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Physical, Affective and Psychological determinants of Athlete Burnout

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Authors: Frode Moen, Kenneth Myhre, Christian A. Klöckner, Kristin Gausen and Øyvind Sandbakk.

Corresponding Author:
Frode Moen
E-mail address: frmoe@online.no, Tel. : +47 932 487 50
Postal address: Department of Education, Norwegian University of Science and Technology, N-7491 Trondheim, Norway

Frode Moen is currently the head manager of the Olympic Athlete program in central Norway, where he also has a position as a coach / mental trainer for elite athletes and coaches. He also is an associate professor at the Department of Education and lifelong learning at the Norwegian University of Science and Technology. He previously has worked as a teacher in high school where sport was his major subject, and he has been a coach for the national team in Nordic combined in Norway for several years. Frode received his Ph. D. in coaching and performance psychology from the Norwegian University of Science and Technology. His research focuses mainly on coaching in business, coaching in sport, communication, performance psychology and relationship issues.

ABSTRACT
This article examined how training load, illness and injuries, perceived performance, affect and worry predict athlete burnout in sport. A sample of 358 Norwegian junior elite athletes from a variety of sports with cross country skiing (28 %), soccer (22 %) and biathlon (13 %) being those most frequently reported participated in the investigation. The results show that the theoretical model in this study explains 57% of the variance in athlete burnout, and the direct effects on athlete burnout are mainly derived from the variables positive affect, worry and negative affect. In addition, our model also shows that performance, illness/injuries and worry indirectly affect athlete burnout through the mediating variables in the model. The results are discussed in regard of applied implications and possible future research.

Keywords: training load, worries, affect, athlete burnout, performance

INTRODUCTION

Research in sport psychology claims that the occurrence of burnout among athletes in sport are rising and that the optimal psychological state of athletes is challenged when they experience performance impairments or are injured or ill (68, 73). This could be disruptive for the development process, considering that being healthy is essential to succeed as an athlete (76, 78). Thus, understanding reasons why athletes struggle with physical and psychological health is an important issue. Traditionally, the prevalence of athlete burnout is explained with the strenuous work athletes need to complete to become competitive in their sports (63). The flip side of this strenuous work is the danger of failing to adapt to training loads, being ill, injured and thereby experience performance impairments. These factors may ultimately lead to athlete burnout (38, 75, and 77).

Research on athlete burnout has historically focused on the physical load from training and competitions as well as the psychological stress associated with situational pressure to explain the occurrence of athlete burnout (36, 33, and 38). The athlete burnout construct is based on the cognitive-affective stress model (77), in which stress is viewed as a result of cognitive appraisals and the coping resources athletes consider they have to meet situational demands. Ambiguous junior elite athletes in sport expect to achieve their goals and become future elite athletes. To achieve their goals, these athletes need to be healthy and free from injuries (79). Thus, experiencing illnesses, injuries, and/or performance impairments are, together with the training load they are exposed to, potentially situational stressors that might result in stress related psychological responses such as negative affect and worries (58). The purpose of this study is therefore to explore how physical training loads, perceived performance, illness and injuries, affective- and cognitive loads, indirectly and directly predict athlete burnout among ambitious Norwegian junior athletes in sport.

Athlete Burnout

The conceptualization of burnout among athlete populations comprises three dimensions: physical and emotional exhaustion, reduced performance accomplishment and sport devaluation (23, 24, and 65). The core element in athlete burnout is physical and emotional exhaustion (65), characterized by fatigue associated with training and competitions (68). The second dimension in athlete burnout is focusing on the feeling of being unable to reach own goals and succeed with training and competitions, defined as reduced sense of accomplishment (68). The third dimension, sport devaluation, is characterized by loss of interest and care for sports, and reduced quality in the athletes' work (68). Athlete burnout is explained as a result from athletes' experienced- or believed inability to meet situational demands in training and competitions, and the distress athletes experience related to the discrepancy between athletes' expectancies to achieve their goals and cope with situational demands associated with their training and competitions (38, 75, and 77). Thus, both cognitive and affective constructs are related to the burnout construct.

Cognitive activation of stress

The Cognitive Activation Theory of Stress (CATS) predicts that negative stress can occur in situations where athletes are unable to meet the situational demands, or when there is homeostatic imbalance, or when they experience a threat (84). The cognitive components in CATS are the evaluation of the situation and the athletes' perceptions about what they can do about it (70). It is assumed that the attempt to engage in mental problem solving caused by the possibility of negative outcomes stimulates worry (4). Worry is defined as a mental problem-solving process based on an uncertain issue, which for a young athlete can be a situation in training or a competition that has the possibility of one or more negative outcomes (4, 58). Worry is experienced as relatively uncontrollable thoughts and images (4). For an athlete, possible performance impairments, illnesses or injuries, and/or too heavy training loads, are all uncertain issues that might have the potential to stimulate worry. Importantly, worry is a load in itself for an athlete and can become very demanding and lead to exhaustion (87, 88, 89, and 90). Interestingly, negative stressors have the potential to stimulate both worry and negative affect, whereas worry also has the potential to stimulates a chain of negatively affect-laden directly (34).

