Need for Cognition and Psychosocial Adjustment in Prostate Cancer Patients and Partners

Sindy Oh, MA
Beth E. Meyerowitz, PhD
Martin A. Perez, PhD
Andrea A. Thornton, PhD

Individual differences in cognitive style, specifically need for cognition (NFC), may play an important role in facilitating communication and psychosocial adjustment to cancer during the presurgical period, a time marked by distress and the need to process disease-related information. This study examines the relations between NFC, adjustment, and communication in 106 prostate cancer patients and their partners within 2 weeks prior to radical prostatectomy. High NFC was significantly associated with better psychological adjustment for partners only, whereas for patients, communication with the medical team played a more important role. High NFC patients who were partnered with high NFC partners reported better dyadic communication compared with those who were partnered with low NFC partners. This study indicates that predictors of adjustment may differ for patients and partners, who are likely differentially affected by the disease process.

KEYWORDS. Prostate cancer, partners, need for cognition, communication, adjustment
A Structural Model of the Relationships Between Perceived Control and Adaptation to Illness in Women with Breast Cancer

M. Bárez, PhD
T. Blasco, PhD
J. Fernández-Castro, PhD
C. Viladrich, PhD

Objectives: To examine whether perceived control produces better adaptation to illness in breast cancer patients in stages I or II.

Design: Longitudinal, 1-year following study.

Methods: One hundred and one women were assessed on five occasions: one week after surgery, and again 1, 3, 6 and 12 months later, using, among other measures, the Mental Adjustment to Cancer (MAC) and the Hospital Anxiety and Depression Scale (HADS).

Results: Structural equation models confirmed that patients with higher perceived control showed better adaptation to illness in all five assessments.

Conclusions: These data fit well with previous research and suggest that psychological interventions which emphasize a sense of personal control would be effective in enhancing well-being in breast cancer patients at the early stages.

KEYWORDS. Breast cancer, perceived control, illness adaptation, structural equation models

Hematopoietic Stem Cell Donation in Children: A Review of the Sibling Donor Experience

Lori S. Wiener, PhD, ACSW
Emilie Steffen-Smith, BA
Terry Fry, MD
Alan S. Wayne, MD

Hematopoietic Stem Cell Transplant (HSCT) represents the second most frequent major organ transplant in the United States. Compared with other family members, siblings are more likely to be immunologically matched with the recipient and therefore are often the most suitable donors. Due to a dearth of information on the positive and adverse effects of HSCT on pediatric sibling donors, we sought to examine available data. Eight published reports assessing the pediatric sibling donor experience were identified in the literature. Studies were predominately small (n < 44) and cross-sectional. Results suggest a range of psychological distress responses with higher distress in pediatric donor than non-donor siblings. Recommendations include future longitudinal research on sibling donor psychosocial adjustment, identification of sibling donors at high risk for maladaptive responses, and development of educational and psychosocial interventions for this overlooked pediatric population.

KEYWORDS. Hematopoietic stem cell transplantation, bone marrow and peripheral blood stem cell transplantation, pediatric sibling donors, psychosocial adjustment
Spiritual Life After Cancer: Connectedness and the Will to Meaning as an Expression of Self-Help
Stuart J. Edser, PhD
Christopher G. May, BA (Student)

This article uses a mixed quantitative/qualitative design to elicit the attitudes and experience of spirituality in a group of N = 11 heterogeneous cancer participants, who were interviewed regarding self-help practice. Part of this interview enquired about spirituality and was analysed separately from the larger body of data, becoming the Spiritual Interview. The authors argue for a conceptualisation of spirituality as a “will to meaning” and “connectedness.” Further, they propose that it is the integration of spiritual life that is the crucial variable in assessing spirituality. Participants demonstrated a wide diversity of attitude and experience that supports the authors’ contentions.

KEYWORDS. Cancer, spirituality, religion, meaning, connectedness, integration, self-help

Social Support, Optimism, and Self-Efficacy Predict Physical and Emotional Well-Being After Bone Marrow Transplantation
Nicole Hochhausen, BA
Elizabeth M. Altmaier, PhD
Richard McQuellon, PhD
Stella M. Davies, MD
Esperanza Papadopolous, MD
Shelly Carter, ScD
Jean Henslee-Downey, PhD

This study examined whether three psychosocial variables (social support, self-efficacy, and optimism) assessed prior to bone marrow transplantation (BMT) predicted physical and emotional well-being one year post-BMT. Data were gathered on 87 participants enrolled in a multicenter, randomized trial examining the impact of ex-vivo T-cell depletion on disease-free survival in leukemia patients receiving allogeneic BMT. Social support, optimism, and self-efficacy significantly predicted emotional and physical well-being one year post-BMT, controlling for age, gender, maximum grade of acute GVHD, and treatment arm. Attention to psychosocial factors prior to BMT and during recovery appears critical for physical and mental well-being, especially considering the influence of psychosocial variables independent of medical risk factors.

KEYWORDS. Psychosocial predictors, bone marrow transplantation, health-related quality of life, social support, optimism, self-efficacy
Providing Psychosocial Group Support
for Young Women with Breast Cancer:
Findings from a Wellness-Based Community Collaboration

S. C. Danhauer, PhD
C. A. Rutherford, MA, LPA
G. Hurt, RN, MAEd, LPC
S. Gentry, RN, MSN, AOCN
J. Lovato, MS
R. P. McQuellon, PhD

This article describes our experience offering a collaborative, wellness-based group support program for young women with breast cancer. Goals were (1) to identify needs and priorities of young women with breast cancer; (2) to test the feasibility of a collaboration between an academic medical center, a regional cancer center, and a community-based agency; and (3) to positively influence participants’ overall quality of life (QOL), emotional distress, and psychological well-being. The group intervention consisted of presentation of various topics, group discussion, and relaxation exercises. No significant changes on QOL or emotional measures were seen. Participants rated the session on symptom management as most useful and identified two areas for potential improvement (more homogeneity of participants, suggestions for additional topics).

KEYWORDS. Breast cancer, young women, group support

Oncology Nurses’ Teaching
and Support for Suicidal Patients

Sharon M. Valente, RNCS, PhD, FAAN

Although the nursing literature contains many references to the nurses’ teaching, support, and advocacy functions, the consumer and other health care professional literature suggests that the potential importance of nurses in these roles is not widely accepted. In a secondary analysis, we examined nurses’ interventions for teaching and support in survey of a random sample of oncology nurses in a national organization. Clinical oncology nurses (n = 454) reported their attitudes to and knowledge about suicidal patients. They reported their goals, interventions, and emotional support for a suicidal patient. When nurses described their care, they rarely mentioned patient teaching, emotional support, and advocacy. A gap also existed between the recommended assessments, related goals, and interventions. The nurses’ difficulties in responding therapeutically to suicidal patients also emerged from their religious/other values, uncomfortable feelings, inadequate knowledge, personal experiences, and weight of professional responsibility. A small percentage of oncology nurses with good psychiatric skills reported they had no difficulty in their caregiving role including teaching, support, and advocacy.

KEYWORDS. Patient teaching, education, suicide, oncology nurses
Perceived control and psychological distress in women with breast cancer: a longitudinal study

Milagros Bárez · Tomas Blasco · Jordi Fernández-Castro · Carme Viladrich

Abstract The relationship between perceived control and psychological distress in cancer patients has been widely studied, but longitudinal designs are scarce. The aim of this study was to examine whether perceived control could predict changes in the evolution of psychological distress in breast cancer patients at stages I or II. One hundred and one women were assessed on five occasions: one week after surgery, and again 1, 3, 6 and 12 months later, using the Mental Adjustment to Cancer (MAC) Scale, a Self-Efficacy Scale, the Personal Competence Scale, the Hospital Anxiety and Depression Scale (HADS), the Profile of Mood Sates (POMS), and the EORTC questionnaire of quality of life. Latent growth curve (LGC) model analysis was used to test the relationship between perceived control and psychological distress in a longitudinal, 1-year study. The results showed that perceived control increases linearly and that distress also decreases linearly. Moreover, the evolution of distress can be predicted from the initial value and the rate of change of perceived control. This close relationship between perceived control and psychological distress was found to be independent of the evolution of the physical state. These findings suggest that perceived control could be used as an early predictor of psychological adjustment to illness.

Keywords Perceived control · Distress · Cancer · Longitudinal design · Latent growth curve

Adjustment to illness in cancer patients has been widely studied in order to find out which psychological factors make the experience of this disease less traumatic for patients. Relationships between adjustment to cancer and coping strategies as well as other factors such as age or stage of disease have been tested in several studies. Results obtained in these studies led to the conclusion that patients who show a good adjustment to illness are less anxious and depressed, request lower levels of medical attention, and create lower costs than patients with poorer levels of adjustment (Butler et al. 2006).

However, there is no agreement about what adjustment to illness is. Some authors consider that adjustment to illness exists when patients show low levels of negative mood states (Hack and Degner 2004; Hirai et al. 2002; McCaul et al. 1999). Other authors consider that adjustment to illness includes mood states and also quality of life (Butler et al. 2006; Schnoll et al. 1998b; Stanton et al. 2002). Mood states and quality of life have also been considered by Schnoll et al. (1998a), although these authors use the term “adaptation” rather than “adjustment”. Finally, Lechner et al. (2006) state that adjustment to cancer must include intrusive thoughts, quality of life and mood states.

A complete picture of adjustment to cancer or to a chronic disease must include mood states, but also some other aspects that are present in patients’ lives (Stanton et al. 2007). However, mood states reveal whether patients have or have not some level of psychological distress, and we agree that psychological distress is the most sensitive measure of the level of adaptation that patient has achieved, since changes in quality of life of any dimension (pain, physical symptoms, activity, autonomy or other) would also produce a change on an emotional level (Snaith 2003).

M. Bárez · T. Blasco (✉) · J. Fernández-Castro · C. Viladrich
Universitat Autònoma de Barcelona, Barcelona, Spain
e-mail: tomas.blasco@uab.es
The relationship between psychological adjustment to illness and patients’ active coping, self-efficacy, or perceived control has been well established in previous studies (Hack and Degner 2004; Hirai et al. 2002; Schnoll et al. 1998b; Schou et al. 2004; Stanton et al. 2002). Some studies have shown this relationship in patients at earlier stages of breast cancer, and throughout the first year after diagnosis (McCaul et al. 1999; Schnoll et al. 1998b; Stanton et al. 2002). Furthermore, this relationship has also been found in advanced cancer patients with different tumours (Hirai et al. 2002). Moreover, some other studies have found that active coping following diagnosis of breast cancer predicts psychological adjustment to illness three years later (Hack and Degner 2004). Self-efficacy assessed prior to bone-marrow transplantation also predicted emotional well-being in these patients one year later (Hochhausen et al. 2007). Overall, these studies led to the conclusion that current and future measures of lower distress and higher adjustment are clearly related with active coping, high self-efficacy, and high perceived control. These traits are considered to be different variables, but it could be hypothesized that they share a common feature that could be assessed as a latent variable. The analysis of relationships between psychological factors in cancer patients using latent measures has been applied in several studies. Schnoll et al. (1998b) developed two latent measures called “Coping style” and “Psychological Adjustment”, whereas Hirai et al. (2002) develop a latent measure of “Self-efficacy” and other latent measure of “Emotional Distress”.

