communications to obtain further data for 27 studies that met the inclusion criteria but reported insufficient data for the calculation of ESs per POMS subscale met with a very poor response. It was judged that to include those few studies for which additional data were subsequently made available may have presented issues of bias (for example, such data were readily available from the present authors and their co-workers). Consequently, these 27 studies, which included seven studies from Rowley et al.'s analysis (indicated by an asterix), were excluded from the meta-analyses. These studies were: Cockerill et al. (1991); Craighead, Privette, Vallianos, and Byrkit (1986); *Daiss, LeUnes, and Nation (1986); *Daus, Wilson, and Freeman (1986); DeMers (1983); Durtschi and Weiss (1986); *Dyer and Crouch (1987); *Frazier, (1988); Friend and LeUnes (1990); Hall and Terry (1995)[1]; Hassmen, Koivula, and Hansson (1998); Lane and Terry (1998a); LeUnes and Nation (1982); *McGowan and Miller (1989); Morgan, O'Conner, Ellickson, and Bradley (1988); Nagle, Morgan, Hellickson, Serfas, and Alexander (1975); Nation and LeUnes (1983); Newby and Simpson (1991, 1994, 1996); Newcombe and Boyle (1995); Riddick (1984); *Robinson and Howe (1987); Silva, Schultz, Haslam, and Murray (1981); Thomas, Zebas, Bahrke, Araujo, and Etheridge (1983); *Wilson, Morley, and Bird (1980); and, Wormington, Cockerill, and Nevill (1992). It is acknowledged that the application of such a stringent exclusion criterion resulted in a reduced data base from which to draw inferences and may be viewed by some meta-analysts as a limitation.

A total of 13 studies representing 2,285 participants were selected for inclusion in MA1 and a total of 16 studies representing 1,126 participants were selected for inclusion in MA2. Effect sizes were calculated separately when data were reported in distinct sub-groups (e.g., males and females in Berger & Owen, 1983; two different competitions in McGowan, Miller, & Henschen, 1990; lightweight and heavyweight rowers in Morgan & Johnson, 1978). Overall, a total of 90 effect sizes were entered into MA1 and 102 effect sizes into MA2.

Estimation of Effect Sizes

Effect sizes were calculated using procedures recommended by Glass (1977) and Hedges and Olkin (1985). These procedures are summarized in a tutorial on the use of meta-analysis in exercise and sport (see Thomas & French, 1986). Fundamentally, an effect size is equal to the mean difference between two groups divided by the standard deviation of group scores. There has been some debate over which standard deviation should be used in this calculation. The present analysis used the pooled standard deviation as it corrects for any bias due to sample size. Also, as ESs are positively biased in small samples, a correction factor was used as recommended by Hedges and Olkin (1985). To establish the overall effect

[1] As this paper was co-authored by one of the present authors it would have been possible to obtain the relevant data. This also applies to Lane and Terry (1998a). However, it was decided to exclude all studies reporting insufficient data.

size for each mood dimension a *weighted* mean was calculated using the formula recommended by Thomas and French (1986, p.199). A weighted mean is a more precise estimate of the overall effect as it gives more weight to effect sizes with smaller variances. The use of a weighted mean precludes the calculation of standard deviations.

Selection of Data

In some studies the calculation of ESs involved decisions about which data were most relevant. For example, many studies in MA1 reported data for more than two groups of athletes (e.g., McGowan et al., 1990), raising the issue of which between-group comparison would provide the most meaningful information. Morgan (1980) proposed that differences in the mood scores of athletes and population norms were greater when the elite performer was considered, a proposal supported by the findings of Terry and Hall (1996). Given the suggestion that differences in reported mood widen as differences in level of achievement increase, ESs were calculated based on comparisons between the most extreme ability groups in any particular study. Furthermore, when repeated measures were a feature of a study (e.g., Gutmann, Pollock, Foster, & Schmidt, 1984; Raglin, Morgan, & Luchsinger, 1990) there were many possible ESs that could be calculated (e.g., mean ES over all measures, first measure, last measure, etc.). As mood is a transitory construct, data reported closest to the performance of interest were judged to be most likely to provide useful information about the quality of performance and were used for the calculation of ESs.

Coding of Variables

All studies to be included in the meta-analyses were coded for variables that could potentially moderate the relationships of interest. Based on the proposals of Terry (1995a), the moderating variables judged to be most pertinent were the type of sport (e.g., open/closed skills, team/individual), the duration of the sport, the range of ability among the participant groups, the operational definition of performance success, the time of administration of the mood measure, and the response set used (e.g., "How do you feel right now?" or "How have you felt during the past week including today?").