Affective activation of stress and worry

According to CATS, cognitive evaluation of stress causing factors determine the physiological and psychological consequenses (84). A positive expectation about the outcome of a situation indicates that the athlete has the necessary resources to cope with the situational demands. In such cased the consequence will be a positive affect response (56). On the contrary, if the athlete does not expect to have the necessary coping resources, the affect response can be negative. Interestingly, research claims that there is a relationship between stress and affect (42, 48). Positive stress (eustress) stimulates positive affect, whereas negative stress (distress) stimulates negative affect (12; 48). Positive affect reflects to what extend athletes feel enthusiastic, active and alert, in a state that refers to high energy, full concentration and pleasurable engagement (86). Negative affect on the other hand refers to athletes' feelings of sadness and lethargy, in a state that refers to anger, contempt, disgust, guilt, fear, and nervousness (86). Importantly, positive and negative affect represents different loads for an athlete. Unfortunately, a long-term exposure to distress might become chronic and ultimately lead to athlete burnout (65, 68, and 77).

Situational demands and potential stressors

There are several situational demands that are potential stressors for young athletes in sport and therefore have the potential to stimulate both cognitive responses such as worry, and affect responses. First of all, the training load itself is potentially a negative stressor, due to the dose-response relationship related to physical training and competitions (7). Second, illnesses or injuries prevent athletes to complete the physical exercise and the competitions that they need to be competitive in their sports (79). Third, if performances are not on expected levels it will represent a harsh reality that situational demands are not within the reach of that athlete for the time being (77).

Training load. Although periods of injury and illness can reduce performance achievement due to lack of training or motivation to train with required quality, training load itself can also be so high that an athlete's body fails to adapt (5, 27, 46). Failing to adapt to training will influence the athletes' abilities to reach their inner potential within their sports, and it is therefore a natural stressor (48, 77).

Illness and injury. Illness and injuries are obstacles that prevent athletes to compete and train as they could if they were not ill or injured. To reach the highest levels of sport performance, a healthy body and mind is a necessity (61). Disturbingly, a large number of athletes are exposed to extensive instances of illness and injuries on their path (16, 17, 35, 50, 82). A recent study shows that more than one third (36%) of the athletes who were preparing for the 2012 Olympic and Paralympic games were either injured or ill at any given time throughout their time participating in the study (9).

Performance impairments. Possible performance impairments might be a threat for athletes' goals to become future elite athletes. Young athletes need to maintain the motivation to complete thousands of hours of high quality- and strenuous training to become competitive in elite sports (20, 26, and 63). Such training is physically, psychologically and emotionally demanding, and with such effort athletes will be negatively affected both cognitively and emotionally if they experience inability to meet the demands (55). Interestingly, a recent study shows that lower performance level is associated with more illness (79). Thus, when athletes cannot meet situational demands in their environment, this will stimulate both cognitive- and affective activation. Training loads that are too high, possible occurrences of injuries or illnesses, and/or performance impairments are obvious threats for athletes' possible career and success within elite sports (61). Therefore, all these variables have the potential to trigger both cognitive and affect reactions, such as worry, positive affect and/or negative affect. Ultimately, these cognitive and affect loads might stimulate occurrences of athlete burnout (38, 75, and 77).

PURPOSE OF PRESENT STUDY

The purpose of the present study is to test a theoretical model (Figure 1) of relations between physical training loads, illness and injuries, perceived performance, PA, NA, and worries, and how these variables predict athlete burnout among junior athletes in sport. Furthermore, we expect training load to predict perceived performance positively, and illness/injury to predict perceived performance negatively, and that training loads, illness and injuries, and perceived performance predict positive and negative affect as well as worry. We also expect that training load predicts NA and worry negatively, and PA positively, whereas positive and negative affect and worry predict athlete burnout. In the latter case, we specifically expect that worries and that negative affect (distress) predict burnout positively, whereas positive affect (eustress) predicts burnout negatively. Finally, we expect that illness and injuries as well as training load predict athlete burnout positively, and that the perceived level of performance predicts athlete burnout negatively. These hypotheses are outlined in a resulting model shown in Figure 1.