In a previous paper using the same data that will be presented here (Barez et al. 2007) we found a consistent and direct relationship between perceived control and adaptation to illness over five assessment periods during 1 year following a breast cancer diagnosis. This relationship was independent of the medical procedures received and perceived control was considered to be a latent measure that would be inferred from psychological variables such as self efficacy, active coping strategies and beliefs about control. However, causal relationships between perceived control and adaptation to illness cannot be determined as the data were cross-sectional.

The use of longitudinal designs assessing the stability of the relationships between psychological factors across time could enhance the argument of causal relationships if this stability is provided by data supported by a theoretical model. We propose that if perceived control produces less psychological distress, initial values of perceived control will predict initial values of psychological distress, changes in perceived control will predict changes in psychological distress, and, accordingly, both constructs will exhibit the same evolution. In other words, patients whose perceived control increases over time would also exhibit a decrease in psychological distress, and patients whose perceived control decreases would also have higher psychological distress. This relationship should be observed while controlling the influences of other variables such as type of tumour, stage of cancer, oncological treatment, age, or physical state. If empirical results corroborate this hypothesis, it could be suggested that perceived control is essential to decrease psychological distress, although a causal relationship cannot ultimately be proven if experimental designs are not applied.

Given these considerations, the present study re-analyses the data published in Barez et al. (2007) to test whether changes in perceived control predicts changes in psychological distress in breast cancer patients during the first year after surgery using latent growth curve models.

Method

Participants

A convenience sample of 101 women with breast cancer at stages I or II was recruited from the oncological units of the Hospital del Sagrat Cor and Hospital Maternal de la Vall d’Hebron in Barcelona after undergoing surgery. 49.5% of women had undergone a mastectomy and 50.5% had undergone a lumpectomy. The mean age was 48.03 years (SD = 8.42), with an age range of 25–65 years. A majority of women (79.2%) were married, and 48.5% had received a university education, whereas 29.7% had taken middle level studies and 21.8% were school graduates.

Attrition analysis

One hundred and eighty-two women were asked to participate, and 129 accepted. Our results suggest that women who did not work outside home and who were at risk of experiencing psychological distress (suffered some kind of stress or received psychological treatment before cancer was diagnosed) were more prone to participating in the study. Once the study had started, 28 of the patients who agreed to participate quit after one or two interviews. No differences were found between the 28 patients who refused to continue and the 101 patients who completed the study.

Measures

The Spanish Version (Ferrero et al. 1994) of the Mental Adjustment to Cancer (MAC) Scale (Watson et al. 1988). The MAC is a 40-item questionnaire that assesses five categories of coping style. Alpha values of the two scales

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that will be considered in our analysis ranged from 0.69 to 0.74 for the helplessness scale (6 items, score range: 6–24), and 0.67 to 0.72 for the fighting spirit scale (16 items, score range: 16–64).

**Self-efficacy (SE), assessed by a 36-item scale developed by the authors for this study.** This describes the most frequent concerns stated by breast cancer patients and has been reported in a previous work (Barez et al. 2007). For each item, the patient states the level of concern produced by the situation (using a 4-point scale ranging from 0 = ‘not at all’ to 3 = ‘it worries me extremely’) and the level of capability of overcoming it (using a 4-point scale ranging from 0 = ‘not at all’ to 3 = ‘completely’). The self-efficacy measure is obtained from the average level of capability obtained from the pertinent capability items (range score 0–3). Alpha values ranged between 0.91 and 0.96 across assessments.

**Personal Competence Scale (PCS).** Originally developed by Wallston (1992), this is an 8-item scale that assesses a persons’ expectations of being able to effectively interact with his/her environment (score range 8–48). We used the Spanish version developed by Fernández-Castro et al. (1998). Observed alpha values across our five measurements ranged between 0.85 and 0.88.

**Anxiety and Depression, assessed by the Spanish version (Tejero et al. 1986) of the Hospital Anxiety and Depression Scale (HADS)** developed by Zigmond and Snaithe (1983). HADS is an effective measure for screening affective disorders in the hospital setting and has been applied without problems to cancer patients (Hirai et al. 2002; Watson et al. 1999). In our study, the anxiety scale had alpha values between 0.81 and 0.88, whereas the depression scale had alpha values between 0.79 and 0.87.

**Distress, measured using a 15-item shortened Spanish version (Fuentes et al. 1994) of the Profile of Mood States (POMS)** (McNair et al. 1971). Although POMS assesses five different mood states—anxiety, depression, vigour, fatigue and anger—using a 5-point response scale ranging from 0 (‘not at all’) to 4 (‘extremely’), a single overall measure of mood-state, ranging from 0 to 60 will be used (higher scores reveal a more negative mood state). Alpha values were as high as 0.90–0.93.

**Quality of life, assessed with the Spanish version (Ferrero 1992) of the EORTC questionnaire for breast cancer** (Aaronson et al. 1988). This questionnaire has been shown to have good psychometric properties (Ferrero et al. 1994), and assesses six areas: functional status, physical symptoms, psychological distress, social problems, sexual problems, and satisfaction with medical care. Alpha values for the two scales included in our analysis ranged from 0.73 to 0.77 for the functional status scale (9 items; range: 9–18) and 0.85 to 0.89 for the physical symptoms scale (15 items; range: 15–60).

A questionnaire was designed to take information about previous psychological treatments received, and number of stressful episodes experienced over the last year.

**Procedure**

Approximately 1 week after surgery, the purpose of the study was explained to the patients at the hospital. Once the patient agreed to participate, the first psychological assessment was made. Patients then answered the MAC, HADS, SE, POMS and PCS questionnaires. EORTC was not administered at this time since our interest was to find out how chemotherapy and/or radiotherapy could affect quality of life and psychological distress, and these treatments had not started in the first assessment. Although surgical procedures certainly do decrease the quality of life, this effect disappears within a few days (Pandey et al. 2006).

Four additional psychological assessments were made using the previously described questionnaires and adding the EORTC scale. The second assessment was made 4–6 weeks after surgery, just when the patients were beginning chemotherapy or radiotherapy treatment. The third, fourth, and fifth assessments were made at 3, 6, and 12 months after surgery. The questionnaires were always applied in the same order: MAC, HADS, SE, POMS, PCS and EORTC. Each assessment required an amount of time ranging from 45 to 60 min.

**Data analysis**

Latent growth curve model analysis (LGC) was used to test the relationship between perceived control and psychological distress. This data analysis was conducted using AMOS 4.0 (Arbuckle and Wothke 1999) and goodness of fit indexes and criteria applied were the most common according to McDonald and Ho (2002): no significant chi-square, CFI greater than or equal to 0.90; and RMSEA less than or equal to 0.05.

Raw subscale scores were transformed into scales which ranged between 0 and 100 to provide meaningful comparisons between the different measures and times of assessment, since observed indicators are not measured on the same scale and the scales have arbitrary origins and units (Stoolmiller 1995). Scores for perceived control were obtained as the mean score of fighting spirit and reversed helplessness subscales from the MAC, and the SE and PCS scales. The selection of these variables to assess perceived control has been justified in a previous work (Barez et al. 2007). Correlations between these subscales and across the five assessments ranged in absolute values between 0.39
and 0.66. To obtain the latent measure of perceived control, the “Anxious Preoccupation” and “Fatalism” subscales from the MAC were rejected since, although they were related to this concept, they were redundant to data provided by the MAC subscales of “Fighting Spirit” and “Helplessness”. Scores for psychological distress were obtained from the Anxiety and Depression subscales from the HAD and from the global measure of the POMS. Correlations between these measures ranged between 0.62 and 0.78.

EORTC subscales were not included to measure psychological distress, but were used as a covariate in the analysis (see Results). These measures were normalized as the other scales in this analysis, between 0 and 100, and the mean of both indicators was taken as a measure of physical state. Lesser values show better physical state. Distributional assumptions for these seven measures were assessed through univariate normality indicators (skewness and kurtosis) and Mardia’s multivariate coefficient (Mardia 1970).

We made the data analysis in four steps. First, we modelled each construct, perceived control and psychological distress, separately as an LGC process. Second, the best fit model was chosen for the error terms of both constructs taken together. Third, we assessed our main interest, which was to test whether the changes in both constructs were systematically related. So, using the terminology of Curran and Hussong (2003), we analyzed a multivariate latent trait model. Finally, we tested the effects of three covariates, age, physical state and treatment, on the relation between perceived control and psychological distress.

In our first step, we modelled perceived control across the 5 time points as an LGC process, with perceived control intercept defined as values observed at time 1, and a linear slope as a measure of change (First step, Model C) including the test of two alternative models for error terms, namely, autoregressive process of order 1 (ar1 from now on) and independent. Observed psychological distress was analogously modelled (First step, Model D).

The second step was devoted to modelling the error terms of both constructs. In order to do that, all latent variables (2 intercepts and 2 slopes) were defined as freely correlated, and four error structures were tested. Considering the longitudinal nature of the data, and also the fact that two constructs were measured for each of the five assessments, in our first error model (Second step, Error MT) errors were considered to follow an ar1 pattern within the five assessments of each construct plus a correlation between both measures at each time point. In the second model (Second step, Error T) we restricted correlations between error measures to zero but specified correlated errors across time points. In the third model (Second step, Error M), we changed the restriction, errors correlated between measures and were independent across time points. Finally, in our fourth error model (Second step, Error I), errors were specified to be independent both between measures and across time.

In the third step we addressed our main goal. According to our main hypothesis, initial values of perceived control can predict initial values of psychological distress, and changes in perceived control can predict changes in distress.

We also considered initial values to be possible predictors of change values within the construct and between initial perceived control and change in psychological distress. These parameters can provide two pieces of information: first of all, they are a measure for possible ceiling effects (i.e. high initial values systematically associated with small changes), and also, they can provide useful insights into the possible efficacy of the intervention among patients with differential initial characteristics.

Our reference model (Model 0) was specified as the aforementioned relationships between latent variables plus the error model identified in step two. Due to the fact that our hypothesis does not include a precisely defined functional form for the expected relations, in order to obtain the best functional form describing the observed data, our Model 1 tested the linearity of slopes, comparing them with a less restrictive completely latent function (Curran and Hussong 2003) which specifies a free functional form directly estimated from the data.

In the fourth step of our data analysis, we considered three types of alternative structural models to Model 0. In Models 2 (a, b and c), we tested the comparability of the parameters for Model 0 between the mastectomy and lumpectomy groups. Model 2a is a multigroup model with parameters estimated separately for each group, model 2b is a multigroup model with regression weights restricted to be equivalent between groups, and model 2c is a multigroup model with all parameters, regression weights and variance-covariance structure of errors restricted to be equivalent between both groups. Next, we included age (Model 3) specifying direct projections to intercepts and slopes of both constructs. Mean scores of functional status and physical symptoms from the EORTC were included (Model 4) as time varying covariates. These are fully multivariate latent trait models according to Curran and Hussong’s (2003) terminology.