A general lack of methodological detail precluded a worthwhile exploration of the effects of some potential moderating variables. For example, 13 of 29 studies failed to report the response set used, and 16 of 29 studies failed to report the time of assessment of mood. Therefore, it was judged that no reliable analysis of the possible moderating effects of response set and time of administration could be made. Similarly, the majority of studies did not provide a detailed description of the standard of participants (e.g., terms such as "elite" were rarely defined) and therefore no assessment of its possible moderating influence was made.

Consequently, the coding of potential moderating variables was restricted to (a) type of sport, (b) duration of the sport, and (c) definition of performance success. Type of sport was coded according to Terry's (1995a) proposal that the extent to which a sport emphasizes open or closed skills (Robb, 1972) influences the extent to which mood impacts upon performance in that sport. Terry proposed that performance in closed-skill sports would be more mood-dependent than performance in open-skill sports. That is, the influence exerted on an athlete's performance by the actions of his/her opponent(s) may weaken any relationship between that athlete's pre-performance mood profile and eventual performance outcome. For example, the mood state and subsequent performance of a cyclist in an individual time-trial are largely unaffected by the performance of his/her opponents, whereas the mood state and subsequent performance of a karate player may be dramatically influenced by the actions of his/her opponent. Consequently, sports with a high degree of unpredictable interaction among competitors and a considerable degree of, or potential for, external influence on an individual's performance (e.g., basketball, karate, soccer, tennis, wrestling) were classified as open-skill sports. Sports which are generally self-paced, involve little or no interaction with competitors, and involve a limited degree of external influence over performance (e.g., bobsled, climbing, rowing, shooting, skiing, swimming, weightlifting) were classified as closed-skill sports.

Similarly, Terry (1995a) proposed that the number of co-acting performers may moderate the relationship between POMS scores and performance. For example, a crew rower may experience positive pre-competition mood but the performance of his/her crew may be impaired due to the negative mood of the other crew members. Therefore, the relationship between this rower's pre-performance mood profile and performance outcome is likely to be weak. However, if the same athlete were competing in a single scull, where crew dynamics are not an issue, his/her performance would be more likely to be reflective of pre-competition mood. Thus, the moderating effect of team versus individual sports was examined. Team sports were classified as those where performance outcome was the result of the cooperation of athletes (e.g., crew rowing, soccer, hockey, bobsled) and individual sports as those where each athlete competed as an individual (e.g., ergometer rowing trials, marathon running, karate). Although some studies operationalized performance outcome in team sports on an individual basis (e.g., Morgan & Johnson, 1978; Terry, 1995b; Terry & Youngs, 1996) these studies were classified as team sports because the co-action of other athletes was a feature of these individual performances.

Terry (1995a) also proposed that, as mood is a transitory construct, the longer the duration of the performance the greater the potential for mood to fluctuate. Duration of sport was thus also coded to examine whether the impact of pre-competition mood on performance is greater in activities of short duration. Short duration sports were classified as those lasting less than 10 minutes (e.g., bobsled, karate, rowing, wrestling) whereas long duration sports were classified as those lasting more than 10 minutes (e.g., basketball, shooting, soccer, tennis). It is acknowledged that this temporal distinction is somewhat arbitary although we suggest that the limited understanding of the dynamics of mood change precludes a dichotomy based on theory.

Operational definitions of performance success in the literature have been based either on objective criteria (e.g., win/loss, selection/non selection) or self-referenced criteria (e.g., post event self-rating, percentage of personal best). Terry proposed that the latter may be more sensitive to the impact of pre-competition mood as self-referenced measures account for situations where athletes produce their best performance but do not win or are not selected for a team for reasons beyond their control.

Gender was not included as a coding variable for three reasons. First, because many researchers investigated groups of mixed-gender participants; second, because there is evidence that mood responses are consistent across male and female athletes (e.g., Terry & Hall, 1996); and third, because there is no suggestion in the literature that mood-performance relationships are gender-dependent.

Results

Effect sizes were calculated for all six POMS subscales in each study. ESs and coded variables for each study included in MA1 and MA2 are presented in Table 1. Summary statistics of the meta-analyses are contained in Table 2. For level of achievement, only 39 of 90 effect sizes (43.3%) were in the direction predicted by the Mental Health Model (Morgan, 1985). The weighted mean of all studies in MA1 showed very small effects associated with level of achievement (M = .10, SD = .07). Overall effects were less than .20 for all mood subscales except vigor (ES = .22). Therefore, except for a small difference in vigor scores, athletes at different levels of achievement report essentially the same moods. This finding supports the conclusions of Rowley et al. (1995) that the "utility of the POMS in predicting athletic success is questionable" (p. 185). However, it should be emphasized that although such a conclusion may hold true when athletic success is interpreted as the level of achievement that an athlete has attained (e.g., novice, varsity, or elite), it may not necessarily apply to the prediction of performance outcome from mood responses.