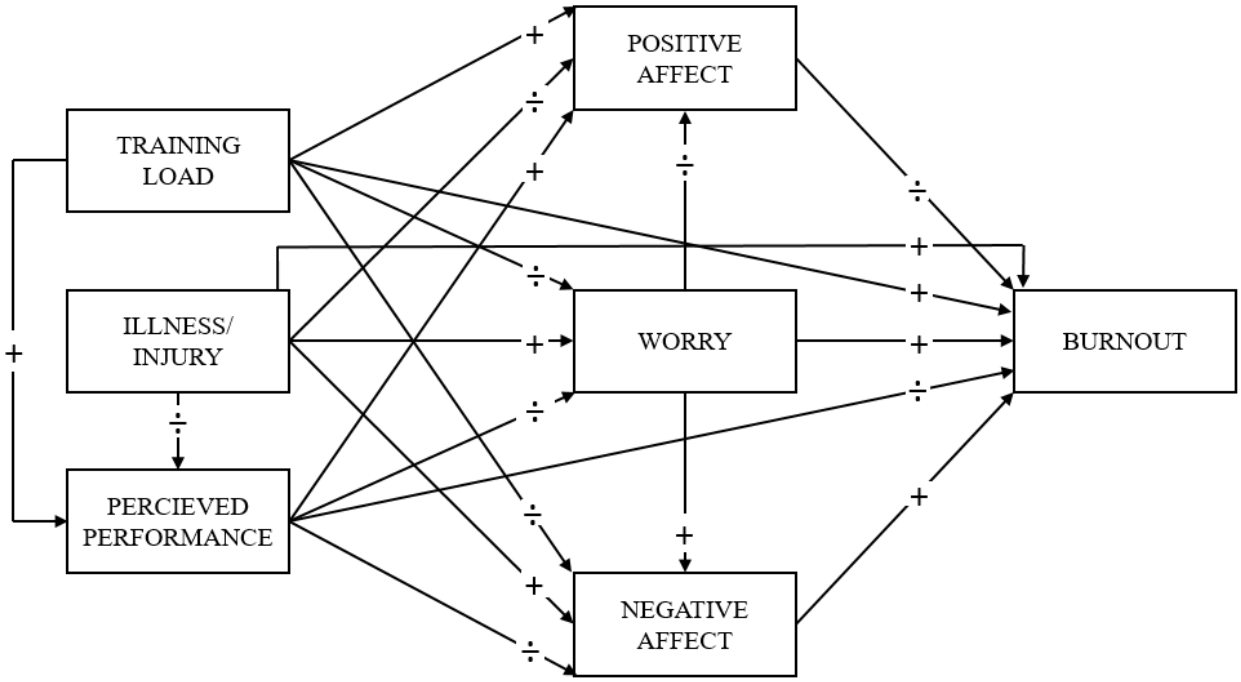

Figure 1: Hypothesized model

METHOD

Participants

Five hundred and twenty-nine junior athletes practicing a wide variety of sports were invited by the authors in the end of October 2015 to voluntarily participate in the investigation. The athletes invited were from three different Norwegian high schools specialized for elite sports. The athletes have to document both talent and ambition to gain admission to these schools. Training is on the schedule at school every day of the week, and the athletes normally practice their sports after school some of the days during weekdays and in the weekends. Thus, the athletes in this study have ambitions to develop their potentials at elite senior level.

Procedure

This study was approved by the Norwegian Social Science Data Services (NSD). The researchers visited the three involved schools, and gave oral information about the study and the completion of the data collection to the athletes and their coaches. Thereafter, athletes received an invitation to the survey by e-mail, and was given three weeks to complete the survey. In this period, a reminder was sent every four days to those who had not completed the survey.

In the survey, the athletes had to respond to general variables covering demographics such as such as age, gender and type of sport. Further, they documented their training loads for the last six months (May – October), and the complete questionnaires measuring psychological variables such as satisfaction with performance, affect, worry and athlete burnout at the point of the survey. The psychological measurements that were

used were based on previously developed scales proven to hold both satisfactory validity and reliability. If a Norwegian translation of a scale was not available, translation-back-translation methods was performed.

Training data. The athletes reported individual monthly training data from May until October. The training data was reported on the basis of their personal training journal, which they are introduced to and compelled to keep as a part of the study program at their school. Since different sports have somewhat different procedures for how to keep the diary with regard to intensity zones, training method etc., training load was calculated as the total number of hours reported through the six-month period.

In case of missing training data, an imputation was estimated based on the maximum-likelihood procedure recommended by Schafer and Graham (74), using the available information in the questionnaire. This procedure prevents losing valuable information by excluding participants with missing values and thereby introducing bias into the data in case the data is not missing completely at random.

Illness/injury. In addition to training data, the athletes were asked to report the number of training days lost as a result of illness or injury. This information was also obtained from the training journals, as the athletes are required to keep this information in their journals. The incidence of illness/injury was calculated as the total number of days of training lost over the six-month period.

Athlete Satisfaction Questionnaire. To measure the athletes perceived satisfaction with their own performance, the Athlete Satisfaction Questionnaire (ASQ; 72) was used. In this scale, the athletes are asked to evaluate four items related to their contentment regarding their absolute performance, improvements in performance and goal achievement in sport during the last month. They gave their answers on a 7-point Likert-scale, which ranged from 1 (not at all satisfied) to 7 (extremely satisfied). An example item from this scale is "*I am satisfied with the degree to which I have reached my performance goals during the last month*". Previous research has given support to the internal consistency and criterion validity of the ASQ (71). The Cronbach's alpha for ASQ in this study was .89.