Finally, a fifth alternative model (Model 5) was tested. In this model, physical state was viewed in a new conceptualization. Physical state intercept and slope were derived from the functional status and physical symptoms scales taken from EORTC, and fitted a multivariate latent trajectory model between the initial status and change for the three constructs. The 6 variances and 15 covariances of
the six latent variables were freely estimated from the data. The aim of this model is to test the plausibility of the idea that changes over time in physical state (Model 5) could be better predictors of psychological distress than when the physical state is seen as a covariate (Model 4).

Results

A comprehensive description of the values for each variable in each psychological assessment can be found in Table 1. It can be seen that mean scores of perceived control increase over time while mean scores of psychological distress decrease.

All of the univariate skewnesses indicated slight or moderate non-normality (maximum 1.44) according with Lei and Lomax (2005); kurtosis was also in the interval of slight or moderate non-normality with the only exception being the fifth assessment of psychological distress, which reached a kurtosis equal to 3.03. Mardia’s multivariate normality coefficient was statistically significant (32.39, critical ratio = 10.51). All deviations from normality are concentrated in the first and last measures.

A series of structural equation models were fitted to the data according to the established plan for data analysis. Goodness of fit statistics for all tested models are shown in Table 2.

Latent trajectories with linear slopes and autoregressive error terms described correctly both perceived control and psychological distress. All goodness of fit indexes were very good in both cases (First step, Models C and D in Table 2). In both cases, the independent error structure was not very far from acceptability (RMSEA of 0.11 and 0.09, respectively).

When modelled together, the error terms were shown to be strongly correlated between measures (correlation coefficients between −0.61 and −0.71, not showing any particular pattern over time) with very good fit to the data (Second step, Error M in Table 2). On the other hand, the autoregressive process was not shown to be relevant. This structure neither improved the model fit to the data (Second step, Error MT in Table 2), nor yielded any significant autoregressive parameter. Goodness of fit clearly worsened with the alternative structure specifying uncorrelated errors between measures (Second step, Error T and Error I in Table 2). According to these results, all our substantive hypotheses were tested considering correlated errors between measures. Figure 1 depicts a graphical representation of this error structure and the correlation estimates between error terms.

As has been said, our main hypothesis was specified in a multivariate latent trait model, which is depicted in Fig. 1. The model showed very good fit to the data (Third step, Model 0 in Table 2) and all freely estimated parameters were shown to be statistically significant (see Table 3). Under the hypothesis of nonlinear shape for the latent trait slopes, (Third step, Model 1 in Table 2), we did not find any significant difference in goodness of fit, and none of the added free parameters yielded significant estimates. Additionally, we believe it to be more conservative not to correct the observed chi-square value for non-normality, since corrections will lower it, and consequently increase the probability of observing it under the null hypothesis.

As can be seen both in Table 3 and in Fig. 1, perceived control intercept is a strong predictor of psychological distress intercept, and perceived control slope is also a strong predictor of psychological distress slope. Both standardized regression weights are above 0.80 in absolute value. Their negative sign was expected because of the definition of the constructs. On the other hand, perceived control intercept is a significant but not so good predictor of psychological distress slope (standardized regression weight of −0.31).

Standardized regression weights from perceived control intercept to perceived control slope, and from psychological distress intercept to psychological distress slope are also very moderate in size (−0.35 and −0.51, respectively). Their negative signs fall within the range of possibilities for relations between initial values and observed change.

Table 1 Mean (with standard deviations in parentheses) of perceived control and psychological distress of mastectomy patients (n = 50), lumpectomy (n = 51) and the whole sample (N = 101) along five assessments

<table>
<thead>
<tr>
<th>Mastectomy</th>
<th></th>
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<th>Lumpectomy</th>
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<th>Whole sample</th>
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<tr>
<td></td>
<td>Perceived control</td>
<td>Psychological distress</td>
<td>Perceived control</td>
<td>Psychological distress</td>
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<tr>
<td>1</td>
<td>64.63(16.24)</td>
<td>33.27(18.52)</td>
<td>68.98(13.86)</td>
<td>27.29(15.94)</td>
<td>66.63(15.17)</td>
<td>30.25(17.44)</td>
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<td>2</td>
<td>65.23(13.98)</td>
<td>32.10(19.47)</td>
<td>71.79(13.66)</td>
<td>26.01(18.00)</td>
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<td>29.02(18.90)</td>
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<td>3</td>
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<td>30.14(16.76)</td>
<td>71.57(14.19)</td>
<td>24.64(16.86)</td>
<td>68.96(14.31)</td>
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<td>4</td>
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<td>24.44(16.00)</td>
<td>72.76(14.33)</td>
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<td>5</td>
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<td>25.21(17.56)</td>
<td>73.57(13.52)</td>
<td>18.04(14.78)</td>
<td>71.45(14.39)</td>
<td>21.59(16.53)</td>
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Table 2  Goodness of fit statistics for all tested models

<table>
<thead>
<tr>
<th>Model</th>
<th>Model comparison</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$p$</th>
<th>CFI</th>
<th>RMSEA (IC90)</th>
<th>$\Delta\chi^2/\Delta gl (p)$</th>
<th>Reference model</th>
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<tbody>
<tr>
<td>First step</td>
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<tr>
<td>Model C</td>
<td>7.22</td>
<td>9</td>
<td>0.61</td>
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<td>0.00 (0.00 0.10)</td>
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<tr>
<td>Model D</td>
<td>7.74</td>
<td>9</td>
<td>0.56</td>
<td>1.00</td>
<td>0.00 (0.00 0.10)</td>
<td></td>
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<tr>
<td>Second step</td>
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</tr>
<tr>
<td>Error MT</td>
<td>42.27</td>
<td>34</td>
<td>0.16</td>
<td>0.99</td>
<td>0.05 (0.00 0.09)</td>
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<tr>
<td>Error T</td>
<td>189.23</td>
<td>39</td>
<td>&lt;0.01</td>
<td>0.86</td>
<td>0.20 (0.17 0.23)</td>
<td>146.96/5 (&lt;0.01)</td>
<td>Error MT</td>
<td></td>
</tr>
<tr>
<td>Error M</td>
<td><strong>45.40</strong></td>
<td><strong>36</strong></td>
<td><strong>0.14</strong></td>
<td><strong>0.99</strong></td>
<td><strong>0.05 (0.00 0.09)</strong></td>
<td>3.13/2 (0.21)</td>
<td>Error MT</td>
<td></td>
</tr>
<tr>
<td>Error I</td>
<td>210.63</td>
<td>41</td>
<td>&lt;0.01</td>
<td>0.84</td>
<td>0.20 (0.18 0.23)</td>
<td>165.22/5 (&lt;0.01)</td>
<td>Error M</td>
<td></td>
</tr>
<tr>
<td>Third step</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>Model 0</strong></td>
<td><strong>47.55</strong></td>
<td><strong>37</strong></td>
<td><strong>0.12</strong></td>
<td><strong>0.99</strong></td>
<td><strong>0.05 (0.00 0.09)</strong></td>
<td>2.15/1 (0.14)</td>
<td>Error M</td>
<td></td>
</tr>
<tr>
<td>Model 1</td>
<td>44.09</td>
<td>31</td>
<td>0.06</td>
<td>0.99</td>
<td>0.07 (0.00 0.11)</td>
<td>3.45/6 (0.75)</td>
<td>Model 0</td>
<td></td>
</tr>
<tr>
<td>Fourth step</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Model 2a</td>
<td>88.90</td>
<td>74</td>
<td>0.11</td>
<td>0.99</td>
<td>0.05 (0.00 0.08)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Model 2b</strong></td>
<td><strong>96.27</strong></td>
<td><strong>79</strong></td>
<td><strong>0.09</strong></td>
<td><strong>0.98</strong></td>
<td><strong>0.04 (0.00 0.077)</strong></td>
<td><strong>3.37/5 (0.64)</strong></td>
<td><strong>Model 2a</strong></td>
<td></td>
</tr>
<tr>
<td>Model 2c</td>
<td>122.91</td>
<td>94</td>
<td>0.02</td>
<td>0.97</td>
<td>0.06 (0.02 0.08)</td>
<td>30.64/15 (0.01)</td>
<td>Model 2b</td>
<td></td>
</tr>
<tr>
<td>Model 3</td>
<td>54.29</td>
<td>43</td>
<td>0.17</td>
<td>0.99</td>
<td>0.05 (0.00 0.09)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 4</td>
<td>98.47</td>
<td>65</td>
<td>0.01</td>
<td>0.97</td>
<td>0.07 (0.04 0.01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model 5</td>
<td>81.02</td>
<td>63</td>
<td>0.06</td>
<td>0.99</td>
<td>0.05 (0.00 0.09)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In bold the best fitting model within each group of nested models.

Note: df = degrees of freedom; $p$ = statistical significance of Chi-square statistic; CFI = Comparative fit index; RMSEA = Root Mean Squared Error of Approximation, IC90 limits of 90% confidence interval for RMSEA; $N = 101$

Fig. 1  Path diagram of the best-fitting latent growth curve model of the relationships between perceived control and psychological distress, with standardized regression weights, error correlations, and R square for each dependent variable (in italics). The paths from the intercepts to observed variables were fixed to 1 and the paths from the slopes to observed variables were fixed to values from 0 (P.CONTROL1 and P.DISTRESS1) to 4 (P.CONTROL5 and P.DISTRESS5) in order to model two linear latent growth models. All observed variables were well determined by the latent factors (explained variances between 64 and 83%).
This data shows that perceived control is a strong predictor of distress, considering both transversal values (intercepts) and change values (slopes). As could be expected given the simplicity of the model, variance of intercepts and change values (slopes), are remarkably well accounted for ($R^2 = 0.64$ and 0.81, respectively).

The covariates identified as possible moderators of these multivariate relationships were tested next, one by one. The specified configuration of relations and the estimated regression weights were shown to be equivalent in both mastectomy and lumpectomy groups (Fourth step, Model 2b in Table 2). Probably due to the loss of statistical power, two of the regression weights turned out to be non-significant (perceived control intercept to perceived control slope and perceived control intercept to perceived distress slope). Specifying free parameters for each group did not significantly improve the goodness of fit of the model (Model 2a) and restricting the variances and covariances of errors to be equivalent (Model 2c) worsened the fit.

Age did not show statistically significant effects on any of the intercepts or the slopes, even though their inclusion in the model was acceptable in terms of goodness of fit indexes (Table 2, Model 3).

Physical symptoms and functional status were considered next. This can vary over time and we tested two types of possible effect. First, it was included in the model as a time varying covariate (Model 4), and secondly it was defined as a latent trajectory construct and its influence was studied (Model 5). Basic descriptive statistics are shown in Table 4, where an increment is observed between the second and the third measurement, after that, means begin to diminish steadily.