For level of performance, 75 of 102 effect sizes (73.5%) were in the direction predicted by the Mental Health Model. The weighted mean of all studies in MA2 showed small to moderate effects associated with level of performance (M = .31, SD = .12). All of the overall effects were in the direction predicted by the Mental Health Model, indicating that successful performances were associated with lower tension, depression, anger, fatigue, and confusion scores and higher vigor scores than unsuccessful performances. Effects were moderate for vigor, confusion, and depression, small for tension and anger, and very small for fatigue. It appears, therefore, that POMS scores have some utility in the prediction of performance outcome.

Table 2 also contains the weighted mean effects of mood responses grouped by the potential moderating variables of type and duration of sport and the success criterion used. Given the relatively small number of studies and the resultant limited statistical power, no statistical comparison of these means was conducted. Group differences should therefore be interpreted with caution. Results showed that effects were larger for open-skill sports (M = .39, SD = .18) than closed-skill sports (M = .27, SD = .12). This finding runs counter to the proposal that performance in closed-skill sports would be more mood-dependent (Terry, 1995a). Consistent with Terry's proposal that mood scores would relate more to performance in short rather than long duration sports, effects were larger for short duration sports (M = .35, SD = .10) than long duration sports (M = .26, SD = .14). This indicates that pre-performance mood is a better predictor of performance in sports that last less than 10 minutes than those of longer duration. Also, effect sizes were marginally smaller for team sports (M = .30, SD = .19) than individual sports (M = .33, SD = .19). Furthermore, effect sizes were larger in studies using a self-referenced performance criterion (M = .37, SD = .18) than in studies using an objective performance measure (M = .28, SD = .18). Therefore, it appears that the capacity to discriminate the quality of athletic performance from pre-performance mood may be greater when performance is judged using self-referenced criteria such as percentage of personal best or the attainment of personal goals rather than objective criteria such as win/loss or selection/non-selection.

Discussion

The purpose of the present study was to summarize, using meta-analysis techniques, research findings pertaining to (a) the relationship between POMS scores and levels of athletic achievement, and (b) the relationship between POMS scores and performance outcome among athletes of similar levels of achievement.

The results of MA1 clearly demonstrated that mood responses do not reliably differentiate between athletes at different levels of achievement. The stringent inclusion criteria of the present meta-analysis ensured that only those studies that genuinely tested the question of interest were included in MA1. Given that previous quantitative reviews of the literature by Landers (1991) and Rowley et al. (1995) have produced similar results, it is questionable whether there is a valid rationale for continuing this line of research.

The results of MA2, in contrast to previous quantitative reviews, showed that pre-performance mood responses do have utility in the prediction of performance outcome. This was more evident for short duration sports than long duration sports, more evident for open-skilled sports than closed-skill sports, and more evident when performance was judged using