The Athlete Burnout Questionnaire. The Athlete Burnout Questionnaire (ABQ; 66, 67) was used to measure athlete burnout. ABQ consists of three five-item subscales assessing the three key dimensions of burnout: (1) a reduced sense of accomplishment, (2) emotional and physical exhaustion, and (3) devaluation of sports participation. Examples of items covering these dimensions are respectively: "It seems that no matter what I do, I don't perform as well as I should", "I feel so tired from my training that I have trouble finding energy to do other things", and "I have negative feelings toward sports". Athletes were requested to rate the extent to which each item addresses their participation motives in sport on a five-point Likert scale ranging from 1 ("Almost Never") to 5 ("Almost Always"). In this study, a global burnout index was computed by calculating a mean score from the three subscales in line with Raedeke & Smith (67). Previous research has supported both the reliability and the factorial and convergent/divergent

validity of The Athlete Burnout Questionnaire (14, 49, and 66). The Cronbach's alphas for each of the dimensions in the present study were .84, .82, .76, and .78 for the complete measure.

The Positive and Negative Affect Schedule (PANAS). The Positive and Negative Affect Schedule (PANAS; 86) was used to measure positive and negative affect in this study. PANAS consist of two sub-scales that measure positive affect and negative affect respectively. The athletes were asked to rate the extent to which they have experienced each particular emotion within the last week as an athlete, with reference to a 5-point Likert scale from 1 ("not at all") to 5 (very much). Ten descriptors representing different emotions are used for positive affect (i.e. excited – strong – proud) and negative affect (i.e. upset – nervous – irritable), respectively. The PANAS has strong reported validity with such measures as general distress and dysfunction, depression, and state anxiety (85). Previous research among young athletes has supported the factor structure of the PANAS (15). The Cronbach's alphas for the measurement in this study were .83 (positive affect) and .85 (negative affect).

The Penn State Worry Questionnaire (PSWQ). A Norwegian version of the The Penn State Worry Questionnaire (52, 62) was used to measure worry and consists of 16 items, each rated on a five-point Likert scale ranging from 1 (not at all typical) to 5 (very typical). The athletes were asked to rate how typical or representative each of the different items were for them. An example of an item is: "If I don't have enough time to do everything, I don't worry about it." Another item is: "When I'm under pressure, I worry a lot." An important aspect of the PSWQ is that the instrument is not related to any specific worry domain or content (52) in contrast to other worry measures (e.g., Worry Domains Questionnaire, WDQ; 81). The reliability and validity of the Norwegian version of the PSWQ is supported and in line with former studies conducted with the PSWQ (18; 59, and 62). The Cronbach's alpha for the measurement in this study was .93.

Data analysis

All sets of data were found to be normally distributed. Means ± standard deviations are presented. The data were first analyzed by examining the correlations among variables by using Pearson correlational coefficient. The data were initially analyzed by means of confirmatory factor analysis (CFA) to establish the quality of the measurement instruments and determine the zero-order correlations between the study variables. In a second step the proposed model was tested with structural equation modeling (SEM) using the AMOS 21 program. Due to its robustness towards violations of the multi-normality assumptions we used a maximum likelihood estimator (MLR), as suggested by Brown (6). The first indicator of each scale was used to set the metric of the latent variables that is the standard approach in most latent variable models (6).

We explored relations between the variables in both the CFA and the structural model by means of SEM, which is a statistical methodology that takes a confirmatory approach to the analysis (8). In this approach, a hypothesized model of the relations between the

constructs is tested statistically to determine the extent to which it is consistent with the data, which is referred to as the goodness of fit. If the goodness of fit is adequate, the plausibility of the proposed relations among the constructs is supported.

To assess the model fit, we used well-established indices, such as CFI, IFI, TLI, and RMSEA, as well as the chi-square test. For the CFI, IFI, and TLI indices, values higher than .90 are typically considered acceptable, and values higher than .95 indicate a good fit of the data (8, 45). For well-specified models, an RMSEA of .06 or less reflects a good fit (45, 80).

RESULTS

From the 539 participants that were invited, 358 (54% males and 46% females) completed the data collection, which gives a response rate of 66.4%. The sample had a mean age of 18.2 years (ranging from 17 to 20 years), and practiced a variety of sports with cross country skiing (28%), soccer (22%) and biathlon (13%) being those most frequently reported.

Correlations and descriptive statistics

Table 1 shows the correlations between the study variables as well as the possible maximum scores, statistical means, standard deviations, and Cronbach's alphas. Negative affect exerted the strongest correlation with athlete burnout, followed by worry (positive), perceived performance (negative) and training load (negative).

Table 1

Pearson correlations and descriptive statistics of the study variables

Variable	1	2	3	4	5	6	7
1. Illness/injuries	-	-.41***	-.05	.10	.10	.09	.06
2. Training load (6 months)		-	.31***	.09	-.08	-.03	-.30***
3. Performance satisfaction			-	.45***	-.31***	-.17	-.32***
4. Positive affect				-	-.18	-.04	-.23
5. Negative affect					-	.32***	.38***
6. Worry						-	.36***
7. Burnout							-
Maximum score	∞	∞	7	5	5	5	5
Number of items	1	6	4	10	10	16	15
Mean	1.20	261	4.83	3.91	2.12	2.65	2.12
Standard deviation	.40	80	.98	.48	.65	1.08	.53
Cronbach's alpha			.89	.79	.85	.93	.75

Note. *** $p < .001$. The estimates are based on the observed data.

The zero order correlations between the study variables range from zero (+/- .03 to .17) to strong (+/- .37 to .83) positive and negative relationships. The Cronbach's alphas of the variables in this study varied from excellent to acceptable.