The model that included physical state as a time varying covariate, showed worse goodness of fit (Model 4 in Table 2) than the multivariate model (Model 0 in Table 2). This is seen in all goodness of fit statistics even though their chi-square values are not directly comparable because they are not nested models. Despite the bad fit, we feel it is important to note that all the estimated parameters were statistically significant. Physical state effects over the 4 measures of perceived control showed standardized values from $-0.11$ to $-0.40$, and over the 4 measures of psychological distress the range was between 0.18 and 0.59. The effects related to our main hypotheses all remained statistically significant and are included in Table 2. As would be expected, the effect of initial perceived control on the initial psychological distress is unaffected by the inclusion of a covariate whose measures began in the second assessment. It can be observed that controlling for physical state moderates the effect of the change in perceived control over the change in psychological distress. The difference is large (standardized effect diminishes from 0.81 to 0.53 in absolute value), but the effect is still sizeable. On the other hand, the effects between initial status and change within each construct increase.

When defined as a latent trajectory construct, physical state was shown not to covary with change either in perceived control or in psychological distress. This is attributable to the fact that physical state did not follow a linear tendency over time. As has been commented on the means displayed in Table 4, physical state scores increased from the second to the third assessment, and from this point on, scores decreased showing that physical state improved. Physical state intercept or slope did not correlate with the slopes of perceived control and psychological distress.

### Table 3

Unstandardized and standardized regression weights, standard errors, critical ratios and significance, for structural model in Fig. 1

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized weight</th>
<th>Standardized weight</th>
<th>Standard error</th>
<th>Critical ratio</th>
<th>$p$</th>
<th>Partial standardized weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control S $\leftarrow$ Control I</td>
<td>-0.06</td>
<td>-0.35</td>
<td>0.03</td>
<td>-2.43</td>
<td>0.02</td>
<td>-0.58</td>
</tr>
<tr>
<td>Distress I $\leftarrow$ Control I</td>
<td>-1.00</td>
<td>-0.80</td>
<td>0.09</td>
<td>-10.85</td>
<td>&lt;0.01</td>
<td>-0.80</td>
</tr>
<tr>
<td>Distress S $\leftarrow$ Distress I</td>
<td>-0.11</td>
<td>-0.51</td>
<td>0.03</td>
<td>-3.67</td>
<td>&lt;0.01</td>
<td>-0.78</td>
</tr>
<tr>
<td>Distress S $\leftarrow$ Control S</td>
<td>-1.20</td>
<td>-0.81</td>
<td>0.16</td>
<td>-7.45</td>
<td>&lt;0.01</td>
<td>-0.53</td>
</tr>
<tr>
<td>Distress S $\leftarrow$ Control I</td>
<td>-0.08</td>
<td>-0.31</td>
<td>0.04</td>
<td>-2.25</td>
<td>0.02</td>
<td>-0.30</td>
</tr>
</tbody>
</table>

In the last column partial standardized weights controlling for physical well-being as a time variable covariate are added. The arrow indicates the direction of the relation.

**Note:** Control I = Perceived Control Intercept; Control S = Perceived Control Slope; Distress I = Psychological Distress Intercept; Distress S = Psychological Distress Slope; $N = 101$

### Table 4

Mean (with standard deviations in parentheses) of physical state of mastectomy patients ($n = 50$), lumpectomy ($n = 51$) and the whole sample ($N = 101$) along the last four assessments

<table>
<thead>
<tr>
<th></th>
<th>Mastectomy</th>
<th>Lumpectomy</th>
<th>Whole sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>35.62(23.03)</td>
<td>28.59(15.20)</td>
<td>32.07(19.70)</td>
</tr>
<tr>
<td>3</td>
<td>36.72(22.99)</td>
<td>32.84(18.66)</td>
<td>34.76(20.90)</td>
</tr>
<tr>
<td>5</td>
<td>24.56(14.85)</td>
<td>22.22(15.59)</td>
<td>23.38(15.20)</td>
</tr>
</tbody>
</table>
Correlations between the intercepts were the only statistically significant effects added to those identified in previous models. So, even though the goodness of fit indexes were acceptable (Model 5 in Table 2) the latent trajectory of physical state did not covariate with the latent trajectories of the other constructs considered.

Discussion

The present study investigated the evolution of perceived control and psychological distress in women for one year after breast cancer surgery. Our results reveal that, over this period, perceived control increases linearly and psychological distress also decreases linearly, whereas the evolution of physical state (physical symptoms and functional status) produced by illness and oncological treatments follows a different profile. Therefore, changes in physical state (functional status and physical symptoms) in breast cancer patients at stages I or II do not seem to be related with changes in psychological distress during treatment.

However, it must be pointed out that, in each assessment, physical state was positively related with psychological distress and negatively related with perceived control, and moderates the effect of the change in perceived control over the change in psychological distress. This shows that the relationship between perceived control and psychological distress remains, despite the physical state, but that physical state must be considered if a complete picture of psychological distress and perceived control features is to be achieved.

Our results have also revealed that the decrease in psychological distress can be predicted by initial values of perceived control and psychological distress, although the strongest predictor is the rate of change in perceived control observed across the five assessments. These results lead to the conclusion that the breast cancer patients in this study improved both in terms of perceived control and psychological distress over the year after surgery. Our statistical analysis did not show that age and the kind of surgery were significantly related with either perceived control or psychological distress. However, this result is not conclusive, since the small sample size limited the power of the statistical methods used, and results provided by other researches are not clear (see Barez et al. 2007, for a wider discussion of these questions).

The finding that psychological distress improves over time agrees with those obtained in previous studies (McCaul et al. 1999; Osowiecki and Compas 1998, Stanton et al. 2002). Furthermore, a relationship between perception of control and psychological distress has been found previously in several studies (Hirai et al. 2002; Osowiecki and Compas 1998; Schnoll et al. 1998b). However, these studies did not analyze whether functional status and physical symptoms were related to psychological distress or perceptions of control. In our study, the global analysis developed across a longitudinal design provides data to reinforce the notion that the perception of control influences the psychological distress of breast cancer patients regardless of the kind of surgery and age, although it is modulated by physical state. Statistical models used in our design provide also evidence of change in perceived control in breast cancer patients across one year after surgery, but some limitations must be considered.

The participants in this study have a specific kind of cancer and a good prognosis, since they are at the initial stages of their disease. Furthermore, of the initial group of patients requested, the women who finally agreed to participate were more distressed than the women who refused. This result is not surprising, since some studies have found that patients with higher psychological distress are more prone to complete a psychosocial intervention program (Gilbar and Neuman 2002; Grande et al. 2006). Although scores for psychological distress in our sample are low, this profile is similar to those found in other samples of breast cancer patients at earlier stages using POMS measures as an index of psychological adjustment to illness (Hack and Degner 2004; McCaul et al. 1999; Stanton et al. 2002). Furthermore, in studies that have analyzed different kinds of cancer patients, low scores for anxiety and depression have also been observed (Osowiecki and Compas 1998; Walker et al. 2006). It could be argued that advanced stages would provide higher rates of depression and anxiety in cancer patients, but this assumption has not received clear support (Hirai et al. 2002). Taking these results as a whole, it can be concluded that a large number of cancer patients do not show any loss of psychological adjustment, regardless of the site and stage of the disease.

One question that deserves some comment is the fact that our results did not reveal any effect of the type of surgery on either perceived control or psychological distress, although observed means of perceived control and psychological distress were systematically worse for mastectomized women. We have stated that this might be of the result of using a small sample that precluded a more conclusive statistical analysis. Previous studies have addressed whether mastectomy or conserving surgery are related with psychosocial problems and worries and the results are not conclusive. McCaul et al. (1999) and Wade et al. (2005) did not find any relationship between these factors, whereas Avis et al. (2004) stated that mastectomy patients had greater problems than non-mastectomy patients only in body image and interest in sex, but not for other psychosocial aspects.

A second limitation of our study can be taken from the fact that although the relationship between the two main
constructs has been found to be statistically significant, the change in scores was small: perceived control changed from 66.63 to 71.45 for the whole sample, whereas the loss of psychological distress changed from 30.25 to 21.59. The present data cannot show whether this small change is caused by a ground effect (a large proportion of women could not improve their scores since they were in the lowest range of values for the first and second assessments) or by the fact that psychological changes are in themselves low and slow.

Thus, more studies must be developed in order to enhance empirical support for the causal relationship between perceived control and psychological adjustment to illness. In the same sense, additional measures of psychological distress (i.e. audio-taped interviews or clinical recordings which could later be rated by experienced judges) should be used. Measures to assess positive experiences of benefit finding which are found by some patients as a consequence of the experience of cancer (Lechner et al. 2006), should also be included.

In the meantime, some recommendations for clinical interventions could be taken from our research. First, it can be expected that therapies and techniques that enhance cancer patients’ sense of control over the disease (see, for instance, Stiegelis et al. 2004) would provide patients with a better emotional profile, with decreased anxiety and depression scores. Second, breast cancer patients at previous stages of the disease having a high sense of control would be expected to be less distressed in the future, since sense of control would increase in the months following surgery and adjuvant treatments. Finally, since our results agree that perceived control is a predictor of psychological distress, it could be expected that patients with low scores for perceived control would benefit from psychological support to manage their emotional distress.

Acknowledgments This research was supported by Grant SEJ2005-06345 from the Spanish Government’s Dirección General de Investigación del Ministerio de Ciencia y Tecnología. We would like to acknowledge the contributions of four anonymous reviewers and the Associate Editor, Dr. Revenstorf, although any mistake or misinterpretation is the authors’ responsibility.

References


Emotional and motivational mechanisms mediating the influence of goal setting on endurance athletes’ performance

Javier Buenoa, Robert S. Weinbergb,*, Jordi Fernández-Castroa, Lluís Capdevilaa

aUniversitat Autònoma de Barcelona, Spain
bDepartment of Kinesiology and Health, Miami University-Phillips Hall, Oxford, OH 45056, USA

Received 29 March 2007; received in revised form 15 November 2007; accepted 23 November 2007
Available online 28 January 2008

Abstract

Objectives: To examine several psychological mechanisms mediating the efficacy of goal setting in endurance sports.

Design: The athletes were randomly assigned to four experimental conditions in a $2 \times 2 \times 3$ mixed design.

Methods: Participants were 35 male endurance athletes ranging in age from 15 to 34 years who competed at different athletic clubs of the Catalonian Track and Field Federation. They were assigned to a goal (attainable or unattainable) and pattern of social comparison (win or lose) conditions, which were between subject variables, and phase of assessment (three repetitions) served as the repeated-measure variable.

Results: To analyze the role of mediator mechanisms, a structural equation modeling analysis was conducted. The results indicated that both motivational and emotional mechanisms were important mediators in improving the efficacy of goal setting in endurance sports. In particular the addition of the concept of suffering (including perceptions of threat and feelings of helplessness) was shown to be related to performance outcomes.

