Goal Striving and Well-Being in Sport: The Role of Contextual and Personal Motivation.

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Abstract

This investigation sought to clarify mixed results in the literature exploring coach behaviors, basic psychological needs, goal motivation, and well- and ill-being. Regional level team sport athletes (N = 241) completed questionnaires on the aforementioned variables at the beginning of the season. A subsample (n = 70) provided saliva samples to assess physical ill-being. At the end of the season, athletes (n = 98) reported their goal motivation and attainment. Structural equation modeling demonstrated that coach behaviors were related to needs satisfaction and thwarting, which were related to autonomous and controlled goal motives respectively. Autonomous motives were related to well- and ill-being; controlled motives were only related to ill-being. Over time, only end-of-season autonomous goal motives were related to goal attainment. The findings provide an insight into how coaches can facilitate optimum goal striving and well-being in their athletes.

In sport and other achievement-driven contexts, the practice of goal setting to enhance performance is widespread (Weinberg & Butt, 2011). Despite extensive work into effective goal setting (Locke & Latham, 2002), research has only recently explored the role of the motivation underpinning goal striving for goal attainment and psychological well-being. Drawing from self-determination theory (SDT; Deci & Ryan, 2000) and the self-concordance (SC) model (Sheldon & Elliot, 1999), the present study explored, using cross-sectional and longitudinal data, links between athletes' perceptions of coach behaviors, athletes' psychological needs and motivation for their goals, as well as their psychological well- and ill-being, and goal attainment over the course of a competitive season.

In proposing the SC model (which is grounded in SDT), Sheldon and Elliot (1999) posited that motivation for goal pursuit can be autonomous or controlled. Autonomous motives reflect enjoyment, interest, or personal value provided by the goal. Conversely, controlled motives are less self-determined and reflect internal (e.g. guilt, anxiety) or external (e.g. the expectations of others) pressures. Sheldon and Elliot suggested that individuals engaging in goal striving with greater autonomous motives invest more effort in goal pursuit and as a result are more likely to attain their goals. A further prediction in line with the SC model is that the interaction between autonomous motives and goal attainment leads to greater satisfaction of three basic psychological needs (autonomy, competence and relatedness), which in turn results in enhanced relative well-being.

Empirical research has generally supported the SC model. In sport, the model was initially tested by Smith, Ntoumanis and Duda (2007), using cross-sectional data. Smith, Ntoumanis, Duda, and Vansteenkiste (2011) provided further support for the SC model over the course of a sport season, however, in both studies the interaction between autonomous motives and goal attainment failed to predict needs satisfaction. Furthermore, SC model research (Greguras & Diefendorff, 2010; Sheldon & Schueler, 2011) from other contexts (for example, business, and education) have not supported this interaction. As such, it could be that the satisfaction of the basic psychological needs is not influenced in the same manner as outlined by Sheldon and Elliot (1999), and alternative theoretical models should be considered.

Smith and colleagues (2007; 2010; 2011) extended the original SC model and examined social-contextual antecedents of goal motivation by focusing on coach behaviors. Using a SDT framework, Deci and Ryan (2000) suggested that coach behaviors can be either autonomy-supportive or controlling. When coaches are autonomy-supportive, they offer choices, provide rationale for activities, and acknowledge the perspective of their athletes (Black & Deci, 2000). In contrast, controlling coach behaviors involve coercion and pressure, as well as using extrinsic rewards and negative conditional regard to gain compliance from athletes (Bartholomew, Ntoumanis, & Thogersen-Ntoumani, 2010). Aligned with the principles of SDT, it has been suggested that autonomy-supportive coaching behaviors lead to more self-determined motivation through psychological needs satisfaction (Mageau & Vallerand, 2003; Vallerand, 1997), whereas controlling coach behaviors thwart psychological needs and lead to diminished functioning, ultimately undermining self-determined-motivation (Bartholomew, Ntoumanis, Ryan, Bosch, & Thogersen-Ntoumani, 2011a; Bartholomew, Ntoumanis, & Thogersen-Ntoumani, 2009).

Smith et al. (2007) found that coach autonomy support predicted autonomous motives and, more strongly, needs satisfaction. More recent work by Smith et al. (2011) found that autonomy-supportive coach behaviors were unrelated to goal motives; however, coach autonomy support did predict needs satisfaction. A possible explanation for these somewhat contradicting findings could be that needs satisfaction mediates the impact of coach behaviors on goal motives, rather than being an outcome of the interaction between goal attainment and autonomous goal strivings. This explanation aligns with Vallerand’s (1997) hierarchical model of motivation, with Vallerand suggesting that the social-psychological environment (for example, coaching behaviors) can predict the extent to which basic needs are satisfied, which in turn predicts the level of self-determined motivation. Greater self-determined motivation would then be expected to lead to more positive cognitive, affective, and behavioral outcomes. Thus, it could be that athletes' goal motives are influenced by the extent to which their needs are satisfied via their interactions with their coach. Therefore, the first aim in the present study was to examine the relations between coach behaviors, needs satisfaction, and athletes' goal motives from a hierarchical model of motivation perspective.