Measurement model (CFA)

To investigate the measurement model and the relations between the variables, we initially conducted a confirmatory factor analysis of the latent variables. Results from the preliminary CFAs calculated for each variable separately revealed good fit for the model of Athlete Satisfaction as latent variable with four indicators. However, models did not fit the data equally well due to higher complexity in relation to sample size when Performance, Worry, Negative affect and Positive affect were entered as latent variables with four, sixteen, ten and ten indicators respectively. This also applied for Burnout, when entered as a second-order latent variable with “Emotional and physical exhaustion”, “Sport devaluation” and “Reduced sense of accomplishment” as primary factors (each containing five indicators).

Thus, to reduce complexity, a parceling method was applied for the indicators of the latent variables Worry, Positive affect and Negative affect, using three parcels constructed from item means of three to four single items (47). For the latent variable Burnout, three parcels conform to “Emotional and physical exhaustion”, “Sport devaluation” and “Reduced sense of accomplishment” were used. Parceling is a common practice in structural equation modeling and involves using composite scores derived from multiple individual scale items (47). The technique has a number of proposed advantages that include higher sample-size-to-estimated-paths ratios, increased reliability of manifest indicators and less violation of normality assumptions (1). With these adjustments, acceptable model fit was achieved for these models as well.

In the final CFA, Illness/injury and Training load was also entered as fixed exogenous variables, and a covariance structure model where all latent variables were specified to correlate with one another was tested. This model had good fit to data ($\chi 2$ (132) = 259.725, $p < .001$, CMIN/DF = 1.968, RMSEA = 0.052, IFI = 0.962, TLI = 0.950, and CFI = 0.961), and all loadings in the model were significant at $p < .001$.

Supporting the zero-order correlations (see Table 1) the correlations between the latent variables varied from low to moderate/strong, as showed in Table 2.

Table 2

Correlations between the latent variables in the measurement model

Variable	1	2	3	4	5	6	7
1. Illness/injuries	-	-.02	-.26*	-.21***	.20***	.14*	.15*
2. Training load (6 months)		-	.03	-.01	-.07	-.10	-.01
3. Perceived performance			-	.44***	-.31***	-.13*	-.29***
4. Affect-PA (positive)				-	-.24***	-.11	-.11
5. Affect-NA (negative)					-	.55***	.61***
6. Worry						-	.64***
7. ABO-sum							-

Note. *** $p < .001$, ** $p < .01$, *$p < .05$.

Table 3 shows the indicators for each latent variable in the investigation. The result from the CFA supports the conceptualization of seven separate but correlated constructs (see Table 3).

Table 3

Results of the Confirmatory Factor Analysis of Performance, Negative affect, Positive affect, Worry and Burnout.

Indicator	Latent variable	*b*	S.E.	*λ*	*p*
Performance1	← Performance	1.00	-	0.76	-
Performance2	← Performance	1.15	0.07	0.88	***
Performance3	← Performance	1.26	0.07	0.91	***
Performance4	← Performance	1.09	0.07	0.84	***
Neg_affect1	← Negative affect	1.00	-	0.79	-
Neg_affect2	← Negative affect	0.75	0.06	0.69	***
Neg_affect3	← Negative affect	0.94	0.07	0.83	***
Pos_affect1	← Positive affect	1.00	-	0.80	-
Pos_affect2	← Positive affect	0.85	0.07	0.69	***
Pos_affect3	← Positive affect	1.04	0.07	0.85	***
Worry1	← Worry	1.00	-	0.82	-
Worry2	← Worry	0.86	0.05	0.83	***
Worry3	← Worry	0.54	0.05	0.59	***
Worry4	← Worry	0.82	0.05	0.80	***
Sport devaluation sum	← Burnout	1.00	-	0.79	-
Exhaustion sum	← Burnout	1.03	0.07	0.81	***
Reduced accomplishment	← Burnout	0.16	0.01	0.65	***

Note: ***$p < .001$

Structural model

As acceptable model fit was achieved in the CFA, we further tested the hypothetical model displayed in Figure 1 by means of specifying the relations between the variables as depicted in the model. Standard errors and confidence intervals of the model parameter estimates were bias corrected by a bootstrapping procedure with 500 bootstrap samples. The path model had acceptable fit to the data ($\chi 2$ (117) = 228.407, $p < .001$, CMIN/DF = 1.952, RMSEA = .052, IFI = .964, TLI = .953, and CFI = .964). Estimates of the standardized regression weights and the squared multiple correlations are shown in Figure 2, whereas unstandardized regressions weights, standard errors, total effects, and indirect effects are presented in Table 4.