Conclusions: When setting goals, the possibility of not reaching those goals can be threatening to individuals and lead to feelings of helplessness, especially if goals are perceived as too difficult. Having strong self-efficacy to meet the goals set is important to maintain motivation.

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Keywords: Goal setting; Emotion; Motivation; Mediating mechanisms; Self-efficacy

Introduction

Goal setting is one of the most effective psychological strategies for improving performance and motivation in organizational settings (Locke & Latham, 1990; Locke, Shaw, Saari, & Latham, 1981; Mento, Steel, & Karren, 1987). Locke and Latham (1985), in fact, suggested that its application in sport would be better than in organizations because individual performance is easier to assess in sport than in other activities. Although initial research testing the effectiveness in sport was not as consistent as in industry, due in part to better

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This research has been funded partly with grants SEJ2005-06345, SEJ2005-05113 and DEP2006-56125-C03/PREV from the Spanish Government, and SGR2005-00318 from the Catalan Government.

*Corresponding author.

E-mail address: weinber@muohio.edu (R.S. Weinberg).
methodology, goal setting research in sport and exercise has been more consistent (Burton & Naylor, 2002; Kyllo & Landers, 1995). However, there are still studies which do not support the hypothesis that specific and difficult goals facilitate higher levels of performance as compared to generalized goals in sport/exercise settings (e.g., Boyce, 1994; Garland, Weinberg, Bruya, & Jackson, 1988; Weinberg, Bruya, Garland, & Jackson, 1990; Weinberg, Fowler, Jackson, Bagnall, & Bruya, 1991). The proximity hypothesis has also received mixed support which demonstrates that the combination of short and long-term goals does not always improve performance more than the use of long- or short-term goals alone (Hall & Byrne, 1988; Tenenbaum, Weinberg, Pinchas, Elbaz, & Bar-Eli, 1991).

Locke (1991) attributed the inconsistent results to methodological flaws: (a) manipulation failure of 'do best' condition, (b) not measuring personal goals in response to assigned goals, (c) not making sure that specific goals are actually difficult, (d) a lack of commitment with the goals, (e) starting from different baseline levels of the various experimental groups, (f) not controlling competition between subjects, and (g) measuring subjective difficulty of the goal or effort, not self-efficacy which is more related to performance. Locke's critical analysis of goal setting in sport led to changes to improve the experimental procedures (Lerner & Locke, 1995) and opened up discussion about the validity of the criticisms (Weinberg & Weigand, 1993). On the one hand, Weinberg and Weigand thought that procedural and methodological issues were not the cause of the inconsistent and equivocal findings but rather it was the motivation of the athlete and the kind of tasks in sport that were the main reasons for the different findings. For example, athletes are usually more motivated than people in industrial/organizational studies and this can diminish the efficacy of goal setting. In addition, Kyllo and Landers (1995) and Burton and Naylor (2002) argued that the small sample size could be responsible for the less consistent goal setting results in sport/exercise settings. Specifically, Burton and Naylor found that between 20% and 25% of the studies in sport/exercise settings used samples smaller than 30 subjects.

Weinberg and Weigand (1993) argued that goal setting improved performance in sport/exercise settings. However, they thought that the challenge was not to carry out methodologically rigid experiments without any external validity, but to determine what kind of goals would be the best for different people. Maybe, it would be more interesting to study which is the cognitive and emotional response of each athlete to particular goals. If this response is negative, these goals will not improve performance. Related to this, Hall and Byrne (1988) pointed out that the cognitive mechanisms mediating the efficacy of goal setting had not been studied. Thus, Wood and Bandura (1989b) and Bandura and Jourden (1991) developed a model of these cognitive mechanisms from the point of view of social cognitive theory. According to social cognitive theory, goals do not directly regulate motivation. Goal setting is a necessary but not sufficient component of a complex mechanism of self-regulation where effort and persistence are governed by several self-regulatory mechanisms operating in concert (Bandura & Cervone, 1983; Bandura & Jourden, 1991). These mediator mechanisms are the positive and negative emotions (self-satisfaction) which derive from self-evaluation of behavior, self-efficacy, and self-set goals or personal goals. Anticipated self-satisfaction for reaching set goals and dissatisfaction when they are not reached, are the motivational inductors that increase performance and diminish the discrepancies between the set goal and the achieved performance. However, dissatisfaction will motivate or not depending on perceived self-efficacy to reach the goals. Finally, when goals are achieved people set a new challenge/goal to increase effort and performance again.

Most of the studies using social cognitive theory have been conducted in organizational settings (Bandura & Jourden, 1991; Bandura & Wood, 1989; Wood & Bandura, 1989a). In these studies, “the application of the theory is illustrated in a series of experiments of complex managerial decision making, using a simulated organization. The interactional causal structure is tested in conjunction with experimentally varied organizational properties and belief systems that can enhance or undermine the operation of the self-regulatory determinants” (Wood & Bandura, 1989b, p. 361). A simulated environment permits systematic variation of theoretically relevant factors and precise assessment of their impact on organizational performance and the psychological mechanisms through which effects are achieved. By incorporating multiple trials in the simulated environment, it is possible to examine temporal interdependencies and cumulative effects in decision-making processes.

From studies by Bandura and colleagues, the self-regulatory model was proposed where self-satisfaction lost importance as an explicative causal factor (Bandura & Wood, 1989; Earley & Lituchy, 1991; Kane, Marks, Zaccaro, & Blair, 1996; Wood & Bandura, 1989a; Wood, Bandura &. Bailey, 1990). According to the
self-regulatory model, from performance in a specific task, people form self-efficacy judgments and set goals. The effect of self-efficacy on subsequent performance is both direct and mediated by personal goals, and personal goals directly influence subsequent performance. Next, present performance will influence subsequent self-efficacy and goal setting. Thus, the above pattern is a cyclical and dynamic process.

Although the validity of the self-regulatory model has been confirmed in several studies in the laboratory domain (Button, Mathieu, & Aikin, 1996; Gibbons & Weingart, 2001; Mathieu & Button, 1992) and in the sport domain (Kane et al., 1996; Theodorakis, 1995, 1996), it is only centered on the motivational consequences of goal setting. From this point of view, goals improve performance through improvements in self-efficacy and personal goals. However, little is known about the emotional consequences of goal setting. Specifically, goals can be an important source of stress, especially when people are threatened because of the possibility of not reaching important or meaningful goals (Burton & Naylor, 2002; Conroy, Willow, & Metzler, 2002; Lazarus, 1999; Lewthwaite, 1990). In addition, according to Lazarus (2000) performance in competitive sports can be affected by emotions because emotions turn the mind toward a different goal commitment and away from the competitive task at hand. Thus, negative emotions, related to threat, could be counterproductive in competitive settings. In the present study, it is, therefore, hypothesized that emotional mechanisms can also be a mediating factor in the same way as self-efficacy and personal goals. Previous studies have not yet explored the complex relationships between motivational and emotional factors, mediating the efficacy of goal setting on performance.

Along these lines, Bueno, Capdevila, and Fernández-Castro (2002) proposed a competitive suffering model to study the implications of emotional factors on the performance of endurance athletes. This model was based on a suffering model in terminal patients (Bayés, Arranz, Barbero, & Barreto, 1996; Chapman & Gavrin, 1993) and on Lazarus and Folkman's (1984) stress theory. According to this model, competitive suffering arises when the athlete discovers, while competing, that an important goal will not be reached. In that situation, the athlete will strive to reach the goal and then unpleasant sensory and psychosocial inputs will be perceived. The feelings of threat and helplessness, because of the conviction that the goal will not be reached, will bring about suffering in the athlete during the competition. In this way, the two most important aspects of suffering are the perception of threat and coping resources available for the threat (see Fig. 1). To measure the above aspects, Bueno (2000) and Bueno, Fernández-Castro, and Capdevila (2001) developed two questionnaires which measure three kinds of threat perceptions: general threat, psychosocial threat and respiratory threat; and six kinds of coping strategies: dissociation, self-blame, social support, positive reappraisal, decrease/increase of effort, and association (see definitions in Table 1).

The present investigation was designed to test the hypothesis that different patterns of social comparison and levels of goal difficulty influence performance through their influence on self-efficacy, personal goals, threat perceptions and coping strategies. Similar to the studies of Bandura and collaborators, the influence of the mediator mechanisms on performance in endurance athletes was tested in a simulated competition. In essence, the interactional causal structure was analyzed by experimentally manipulating competition and goal difficulty, which is predicted to enhance or undermine the operation of the mediator mechanisms. The manipulation simulates the natural setting of competition where an athlete can reach or not an assigned goal.
or he/she can win or lose against a group of opponents. This manipulation was repeated during three consecutive repetitions to assess the effect of repeated success (reach the goal and/or win against the opponents) and repeated failure (not reach the goal and/or lose).

More specifically, the purpose of this study was to analyze the role of mediator mechanisms in the efficacy of goal setting on performance in endurance sports. The mediator mechanisms studied were the self-regulatory mechanisms (self-efficacy and personal goals), threat perceptions and coping strategies. It was predicted that previous performance would be a direct and positive predictor of self-efficacy, personal goals and subsequent performance. Self-efficacy would positively predict subsequent performance both directly and indirectly through personal goals, and personal goals would be a direct and positive predictor of subsequent performance. Threat perceptions and coping strategies would also mediate the efficacy of goal setting but specific predictions cannot be made because of the absence of research examining these relationships. Thus, an exploratory analysis was conducted on the relationships between threat perceptions, coping strategies and self-regulatory mechanisms.

Method

Participants

The participants were 35 male endurance athletes ranging in age from 15 to 34 years, with an average age of 22 years (SD = 5.49). The athletes belonged to different athletics clubs of the Catalan Track and Field Federation. To be selected for the current study, participants had to meet certain criteria. These criteria included doing three or more repetitions of 1000 m (typical training for endurance athletes) during training sessions in less than 3 min 15 s. They trained an average of 6 times per week (SD = 1.87) and had been competing in track and field for an average of 7 years (SD = 4.67). The usual pace for the repetitions of 1000 m in their usual training sessions was 3 min 3 s (SD = 10.7) Eighty-nine percent of the sample only competed in track (600, 800, 1000, 1500, 2000 m steplechase, 3000 m steplechase, 5000 or 10000 m), whereas the other 11% competed in half-marathon (21097 m).