Table 1

Effect sizes and characteristics of studies (N = 29) included in MA1 and MA2

Author and year	*n*	Ten	Dep	Ang	Vig	Fat	Con	Type	Measure	Resp.	Time
MA1 (Level of Achievement)											
Berger & Owen (1983[a])	25	.44	.63	.59	.16	−.10	.55	–	–	-	-
Berger & Owen (1983)[b]	31	.05	−.15	−.27	−.90	.07	−.18	–	–	-	-
Dyer & Crouch (1987)	40	−.13	.20	−.63	−.22	.19	.05	–	–	-	1 hr
Feher, Meyers, & Skelly (1998)	57	.62	.36	1.04	.23	.00	.49	–	–	PW	-
Gondola & Tuckman (1983)	396	−.21	−.15	−.04	.41	−.09	−.14	–	–	-	-
Hassmen & Blomstrand (1991)	61	−.21	−.16	−.08	.32	−.13	−.17	–	–	RN	24 hr
Mahoney (1989)	50	.05	−.33	.00	.20	−.28	−.16	–	–	-	-
McGowan, Miller, & Henschen (1990)[c]	52	−.29	.49	.61	−.05	−1.06	.48	–	–	-	24 hr
McGowan, Miller, & Henschen (1990)[d]	55	−.33	.46	.58	.10	.67	.32	–	–	-	24 hr
McGowan, Pierce, & Jordan (1992)	34	.03	.04	−.74	−.33	.16	.05	–	–	-	24 hr
Meyers, Sterling, et al. (1994)	33	.12	.00	−.04	−.37	.29	.21	–	–	-	-
Morgan, O'Conner, Sparling, & Pate (1987)	27	.20	.30	.40	−.18	.63	.05	–	–	PW	-
Simpson & Newby (1984)	162	−.20	.70	−.30	.28	−.57	−.29	–	–	PW	-
Terry & Hall (1996)	1250	−.64	−.53	−.49	.44	−.49	−.76	–	–	RN	24 hr
Trafton, Meyers, & Skelly (1998)	43	1.99	1.70	1.31	1.17	.63	.39	–	–	-	-
MA2 (Performance Outcome)											
Fung & Fu (1995)	300	−.51	−.11	−.26	.69	.12	−.86	L/I	Select.	RN	96 hr
Gutman, Pollock, Foster, & Schmidt (1984)	11	−.46	−.53	−.03	1.14	−1.56	−.14	S/C/I	Select.	PW	-
Hassmen & Blomstrand (1991)	72	−.29	−.39	−.37	.46	−.28	−.39	L/C/I	Time	RN	24 hr
Hassmen & Blomstrand (1995)	18	.22	−1.42	−.11	.35	−1.26	−1.44	L/O/T	Win/loss	RN	1 hr
Henschen, Horvat, & Roswal (1992)	24	−.92	−.28	−.70	−.31	−.11	−.21	L/O/T	Select.	PW	-
Miller & Miller (1985)	20	.56	−.41	−.35	.08	.64	.34	L/O/T	Select.	-	-
Morgan & Johnson (1978)[e]	57	.39	.06	−.02	−.03	.26	.11	S/C/T	Select.	-	-
Morgan & Johnson (1978)[f]	16	−.57	−1.02	.59	.97	−.19	−.79	S/C/T	Select.	-	-

Table 1
Continued

Author and year	*n*	Ten	Dep	Ang	Vig	Fat	Con	Type	Measure	Resp.	Time
Prapavessis & Grove (1991)[h]	24	.17	.08	−.21	.13	.13	−.01	S/O/I	Self-ref.	RN	1 hr
Prapavessis, Berger, & Grove (1992)[h]	35	.04	.17	−.14	.47	.09	−.33	S/O/I	Self-ref.	RN	1 hr
Raglin, Morgan, & Luchsinger (1990)	22	−.06	−.55	−.66	−.31	−.81	−1.30	S/O/I	Select.	PW	-
Silva, Schultz, Haslam, et al. (1981)	15	.37	−.09	−.85	−.20	−.26	−.09	S/O/I	Select.	RN	-
Terry (1993)	79	−.31	−.61	−.37	.57	−.15	−.41	S/C/T	Self. ref.	RN	24 hr
Terry (1995b)	17	.25	−.52	−.39	.58	−.59	−.24	S/C/T	Self-ref.	RN	24 hr
Terry & Slade (1995)	197	−1.75	−1.83	.48	1.35	−1.69	−2.12	S/O/T	Win/loss	RN	1 hr
Terry & Youngs (1996)	128	−.48	−.20	.30	−.10	−.02	−.21	L/O/T	Select.	RN	1 hr
Tharion, Strowman, & Rauch (1988)	56	.27	−.20	−.20	.04	.37	.71	L/C/I	Finishers	PFH	24 hr

Note. An effect size preceded by a minus sign (−) denotes that successful athletes reported lower POMS scores than unsuccessful athletes. Ten = tension, Dep = depression, Ang = anger, Vig = vigor, Fat = fatigue, Con = confusion. Type = type of sport—S = short duration, L = long duration; O = open-skilled sport, C = closed-skill sport; I = individual sport, T = team sport. Measure = measure of performance—Select. = selection, Self-ref. = self-referenced. Resp. = response set—PW = past week including today, RN = right now, PFH = past few hours. Time = time of administration. - = not reported. – = data not relevant to analysis in MA1. [a] = female, [b] = male, [c] = regional championships, [d] = state championships, [e] = heavyweight rowers, [f] = lightweight rowers, [g] used Shacham's (1983) shortened version of the POMS, [h] used Grove and Prapavessis' (1992) modified version of the POMS.