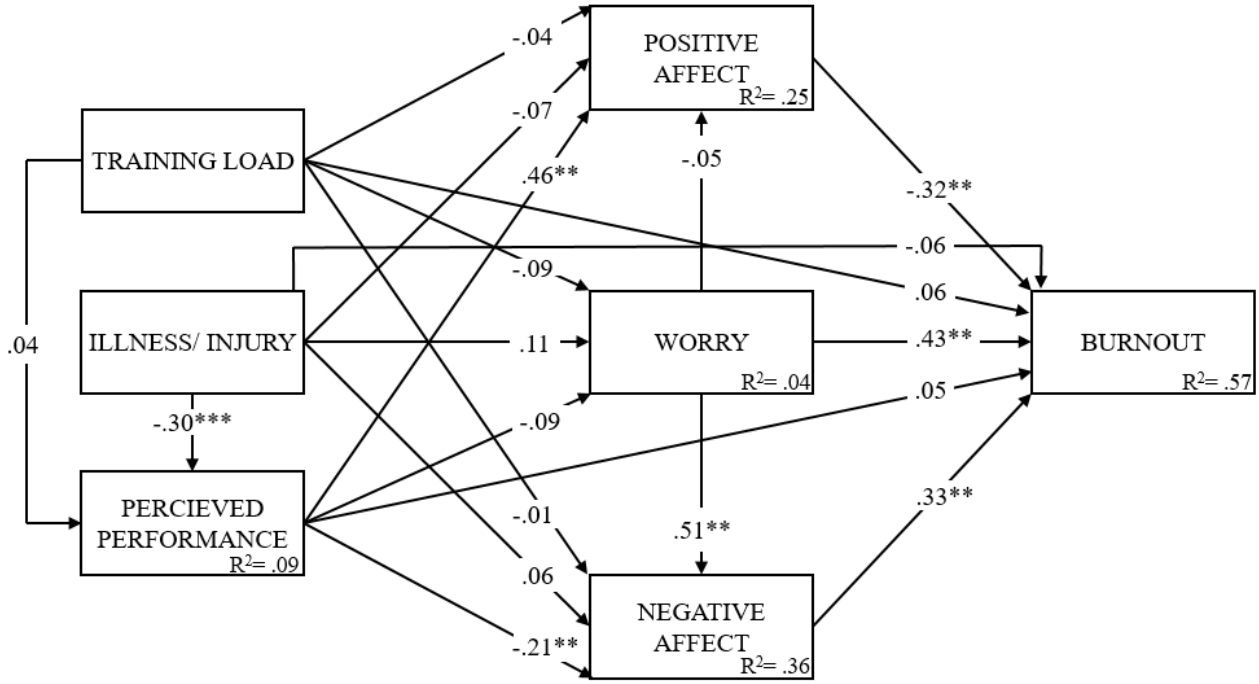

Figure 2: Structural Equation Model (Standardized Solution; N = 358), **p < .01

As shown in Figure 2, perceived performance was influenced significantly by illness/injury with a medium effect size, while it was not influenced by training load.

Worry was not significantly influenced by any of the variables specified in the model, and training load, illness/injury and perceived performance explained in total 4% of the variance in worry. However, worry together with perceived performance significantly influenced negative affect, both with a strong effect size. Training load and negative illness/injury did not influence negative affect. With regard to positive affect, perceived performance had a strong positive influence. Illness/injury, training load and worry on the other hand, did not influence positive affect significantly. In total, perceived performance, illness/injury, training load and worry explained 25% and 36% of the total variance in positive affect and negative affect respectively.

Burnout was significantly influenced by worry, positive affect and negative affect, with a medium to strong effect sizes, while perceived performance, illness/injury and training load did not influence burnout significantly. In total, the predicting variables explained 57% of the variance in burnout.

Table 4

Unstandardized regressions weights with standard errors, standardized regressions weights, total effects and indirect effects

	b	SE	*β*	*p*	Total Effect	SE	CO90		*p*	Indirect Effect	SE	CO 90		*p*
Effects on Performance:														
Illness	-.61	.11	-.30	***	-.61	.13	-.82	-.41	**					
Training load	.00	.00	.04	.46	.00	.00	.00	.00	.44					
Effects on Worry:														
Performance	-.07	.04	-.10	.11	-.07	.05	-.15	.01	.19					
Illness	.15	.08	.11	.07	.18	.08	.05	.32	*	.04	.03	-.01	.09	.12
Training	-.01	.00	-.09	.10	-.01	.00	-.01	.00	.06	.00	.01	.00	.00	.28
sEffects on Positive Affect:														
Worry	-.04	.05	-.05	.41	-.04	.07	-.14	.08	.60					
Performance	.27	.04	.46	***	.28	.06	.19	.38	**	.00	.01	-.01	.02	.41
Illness	-.08	.07	-.07	.22	-.25	.08	-.38	-.11	**	-.17	.05	-.27	-.11	**
Training	.00	.00	-.04	.46	.00	.00	-.00	.00	.73	.00	.00	.00	.00	.29
Effects on Negative Affect:														
Worry	.56	.07	.51	***	.56	.07	.46	.68	**					
Performance	-.16	.04	-.21	***	-.20	.07	-.32	-.10	**	-.04	.03	-.08	.01	.18
Illness	.10	.08	.06	.24	.30	.12	.12	.53	**	.20	.06	.10	.29	**
Training	.00	.00	-.01	.81	-.00	.00	-.01	.00	.10	-.01	.00	-.01	.00	*
Effects on Burnout:														
Positive affect	-1.72	.34	-.32	***	-1.73	.52	-2.64	-.92	**					
Negative affect	1.41	.30	.33	***	1.41	.35	.79	1.95	**					
Worry	2.04	.32	.43	***	2.90	.34	2.43	3.55	**	.86	.24	.46	1.23	**
Performance	.15	.19	.05	.45	-.74	.28	-1.23	-.32	*	-.89	.25	-1.35	-.53	**
Illness	-.36	.32	-.06	.26	.79	.39	.13	1.40	*	1.15	.36	.58	1.77	**
Training	.01	.01	.06	.21	.00	.01	-.01	.01	.94	-.01	.00	-.01	.00	.14

Note. *** $p < .001$, ** $p < .01$, *$p < .05$.