Table 1

<table>
<thead>
<tr>
<th>AITES and AICRES factors and their definitions</th>
<th>Reliability (Cronbach's α)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Factors</th>
<th>Description</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AITES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General threat</td>
<td>Worries related to aspects of sensorial, muscular and psychological nature (e.g. &quot;Pain or muscular discomfort in legs&quot;); “Never finishing the race”, etc.)</td>
<td>0.88</td>
</tr>
<tr>
<td>Psychosocial threat</td>
<td>Worries related to interaction with other people in the competitive situation, such as opponents, partners, coach, etc. (e.g. “Performing worse than other runners”)</td>
<td>0.69</td>
</tr>
<tr>
<td>Respiratory threat</td>
<td>Worries related, above all, to respiratory aspects and other related aspects (e.g. “Breathlessness, difficulty breathing, accelerated breathing, or chest pains”)</td>
<td>0.67</td>
</tr>
<tr>
<td><strong>AICES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dissociation</td>
<td>Attention to irrelevant aspects of the competition, in order to ignore a threat or discomfort (e.g. “I thought about my daily problems”)</td>
<td>0.80</td>
</tr>
<tr>
<td>Self-blame</td>
<td>Athlete’s criticism towards self and/or his performance (e.g. “I criticized myself”)</td>
<td>0.86</td>
</tr>
<tr>
<td>Social support</td>
<td>Support from other runners to improve or not decrease his performance (e.g. “I tried to stay with other runners, in order to maintain or increase my pace”)</td>
<td>0.83</td>
</tr>
<tr>
<td>Positive reappraisal</td>
<td>Efforts to see the threatening situation from a more positive point of view (e.g. “I tried to reduce the significance of my discomfort”)</td>
<td>0.74</td>
</tr>
<tr>
<td>Decrease/increase of effort</td>
<td>Bipolar scale, measuring an athlete’s appraisal about how much effort has been applied in response to threat. High score indicates decrease of effort and low score, increase (e.g. “I increased my effort”)</td>
<td>0.72</td>
</tr>
<tr>
<td>Association</td>
<td>Attention to physical feelings and other relevant aspects of the competition to cope with threat and/or discomfort in order to adjust the pace of the competition (e.g. “I focused on my internal body rhythms (breath or heart rates) and attempted to control them”)</td>
<td>0.64</td>
</tr>
</tbody>
</table>
Task and design

The task consisted of completing three repetitions of 5 min on a treadmill with a slope of 5%, resting 15 min between each repetition. During each repetition, the athlete could change the speed of the treadmill freely to simulate actual race conditions. Every change in speed represented a change of 0.5 km/h, which was practically imperceptible.

The participants were randomly assigned to one of four treatment conditions defined by the difficulty of the assigned goal and by the pattern of social comparison. Thus, the design was a $2 \times 2 \times 3$ with goal assignment (attainable or unattainable) and pattern of social comparison (progressive success or progressive failure) as the between-subject variables, and phase of assessment (three repetitions) as a repeated-measure variable. The speed to begin each repetition was fixed at 15 km/h. A period of 30 s was necessary to reach that speed and then the test officially began. During each repetition, the participants had to try to reach the assigned goal (1250 m in 5 min or 1500 m in 5 min, depending on the experimental condition) and they received feedback about their performance and about the performance of a comparative group on a computer screen located in front of them. Software was specifically designed for the study, and the treadmill and software were synchronized to simultaneously show on the computer screen the changes carried out on the treadmill. The feedback consisted of information about the time and distance of their own performance and of the comparative group. This feedback was received every 30 s and at the end of the test. Specifically, every 30 s, a message appeared on the computer screen informing them if they were running at an appropriate pace to reach the assigned goal or not, and if they were losing or winning in relation to the comparative group. When the repetition ended, the final outcome with regard to the assigned goal and the comparative group was fixed in the screen. For example, an athlete who did not reach the assigned goal but beat the comparative group received the following information: ‘You have not reached the goal by ‘X’ meters; you have beaten the group by ‘X’ meters. ‘The feedback of the participants’ performance attainments in respect to the assigned goal was true but the feedback in respect to the comparative group’s performance was false depending on the pattern of social comparison in which the athlete had been assigned. Thus, comparative information on each repetition was preprogrammed to diverge from the subjects’ actual attainments in the direction designated by the treatment conditions to which participants had been assigned. This procedure ensured that all participants in a given treatment condition received an identical comparative pattern of feedback whatever their level of personal performance. For example, in the progressive failure condition, the comparison group surpassed the participant, but the final distance and the separation moment between participant and group was different in each repetition. Specifically, in the first repetition, the participant lost by 61 m and the comparison group began to separate from him at 2 min and 41 s. In the second repetition, he lost by 83 m and they began to separate from him at 1 min and 55 s. Finally, in the third repetition, the participant lost by 104 m and they began to separate at 1 min and 9 s. Thus, each repetition was progressively more unfavorable. In the progressive success condition, participants surpassed the comparison group with the same final distance and separation moment noted in the progressive failure condition, but now each repetition was progressively more favorable for the athlete. Regarding the assigned goals, pilot tests with five athletes with the same characteristics were done to ensure that they were attainable or unattainable in the sample used. An attainable goal was defined as running 1250 m in 5 min on the treadmill with a slope of 5%, while an unattainable goal was defined as running 1500 m in 5 min with the same slope.

This study received ethical approval from our university’s review committee. All participants indicated their willingness to participate and provided an informed consent.

Procedure

After a brief interview to assess the athletic level of the athletes (experience in athletics, personal bests in the different endurance tests where they competed, etc.), each athlete was told that he was going to perform several repetitions of 5 min on the treadmill where his performance would be compared with the performance of a group of athletes with similar characteristics to him. The athletes were not told the exact number of repetitions to avoid the possibility that they might intensify their performance on the third if they knew it was
their last effort (Bandura & Cervone, 1983). Before starting the repetitions, participants warmed-up on the treadmill for 5 min, at 9 km/h and with a slope of 5%.

After the warm-up, an attainable (1250 m in 5 min) or unattainable goal (1500 m in 5 min) was assigned to them depending on the experimental condition. They carried out three repetitions on the treadmill trying to reach the previously assigned goal. While the participants ran, they would receive feedback about their performance and about the performance of the comparative group and they could change the speed of the treadmill freely to adjust the pace and reach the assigned goal.

After each repetition, the final outcome in relation to the assigned goal and to the comparative group was fixed on the screen. Then, personal and comparative performance in meters, perceived self-efficacy, personal goals, threat perceptions and coping strategies were assessed. A rest of 15 min was necessary to answer every questionnaire and scale and to avoid the effect of accumulative fatigue on performance in the next repetition. The procedure was repeated for the three repetitions. When the questionnaires and scales were answered after the third repetition, the athletes were told that the experiment was finished. Then, the objectives of the research were explained to reduce any negative potential effect produced by experimental manipulation. The participants were asked not to comment on any aspect of the research to anybody from their team.

**Instrumentation**

A Jaeger treadmill, a Laufergetest LE/3 model, was utilized. It can be regulated by changing the speed (from 0.1 to 30 km/h) and slope (from 0% to 20%). Performance was measured in terms of the total meters covered by the athlete in each repetition on the treadmill. Software was specifically designed for the research allowing for manipulation of simulations of competitions between an athlete and a group of runners on a treadmill in a laboratory. Moreover, software provided objective feedback about athletes’ performance through the screen and the loudspeakers. Thus a computer screen was located in front of the athlete showing his position and the group of opponents on a 400-m athletic track. While the athlete ran on the treadmill, he received continuous feedback about his virtual position on the track and the position of the group, completed laps, distance, time, accumulative time every 200 m and speed (km/h). He also received objective and discontinuous feedback every 30 s consisting of visual and audible messages which indicated if the athlete was running, at that moment, at an appropriate pace to reach the assigned goal or not, and if he was losing or winning in relation to the comparative group.

**Questionnaires**

Assessment Instrument of Threat in Endurance Sports (AITES, Bueno, 2000). This was a retrospective questionnaire consisting of 19 items, which assesses threat perceptions while athletes are running. The athletes answered, based on their perceptions regarding their effort and performance on the endurance test by using an 11-point scale that ranged from 0 (not at all) to 10 (very much so). The questionnaire assesses three different kinds of threat: general threat, psychosocial threat and respiratory threat (see definition, examples of items and reliability of factors in Table 1). A total score of threat perception (Cronbach’s α = 0.86) can be also obtained by summing the score in the three scales.

Assessment Instrument of Coping Strategies in Endurance Sports (AICRES, Bueno et al., 2001). This was also a retrospective questionnaire consisting of 28 items, which assessed strategies to cope with threat while the athletes are running. The athletes answered questions regarding different coping strategies used when they were feeling bad during the endurance test by using an 11-point scale that ranged from 0 (not at all) to 10 (very much so). The questionnaire assessed six different kinds of coping strategies: dissociation, self-blame, social support, positive reappraisal, decrease/increase of effort and association (see definition, examples of items and reliability of factors in Table 1).

The self-efficacy scale was based on the directions of Chase and Feltz (1999). This efficacy scale describes 23 levels of attainments ranging from 1100 to 1650 m in 5 min. Ratings were made in terms of a 25-interval scale (i.e., 1100, 1125, 1150, 1175, 1200 m, etc. up to 1650 m) ranging from 0 (no confidence at all) to 100 (total confidence). The athletes had to indicate their confidence to reach each level in the next repetition.

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1A copy of the questionnaires can be obtained by contacting the first author.
The strength of perceived self-efficacy was the sum of the confidence scores for the 23 levels of performance divided by the number of levels.

To assess personal goals (Bandura & Jourden, 1991) participants recorded the level of performance they were personally aiming for in the next repetition. They selected one personal goal from 23 levels of possible attainments ranging from 1100 to 1650 m in 5 min or a last option of no particular goal.

Results

The purpose of this study was to analyze the role of mediator mechanisms in the efficacy of goal setting on performance in endurance sports. However, before analyzing the role of the mediator mechanisms, some results are presented regarding the mediating variables. With regard to performance, 100% of the participants in the attainable goal condition (running 1250 m in 5 min) reached this goal. The minimum distance covered was 1250 m and the maximum, 1511 m. Conversely, the participants in the unattainable goal condition (running 1500 m in 5 min), reached the assigned goal only 5.88% of the times. The minimum distance covered was 1214 m and the maximum, 1526 m. In relation to personal and assigned goals, results showed that participants were committed to assigned goals because they chose higher personal goals (mean = 1395.39) when assigned goals were unattainable and lower (mean = 1334.26) when they were attainable ($F(1, 29) = 4.64; p < 0.05$).

In relation to the threat perceptions and coping strategies, the obtained results have been compared by the norm-based scoring from previous research with athletes competing in natural environments (Bueno, 2000; Bueno et al., 2001). Tables 2 and 3 show means, standard deviations, and correlations between the included variables in Phase 1 and 2, respectively, of the experiment. For example, in relation to the total punctuation of threat perception, the means (52.43 and 53.46) correspond to a percentile of 68.5 in repetition one, and a percentile of 69.4 in repetition two. With regard to self-blame, the means correspond to a percentile of 74 in repetition one, and 73.3 in two. In relation to positive reappraisal, the means correspond to a percentile of 36.9 and 43.8, after repetitions one and two, respectively. Finally, the punctuations of a decrease/increase of effort in repetition two (see Table 3) correspond to a percentile of 35.9.