Table 2
Weighted means of effect sizes grouped by moderating variables

Effect	No.	Ten	Dep	Ang	Vig	Fat	Con
MA1 (Level of Achievement)							
Overall	15	−.14	.06	−.02	.22	−.04	−.11
MA2 (Performance Outcome)							
Overall	17	−.25	−.34	−.27	.47	−.13	−.40
Closed-skill sports	10	−.13	−.40	−.29	.41	−.21	−.19
Open-skill sports	6	−.33	−.67	−.24	.19	−.39	−.53
Short duration sports	10	−.21	−.42	−.28	.48	−.34	−.34
Long duration sports	7	−.31	−.21	−.27	.46	.07	−.47
Individual sports	9	−.30	−.20	−.25	.50	−.01	−.51
Team sports	8	−.21	−.51	−.30	.43	−.28	−.27
Objective outcome	13	−.27	−.26	−.23	.43	−.02	−.48
Self-referenced	4	−.22	−.46	−.35	.54	−.32	−.30

Note. Data from Fung & Fu (1995), which investigated open- *and* closed-skill sports of long duration, were excluded from the type of sport analysis but included in analysis of duration of sport. An effect size preceded by a minus sign (−) denotes that successful athletes reported lower POMS scores than unsuccessful athletes. No. = number of studies in analysis. Ten = tension, Dep = depression, Ang = anger, Vig = vigor, Fat = fatigue, Con = confusion.

self-referenced criteria than objective criteria. The apparent moderating influence of duration of the sport is unsurprising. Given that the potential for mood fluctuation to occur *during* performance will increase in longer duration events, it is logical that the predictive effectiveness of pre-performance measures of mood will diminish accordingly. Similarly, the application of a self-referenced performance measure would logically increase its sensitivity as a true measure of how well an athlete has performed, and therefore it is to be expected that the measure of performance would moderate the predictive effectiveness of mood measures. However, the finding that effect sizes were greater for open-skill sports compared to closed-skill sports is perhaps counter-intuitive. Closed-skill sports involve a greater degree of predictability and successful performance in such an environment might be assumed to be more dependent on pre-existing mood because there are fewer environmental changes to contend with. There are at least two explanations for the present result. First, it is possible that an appropriate pre-competition mood is required to cope successfully in a constantly changing environment and an inappropriate mood is damaging to performance because coping becomes more difficult. Second, it is possible that the categorization of sports into open-skill and closed-skill in the present study was problematic and the result is an anomaly. It is acknowledged that the nature of skills varies along a continuum rather than a dichotomy and that the inclusion of skiing, for example, in the closed-skill category is debatable. Also, given the absence of an effect for team versus individual sports, it appears that the moderating impact of type of sport on mood-performance relationships warrants further investigation. It is also possible that mood performance relationships are specific to individual sports (e.g., karate) than classifications of sports (e.g., open skill sports).

The results of MA2 showed that the debilitative effects of tension and anger upon performance were small overall. It can be seen from Table 1 that the small overall ESs for these subscales result from the large range of individual ESs, indicating that anger and tension are associated with both positive and negative performance outcomes. There are a number of possible explanations for this finding. Firstly, anger and tension may be facilitative of performance in certain sports (e.g., karate) and not in others (e.g., speedskating). Also, the interaction of mood dimensions may influence mood performance relationships. For example, a recent theoretical model (Lane & Terry, 1998b, 2000) proposes that the effects of tension and anger upon performance are moderated by depression. Lane and Terry argue that tension and anger may not always exert a negative influence on performance as is often proposed. Their premise is that anger and tension will debilitate performance for an athlete in a depressed mood but show a curvilinear relationship with performance in the absence of any symptoms of depression.

Although the POMS has been shown to have utility in predicting performance, the mean overall effect sizes were moderate at best and therefore research designs that move beyond cross-sectional investigation of mood-performance relationships may prove more productive. Such lines of investigations may include a longitudinal within-subjects approach that seeks to identify optimum pre-training or pre-performance moods on an individualized basis (c.f., Hanin, 1989; Morgan et al., 1987; Terry, 1995a). Also, there appears to be a need for intervention studies that assess the effects of manipulating mood toward an individualized optimum mood for training or performance.

Moreover, the present study has highlighted certain limitations of previous research in the area of mood and sport. First, there has been a distinct lack of theory underlying mood-performance research that has contributed to a huge disparity of methodologies and research questions. Second, researchers have shown little attention to reporting methodological detail so that, for example, the appropriateness to the research question under investigation of the response set of the mood measure and its time of administration can be judged. Finally, to facilitate future objective summaries of research, there is a strong case for the reporting of effect sizes to be a requirement in all published studies.

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