DISCUSSION

The purpose of the present study was to test a theoretical model of relations between training load, illness and injuries, perceived performance, positive affect (PA), negative affect (NA) and worries, and how these variables predict athlete burnout among Norwegian high-level junior athletes attending high schools specialized for sports. The main findings of this study is that perceived performance, illness and injuries significantly predict athlete burnout indirectly, while PA, NA and worry significantly and directly predict athlete burnout. The theoretical model that is proposed in this study explains 57% of the variance in athlete burnout.

Our hypothesis that training load would predict perceived performance positively was not confirmed by our findings. A possible explanation might be that training load was measured by documenting the amount of training hours the athletes did complete during the last 6 months before the psychological data collection (a quantitative measure), whereas the quality the athletes invested into their training effort was not included. Earlier

studies claim that it is the amount of deliberate training efforts that makes the difference between experts and novices, and thus is predictive of performance (26). In addition, we used the amount of training hours as a measure of load in a sample comprising different types of sports. The validity of this method might be questioned. Individualization in the training load that is another necessity for optimizing the effect from training (3). The potential for individual development and high performance is likely to depend on the degree of individual adjustment of the training process and the type of sport (3). The importance of recovery and regeneration to gain a subsequent effect might also explain the non-significant relation between training loads and perceived performance. The degree to which athletes got sufficient and appropriate recovery is not taken in to account in our study. Recovery is also specific to the individual, and depends on individual appraisal, and the degree of individualization is not controlled for (25). In total, these factors might explain the non-present prediction of perceived performance from training load in this study.

We further expected training load to predict NA and worry negatively, and PA and burnout positively, which were not significantly confirmed by our findings. Our hypothesis was based on the assumption that training load was associated with perceived performance, and thus also associated with NA, worry and PA. As discussed, the importance of deliberate training efforts, sufficient and individualized training and recovery, can also serve as a possible explanation for these results. The fact that did not predict burnout positively supports that there are other variables, such as emotional and cognitive variables, that is decisive for the development of athlete burnout syndrome (77).

Our model confirmed that illness and injuries predicted perceived performance negatively. However, our expectations of a direct effect of illness and injuries on PA, NA and worry were not significantly confirmed. Although this finding is in line with previous findings on this type of athlete population (58), an indirect effect from illness and injuries on PA and NA through perceived performance was found in the latter study. Former findings suggest that perceived performance and achievement significantly depend on the ability to conduct planned training (69), and thereby have continuity in their training process. This implicitly requires good physical and psychological health (76).

As young athletes become and remain involved in high-level competitive sport through adolescence, their self-identity may become strongly and exclusively based on athletic performance (10). Therefore, athletes who cannot conduct planned training because of being ill or injured, are likely to feel unable to meet the situational demands, as both adaptations, perceived performance and thereby also their self-identity might be experienced as harmed. Previous findings suggest that an athlete’s experience of being ill or injured is related to the cognitive response to the situation (37). This might especially be true for athletes with an indeterminate injury or illness situation, as this can make them unable to meet the demands of the current situation (84). On the other hand, athletes free from injury or illness have a greater chance to experience positive performance

perceptions, which is likely to stimulate a positive affective response (56). In total, this might be why illness and injury in itself does not directly predict PA, NA and worry, but rather indirectly affects PA and NA through the mediating variable perceived performance.

None of the predicting variables in our model revealed a significant direct effect on worry, although worry was found to be a significant, direct predictor of athlete burnout. This finding raises the question if worry in this type of athletic population might be explained by other variables that are not included in our study. Such factors might be social issues or school tasks. In addition, worry might be related to personality traits, as Smith (77) emphasized that personal dispositions will affect the perception of stress and thereby the risk of developing burnout. At this age, athletes are facing developmental tasks in the transition from adolescence to adulthood, regardless of their sport participation. In this period, they are defining their self-identity, achieving new and more mature relations with peers of both sexes, while also evolving into independence emotionally from parents and other adults (91). At the same time, they are also facing pressure from school, and earlier studies have found a relation between school-related stress, and emotional problems and health complaints among Norwegian high school students (43, 60, and 83). All these factors represent potential negative stressors, which have the potential to stimulate intrusive thoughts such as worrying (43). Importantly, worry is a load that might become very demanding for an athlete (87, 88, 89, and 90), which explain why it directly effects athlete burnout regardless of its origin. However, this study uses cross-sectional data, and can therefore not discuss potential long-term effects from being ill, injured or not competitive on worry. Being ill, injured, or not competitive at one point in time, such as the collected data, might be easier to handle for an athlete, than being ill, injured or not competitive over a longer period of time.