To analyze the role of mediator mechanisms in the efficacy of goal setting on performance, a structural equation modeling analysis was conducted using AMOS 4.0 (Arbuckle & Wothke, 1995–1999). The full set of structural equations representing the hypothesized causal relations were analyzed separately for the variables mediating between repetition one and two (Phase 1), and those mediating between repetition two and three (Phase 2). Because of the absence of research examining the relationships among the self-regulatory mechanisms (self-efficacy and personal goals), threat perceptions and coping strategies, an exploratory strategy was conducted to analyze the mediator relationships. However, the relationships from the

Table 2
Mean, standard deviation and correlations between the variables included in the model in Phase 1 of the experiment

<table>
<thead>
<tr>
<th>Variables</th>
<th>M</th>
<th>SD</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Performance</td>
<td>1352.35</td>
<td>64.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. General threat</td>
<td>33.86</td>
<td>19.68</td>
<td>0.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Psychosocial threat</td>
<td>13.23</td>
<td>10.24</td>
<td>-0.20</td>
<td>0.61**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Respiratory threat</td>
<td>5.34</td>
<td>4.77</td>
<td>0.07</td>
<td>0.45**</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Threat perception</td>
<td>52.43</td>
<td>29.48</td>
<td>0.04</td>
<td>0.95**</td>
<td>0.79**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Self-blame</td>
<td>10.77</td>
<td>9.74</td>
<td>0.13</td>
<td>0.65**</td>
<td>0.44**</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Positive reappraisal</td>
<td>13.71</td>
<td>9.16</td>
<td>-0.06</td>
<td>0.49**</td>
<td>0.40*</td>
<td>0.51**</td>
<td>0.54**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Self-efficacy</td>
<td>54.81</td>
<td>18.86</td>
<td>0.14</td>
<td>-0.45**</td>
<td>-0.32*</td>
<td>-0.35*</td>
<td>-0.47**</td>
<td>-0.18</td>
<td>-0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Personal goal</td>
<td>1383.57</td>
<td>103.07</td>
<td>0.45**</td>
<td>0.05</td>
<td>-0.01</td>
<td>0.12</td>
<td>0.06</td>
<td>0.27</td>
<td>0.12</td>
<td>0.53**</td>
<td></td>
</tr>
<tr>
<td>10. Performance</td>
<td>1370.15</td>
<td>77.35</td>
<td>0.64**</td>
<td>-0.11</td>
<td>-0.12</td>
<td>0.15</td>
<td>-0.09</td>
<td>-0.06</td>
<td>0.16</td>
<td>0.38*</td>
<td>0.58**</td>
</tr>
</tbody>
</table>

*p < 0.05.  
**p < 0.01.  
*p < 0.10.
Table 3
Mean, standard deviation, and correlation between the included variables in the model in the Phase 2 of the experiment

| Variables                  | M    | SD  | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
|----------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. Performance 2           | 1370.15 | 77.35 |      |     |     |     |     |     |     |     |     |     |     |
| 2. General threat 2        | 35.34  | 20.85 | 0.09 |     |     |     |     |     |     |     |     |     |     |
| 3. Psychosocial threat 2   | 10.86  | 9.84  | 0.09 | 0.71**|     |     |     |     |     |     |     |     |     |
| 4. Respiratory threat 2    | 7.26   | 7.49  | 0.10 | 0.72**| 0.56**|     |     |     |     |     |     |     |     |
| 5. Threat perception 2     | 53.46  | 34.49 | 0.10 | 0.97**| 0.84**| 0.81**|     |     |     |     |     |     |     |
| 6. Self-blame 2            | 10.37  | 11.10 | -0.03| 0.78**| 0.67**| 0.58**| 0.79**|     |     |     |     |     |     |
| 7. Positive reappraisal 2  | 15.60  | 8.78  | 0.04 | 0.58**| 0.34* | 0.56**| 0.57**| 0.47**|     |     |     |     |     |
| 8. Effort 2                | 16.14  | 10.04 | -0.15| 0.28  | 0.18  | 0.10  | 0.24  | 0.46**| 0.05 |     |     |     |     |
| 9. Self-efficacy 2         | 47.96  | 18.74 | 0.35*| -0.40*| -0.29*| -0.23 | -0.37*| -0.33*| -0.04 | -0.36*|     |     |     |
| 10. Personal goal 2        | 1349.26| 104.35| 0.70**| -0.01 | -0.07 | -0.05 | -0.03 | -0.04 | 0.01 | -0.22 | 0.63**|     |     |
| 11. Performance 3          | 1349.49| 70.21 | 0.82**| -0.15 | -0.07 | -0.08 | -0.13 | -0.20 | -0.11 | -0.40*| 0.48**| 0.65**|     |

Note: Effort 2 = decrease/increase of effort in repetition 2.
* p < 0.05.
** p < 0.01.
† p < 0.10.

Fig. 2. Estimated structural model in Phase 1 (left network) and Phase 2 (right network). Note: Parameters in the model are standardized. Ellipses represent latent variables and rectangles observed variables.

The self-regulatory model, explained in the introduction, were maintained with respect to the original model (Bandura & Jourden, 1991; Bandura & Wood, 1989; Earley & Lituchy, 1991; Kane et al., 1996; Wood & Bandura, 1989a). A combined model was suggested to show the potential relations among self-regulatory mechanisms, threat perceptions and coping strategies. From successive steps, some variables were removed, as well as relationships among variables that were not statistically significant. Finally, a model which had more shared variance regarding performance, had the best indices of fit measures, and was the most coherent from a theoretical point of view was found. Fig. 2 presents the model, which shows the variables mediating in Phases 1 and 2 of the experiment and their standardized parameters. Every parameter in the model is significant beyond the 0.01 level, except the influence between threat perception and performance, in Phase 1, which is
significant at 0.05 level, and the influence between positive reappraisal and performance, in Phase 1, and positive reappraisal and self-efficacy, in Phase 2, which shows a marginally significant effect. Moreover, every variable introduced in the model showed a normal distribution without surpassing a univariate skewness of 2.0 and kurtoses of 7.0 recommended for this kind of analysis (Curran, West, & Finch, 1996).

The combined set of explanatory variables in the conceptual model accounted for a sizable share of variance in performance in Phase 1 ($R^2 = 0.78$) and in Phase 2 ($R^2 = 0.79$). In Phase 1, the variable which accounted for the most shared variance in performance was threat perception ($b = -0.64$), and in Phase 2, prior performance ($b = 0.81$) and decrease/increase of effort ($b = -0.37$). The study of the different measures of fit indicates a very good fit for both models. Thus, fit measures in Phase 1 of the experiment [$\chi^2(38) = 46.23$ ($p = 0.17$), CMIN/DF (1.22), CFI (0.99), and RMSEA (0.08)]; and in Phase 2 [$\chi^2(60) = 65.59$ ($p = 0.29$), CMIN/DF (1.09), CFI (1.00), and RMSEA (0.05)] were considered correct and satisfactory (Arbuckle & Wothke, 1995–1999) (see Fig. 2).

The outcomes reveal that in Phase 1, performance in repetition 1 enhanced subsequent performance attainments both directly and indirectly through its effects on personal goals. Higher performance attainments in repetition one were accompanied by higher personal goals for repetition two, which, in turn, made an independent contribution after prior performance was controlled. Self-efficacy also had a positive impact on personal goals although it was not affected by prior performance. In addition to these relationships between the self-regulatory mechanisms, threat perceptions and coping strategies also operated as mediators of performance attainments. Specifically, threat perceptions derived from repetition 1 had a positive impact on self-blame and positive reappraisal, and a negative impact on self-efficacy and performance. Thus, an increase in threat perception was accompanied by an increase in the use of coping strategies like self-blame and positive reappraisal, and a decrease in self-efficacy and performance. Moreover, positive reappraisal and self-blame had a positive effect on performance and personal goals, respectively.

In Phase 2, performance in repetition two had positive effects on performance in repetition three and on personal goals, although personal goals were not related to subsequent performance. The effects of prior performance on performance in repetition three were stronger than in Phase 1. In essence, with increasing experience, prior performance made a stronger contribution. In this phase, performance in repetition two had a positive effect on self-efficacy. Higher performance attainments were accompanied by higher self-efficacy, which, in turn, made an independent contribution to personal goals after prior performance was controlled.

Comparison across the two blocks of trials shows some changes in the relationships between threat perceptions and coping strategies with self-regulatory mechanisms. In Phase 2, the effects of threat perception on self-efficacy and self-blame were stronger than in Phase 1. Thus, in Phase 2, higher threat perception accompanied higher self-blame and lower self-efficacy. Moreover, a decrease/increase of effort (labeled as effort in Fig. 2), a coping strategy not important in Phase 1, was positively affected by self-blame and affected performance. Specifically, when the athlete felt more threatened, he increased self-blame, decreased effort, and performance subsequently decreased. Finally, positive reappraisal, which affected performance in Phase 1, had a positive impact on self-efficacy in Phase 2.

Discussion

The purpose of this study was to analyze the role of mediator mechanisms on the efficacy that setting goals has on performance. Along these lines, two theoretical models which correspond to the two phases of the experiment were tested. The assumptions that must be met to adequately test the models presented in the present investigation are that the participants set some kind of goal and that these goals are accepted by them. Thus, participants must be committed to the goals. Goals can be assigned by the researcher (assigned goals) or set by the participant (personal goals), and these can be performance goals (reach a personal best) or outcome goals (beat some opponent). Moreover, it is important that goals change in difficulty because it can increase the variability of the mediator mechanisms, making easier the interpretation of the results.

With respect to the difficulty of the goals, a problem was to assure that all the participants reached the attainable goal and that none reached the unattainable goal. This problem was solved adequately in the case of the attainable goal condition because all the participants reached their assigned goals. In case of the unattainable goal condition, the goal was reached 6% of the times; therefore it cannot be called unattainable.
but very demanding goal. Kyllö and Landers (1995) and Burton and Naylor (2002) have argued that a goal that only can be reached by less of 10% of the participants, might be too difficult as to diminish its acceptance, commitment and performance. In this sense, the unattainable goal condition suggested in this investigation might be considered so difficult that it would probably produce the same effects as a completely unattainable goal (at least 94% of the times).

It should be noted that despite whether goals were perceived to be attainable or not, athletes accepted and were committed to their assigned goals. This can be observed by determining the relationship between assigned and personal goals. Specifically according to Button et al. (1996), assigned goals influence personal goals through goal acceptance and commitment. They argue that individuals adopt the externally set goals as their own and become committed to attaining them. Results showed that participants seemed committed to their assigned goals because they chose higher personal goals when assigned goals were very demanding and lower when they were attainable.

One of the aims of the experimental manipulation was to create threat in the participants to be able to analyze the mediating role of the threat perception and coping strategies on performance. When the scores obtained in the laboratory environment regarding threat perception and coping strategies were compared with the same scores obtained in a natural environment, it was found that the participants experienced more threat, self-blamed more, and strived more than in a natural environment of competition.

The results of the structural equation modeling for Phase 1 indicated a lack of a relationship between self-efficacy, previous performance and subsequent performance, which contradicts the hypotheses of the self-regulatory model. However, according to Bandura (1997), on occasions, a linear equivalence between performance and perceived ability is not found. In the case of previous performance it seems to indicate a non-relationship between the actual performance of the athletes and their expectations. The slope of the performance test, which prevented good performance from occurring, could cause the non-relationship. In turn, this performance was not enough to modify their expectations, deeply rooted through years of experience in the practice of athletics. Furthermore, the lack of a relationship between self-efficacy and subsequent performance has been found in other studies and can be explained by experience and the difficulty of the task (Bandura & Jourden, 1991; Bandura & Wood, 1989; Gibbons & Weingart, 2001; Wood & Bandura, 1989a; Wood et al., 1990). Specifically, according to Earley and Lituchy (1991), when people deal with familiar tasks, as in this research, self-efficacy only affects subsequent performance through personal goals. Similar results have been found in the sports field (Kane et al., 1996; Theodorakis, 1995, 1996). For example, Theodorakis (1996) has suggested that contradictory results can be found because of the different nature of the tasks in the organizational and sports fields, and because the addition of new variables in the model (as in the present study), can change the existing models.

Besides the previous relationships, in Phase 1, threat perception had an important influence on self-regulatory mechanisms and performance. Thus, threat perception negatively influenced performance in repetition two, both directly and indirectly through self-efficacy. The negative influence of threat perception on self-efficacy is consistent with Bandura's (1997) social cognitive theory that suggests that one of the sources of self-efficacy is physiological and affective states. At the same time, negative appraisal of somatic activation, levels of perceived fatigue, pain and physical fitness, act as an indicator of physical ineffectiveness (Feltz & Riessinger, 1990). In this way, threat perception, as a negative appraisal, could affect personal competence, undermining personal ambition and performance in the second repetition.

Threat perception also positively influenced self-blame and positive reappraisal, supporting the hypothesis that when people feel threatened, they try to deal with it through the use of coping strategies (Lazarus & Folkman, 1984). Thus, when the athletes perceived more threat they blamed themselves and positively reappraised the situation. Finally, these coping strategies affected performance and personal goals. Specifically, positive reappraisal had a positive effect on performance and self-blame on personal goals in Phase 1 of the experiment. Therefore, threat perception, which negatively affected performance and self-efficacy, allowed the use of coping strategies to mitigate the damage that was being produced. The adaptive role of self-blame in this phase of the experiment helped to counteract the negative consequences of threat perception enhancing personal ambition through the increase of personal goals and performance. The athlete might conclude that his previous performance was not suitable, blaming himself, and thus try to avoid it happening again in the next repetition by being more persistent. These results are unexpected because
Folkman and Lazarus (1985) and Lazarus and Folkman (1984) have suggested that self-blame is used to prevent problem-focused coping. However, it supports the idea that adaptive or maladaptive roles cannot be assigned to some coping strategies, because it is more important to understand that the adaptive value of strategy depends on the context (Folkman & Lazarus, 1988; Lazarus & Folkman, 1984).

In Phase 2 of the experiment, the causal structure of the self-regulatory mechanisms was similar to the first. However, in the second, previous performance was a direct and positive predictor of self-efficacy, whereas personal goals did not affect subsequent performance. The rest of the relationships according to the self regulatory model were maintained. Threat perception was an antecedent of self-efficacy, supporting the idea that threat perception is a source of negative information of self-efficacy (Bandura, 1997). However, three perception did not affect performance directly but rather through indirect means. In this way, like in Phase 1 threat perception positively influenced self-blame and positive reappraisal, but now, self-blame positively influenced the appraisal of effort which, in turn, impaired subsequent performance in repetition three. The previous relationships indicate that when the athlete feels threatened during the effort test, he begins to blame himself. Then, the athlete appraises that his effort is insufficient and it finally impairs his performance. Moreover, like in Phase 1, positive reappraisal was affected positively by threat perception. In turn, positive reappraisal seems to show an adaptive role increasing self-efficacy. Because self-efficacy was affected negatively by threat perception and positively by positive reappraisal, it can be concluded that the reappraisal of stressful situations can be useful in promoting high levels of self-efficacy.

Finally, the relationships between the variables in the two phases of the experiment describe a process. Like any process, aspects which may be important at a given moment of the situation, may not be so important at another, because the stressful encounter changes (Folkman & Lazarus, 1985). This process indicates that while psychological aspects were more important in determining performance in Phase 1 of the experiment, previous performance was more decisive in the second phase. This pattern is exactly the opposite of that suggested by several authors (Bandura & Jourden, 1991; Bandura & Wood, 1989; Button et al., 1996; Mathieu & Button, 1992; Wood et al., 1990). Accordingly, an increase in experience in a particular task should promote an increase in the impact of self-efficacy on personal goals and performance due to an improvement in the perceived control of the situation. In this way, the critical aspect could be perceived control. In the present study, self-efficacy decreased after the first repetition in the whole sample (see means in Tables 2 and 3). This unexpected decrease could be caused by the slope of the test. The slope could prevent them from performing as usual. Thus, experience in this task instead of promoting an improvement in perceived control, could impair it. This could explain why in Phase 1, self-efficacy and personal goals contributed significantly to performance, whereas in Phase 2 they did not. The results show that as the athlete lost control of the situation, the impact of self-efficacy on personal goals and the latter on performance decreased, and the impact of previous performance increased. At the same time, the loss of perceived control seems also to promote changes in the relationships between threat perception and the remaining variables. Thus, in Phase 2, threat perception more negatively influenced self-efficacy than in Phase 1, and it generated more self-blame which, in turn, impacted negatively on the effort of the athlete. Thus, as control of the situation was lost, threat perception exerted a more negative impact on self-efficacy, and coping strategies became more erratic and non-adaptive. For example, self-blame, was an adaptive strategy in Phase 1 of the experiment, promoting an increase in personal goals, but in the second phase it promoted a decrease in the effort of the athlete.

The perspective of this study is similar to the principles of social cognitive theory (Bandura & Cervone, 1983; Bandura & Jourden, 1991; Wood & Bandura, 1989b). According to this point of view, goals do not directly regulate motivation. Goal setting is a necessary but not sufficient component of a complex mechanism of self-regulation where effort and persistence are governed by several self-regulatory mechanisms operating in concert. According to the effects of the goals on mediator mechanisms, these goals may or may not influence the performance. To find the causes of performance, one must focus on the mediator mechanisms rather than on the goal setting process itself. The model presented in this investigation complements and extends the model of Bandura, including, in addition to self-efficacy and personal goals, threat perceptions and coping strategies.

In this sense, the study highlights the importance of emotional aspects in goal setting contexts. Previous research has centered on self-efficacy and personal goals as mediator mechanisms in the efficacy of goal setting; and stress and suffering, which can be produced by inappropriate goals, has been neglected.
The purpose of this study was to include emotional mediator mechanisms because goals can be an important source of stress, especially when people are threatened because of the possibility of not reaching important or meaningful goals (Burton & Naylor, 2002; Conroy et al., 2002; Lazarus, 1999; Lewthwaite, 1990). Therefore, from the Lazarus and Folkman's stress theory and the Chapman and Gavrin's suffering model, suffering was included as a possible emotional variable. Suffering is composed of two principal components, the perceptions of threat and helplessness (i.e., the incapacity to cope with the threat). To measure suffering it is necessary to keep both components in mind because athletes, who do not feel threat, will not suffer; and if they feel threat but not helplessness, they will also not suffer. For these reasons, suffering was not evaluated directly, but rather its components were assessed. Moreover, suffering is often confused because it can be considered an emotional positive process synonymous with effort and discipline. In this sense, the definition presented in this study shows suffering as an emotional negative process. When athletes suffer they anticipate a loss and their expectation is that they will not reach an important or meaningful goal. It causes in them, a feeling of failure and hopelessness that nothing can be changed with effort and discipline.

From a practical point of view, it seems clear that athletes involved in competitive sports can suffer the negative consequences of goals which are too demanding; and trainers should be aware of the effects on the emotional response of their athletes. The stress produced by very demanding goals can be counter-productive, undermining a sportsperson's personal competence and personal goals as is shown in this research. The trainers might change this situation, planning realistic and specific goals adapted to the skills and interests of the athletes. Mental training also can be useful to help the athletes to maintain self-confidence while they try to reach very difficult goals. The control of thinking, for example, by means of key words can help to increase effort and/or to avoid athletes' criticism towards self and/or their performance. This might increase the concentration of athletes during endurance competitions and avoid some of the negatives effects of suffering such as the decrease of effort or self-blame.

The present research focused on the effects of repeated failure/success in a single experimental session. Future research could be focused on the long-term effects of repeated failure as one possible cause of burnout syndrome in endurance sports (Raedeke & Smith, 2004). Another point of interest in the future was related to the perceived motivational climate and goal orientations of the athletes. In the present investigation, athletes had to reach a performance goal assigned by the researcher. Nothing is known about the goal orientations and motivational climate of the athletes. It would be interesting to study the relationships between perceived motivational climate, goal orientations, and emotional aspects analyzed in this research, because the athletes' goal orientations and the perceived motivational climate can influence more adaptive motivational patterns, effort, persistence, cognitions, affective responses and behavior of sportspersons (Nicholls, 1984; Nitoumanis & Biddle, 1999). One of the limitations of the study is the relatively small sample size (for SEM) and its experimental nature. It would be recommended in the future to check the relationships of the variables studied in this research, with a larger sample of athletes to validate these results, and in natural settings to increase the external validity of the study.

Finally, suffering is not the only emotional response that one can experience in competition that can influence performance. There is a growing consensus in sport psychology that prediction of athletic performance should be based on both pleasant (positively toned) and unpleasant (negatively toned) emotions related to successful and unsuccessful performances. In this sense, Hanin (2000) and Hagtvet and Hanin (2007) distinguishes among four emotional categories, derived from two factors: hedonic tone (pleasure—displeasure) and functionality (optimal, helpful—dysfunctional, harmful), which include pleasant (positively toned) and functionally optimal emotions (P+), unpleasant (negatively toned) and functionally optimal emotions (N+), pleasant and dysfunctional emotions (P−), and unpleasant and dysfunctional emotions (N−). From the point of view of the IZOF model (Hagtvet & Hanin, 2007; Hanin, 2000), suffering could be viewed as an emotional process, unpleasant and dysfunctional, which can lead to unpleasant and dysfunctional emotions like hopelessness, anxiety, discouragement, frustration, anguish, tiredness, failure, misery, pain and/or anger. Several of these emotions would be in evidence in the particular context of failing to meet the set goals while running hard for 5 min, on three different occasions. Nevertheless, it would be interesting to determine if this is different from an individualized and idiosyncratic perspective; and also to study which other emotional experiences (positive and negative, optimal and dysfunctional) are related to a successful or poor performance in a sample of athletes during their participation in endurance events.
References