Another possible explanation to the finding that no variables predict worry significantly can be found in cognitive dissonance theory and the athletes' attitude towards their sport performance (28). Cognitive dissonance is defined as an inner urge to hold all attitudes and beliefs for an athlete in harmony, and avoid dissonance (28). Dissonance among an athlete's beliefs, such as "I'm going to succeed in my sport" versus "I'm not succeeded in my sport", is considered as a potential stressor for athletes (28). A strategy to reduce such dissonance is known as 'effort justification'. If dissonance occurs between the amount of effort (training time, recovery time, sacrifice of other activities) exerted into achieving a goal and perform at a high level, and the subjective reward for that effort (i.e. perceived belief of attaining that performance level), a possible solution is to adjust one's attitude or subjective value of attaining performances at such a high level and thus reduce the dissonance (32). This might especially be true for athletes who do not have the inner drive or passion to work hard over time through deliberate training efforts that do not result in immediate profit. These athletes might have accepted their destiny, and might resign to believe that they will not be competitive on a higher level. Because of this, they might not experience worry in relation to their performance, because their attitudes towards their performance tell them that the actual performance is acceptable.

With regard to burnout, we also expected that illness and injuries as well as training load would predict athlete burnout positively, and that perceived performance would predict athlete burnout negatively. None of these hypotheses were confirmed. However, our analysis shows that illness and injuries, and perceived performance indirectly influence athlete burnout through the variables NA and PA. Wide ranges of stressors (or loads) are suggested to contribute to the development of athlete burnout, with perceived performance pressure (64) and unfulfilled expectations (31) being among these. Altogether, this supports that psychosocial stress and situational pressure are possible antecedents to athlete burnout, and that a stress perspective on the burnout syndrome is necessary and important in sport psychology (19, 56). Being ill or injured, and not able to achieve desired performance outcomes, put youth athletes in a position where they are likely to experience lack of control over their sport participation. This type of situation is also previously associated with burnout perceptions, especially for youth athletes striving to reach elite level in competition with many others peers (39, 44). Our results indicate that it is the affective response related to the situation (being ill, injured or not competitive) that influence athlete burnout. Thus, it seems to be the athletes' perception of the situation, or how they relate to the situation, that is the key with regards to possible athlete burnout consequences.

Finally, we expected that that NA would predict burnout positively, and that PA would predict burnout negatively. These hypotheses were confirmed by our findings, and supports the cognitive affective model (77), stating that burnout develops as a result of exposure to stress and perceived inability to meet situational demands (38). In this regard, recent research highlights the potential importance of positive affect as a protector against development of burnout symptoms (41). This proposal is supported by research suggesting that positive affect is positively related health status, and also found to reduce negative stress (29, 11). This might be interpreted in light of Fredrickson (29, 30) "Broaden and Build" theory of positive emotions, in which she suggests that positive emotions broaden peoples' momentary thought–action repertoires, and build their enduring personal resources (29, 30). This is clearly in contrast to negative emotions, which is expected to narrows one's attention towards specific actions (29). Negative affect on the other hand, is well known as one of the main symptoms of burnout (2, 66, 67, and 75). Since accumulated stress over time can become chronic (51), daily hassles with unfulfilled development- or performance goals, inability to conduct planned training because of illness/injury, and other stress-related factors might lead to burnout (13, 21, 22, and 40). Athletes who invest heavily in sport are suggested to develop an identity that to a great extent rely on their performance as athletes (40, 65), and thus feelings and emotions related to negative affect, such as sadness, lethargy, anger, contempt, disgust, guilt and fear is likely to be stimulated (86). This might explain the effect PA and NA have on burnout, and also support the suggestion of positive affect as a potential protector against burnout.

Conclusions and limitations

The theoretical model in this study explains 57% of the variance in athlete burnout, and the direct effects on athlete burnout is mainly derived from the variables positive affect,

worry and negative affect. In addition, our model also shows that performance, illness/injuries and worry indirectly affect athlete burnout through the mediating variables in the model. Thus, our model supports the cognitive affective model of athlete burnout (77). Thus, it is not the physical load, or the situation itself that is necessarily predictive of athlete burnout; it is how the athletes relate emotionally and cognitively to their path towards becoming elite athletes. Interestingly, research within metacognitive interventions, such as attention training programs, support such an argument (53, 54, and 57).

Although the results in the study are interesting, longitudinal studies are needed to investigate both direct and indirect relationships and how these relationships develop over time. The collected data is constituted by self-reporting measures and it is unknown to what extent these self-reporting instruments accurately reflect the variables examined. Conducting studies that combine self-reported data with data obtained in a more objective manner could further develop this line of research, for instance, by longitudinal studies that incorporate both quantitative and qualitative methods.

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Authors: Travis Scheadler, [...]

Authors: Eric Legg1, [...]

Authors: Ben Donahue [...]

Authors: Reeti Douglas, [...]