Until recently, SDT-based work in sport and other life domains has primarily focused on autonomy-supportive behaviors and the satisfaction of these needs. However, measurement advances have facilitated the exploration of the darker side of athletes' motivational experience in sport. Bartholomew et al. (2010) developed and validated the test scores of a new measure to assess controlling coach behaviors in a sport environment. Further, research has begun to investigate the thwarting of the basic psychological needs (Bartholomew et al., 2011a; Bartholomew et al., 2011b). This work has shown that needs thwarting better predicts negative outcomes than the absence of needs satisfaction. As such it seems pertinent that both needs satisfaction and needs thwarting are independently examined in research predicting positive and negative motivation-related outcomes.

When examining controlling coach behaviors within the SC model literature, Smith et al. (2010) found that athletes were more controlled in their goal motivation when they perceived their coach to be more controlling. However, the researchers did not use the aforementioned measure of controlling coaching behaviors (Bartholomew et al, 2010). Furthermore, to the best of our knowledge, the thwarting of psychological needs has not been examined within SC model research. As such, the second aim of the present study was, using Vallerand's (1997) hierarchical model, to examine both aspects of coach behaviors, as well as both the satisfaction and thwarting of the basic psychological needs, and how these might be related to athletes' goal motivation.

Research in sport has consistently shown the benefits of autonomous goal strivings for goal attainment (Carraro & Gaudreau, 2011; Gaudreau, Carraro, & Miranda, 2012; Ntoumanis et al., 2014; Smith et al., 2007, 2010). This research has also consistently demonstrated that controlled motives are unrelated to goal progress or attainment. These findings are highlighted in two meta-analyses (Koestner, Otis, Powers, Pelletier, & Gagnon, 2008; Gaudreau et al., 2012) in which the authors showed that autonomous, but not controlled, goal motives were related to goal progress. However, to the best of our knowledge, research has not yet examined the stability of goal motives, and how distal and proximal goal motives might relate to goal attainment. It is plausible that the motives with which an individual strives for a goal may change over time as these motives are not dispositional in nature. In such cases, it is important to understand whether it is initial goal motivation that an individual has when they begin goal pursuit, or the goal motives that an individual has when they are close to achieving their goal which are more strongly related to successful goal attainment. Within the literature, goal motives are generally measured at the same time point as perceived goal attainment (e.g. Smith et al., 2007), or at an initial time point with goal attainment measured at a later time (e.g. Sheldon & Elliot, 1999; Smith et al., 2011). Sheldon and Houser-Marko (2001) demonstrated that there could be an upward spiral of goal motivation, whereby higher autonomous goal motivation led to higher goal attainment in the first semester of an academic year, which in turn lead to higher autonomous motivation for goals in the second semester. However, in that work the goal motivation in the different semesters were for separate goals. Within the context of this study, we wished to examine how distal and proximal goal motivation were related to each other, and to end-of-season goal attainment.

Autonomous goal motives have also been linked with positive psychological outcomes, such as life and work satisfaction (Judge, Bono, Erez, & Locke, 2005) and well-being (Miquelon & Vallerand, 2006; Smith et al., 2007, 2010, 2011). The majority of research has used relative well-being, whereby ill-being indicators (e.g. negative affect, burnout) are subtracted from well-being indicators (e.g. positive affect, life satisfaction). While this approach is conceptually and methodologically acceptable, it presents difficulties in exploring the individual relations between goal motives and indices of well- and ill-being. For example, do autonomous motives predict all indices of well-being, and controlled motives all indices of ill-being? There are also indicators of well-being which have not yet been explored within SC model research. For instance, subjective vitality has consistently been linked with psychological need satisfaction within sport research (Adie, Duda, & Ntoumanis, 2008; Balaguer et al., 2012; Gagne, Ryan, & Bargmann, 2003; Mack et al., 2011), however little is known about how this indicator might be impacted by goal motivation. Additionally, only one aspect of burnout (emotional and physical exhaustion) was examined by Smith et al. (2007), and this was subsumed within a relative well-being index. Thus in the present investigation, we explored the relations between goal motivation, subjective vitality, and burnout.

Finally, research has generally focused on self-reported psychological indices, and has failed to explore other indicators of well- and ill-being. Miquelon and Vallerand (2006) explored physical symptoms of ill-being (for example, headache, coughing or sore throat) and self-reported health in a model incorporating goal motives, well-being and stress, however they did not examine the direct or indirect effects of goal motives on physical ill-being and health. Work in the wider SDT literature has started to incorporate biological markers of ill-being. For example, Quested et al. (2011) explored salivary cortisol responses (a biological mediator in stress and physical health; Miller, Chen & Cole, 2009) in dancers when performing an important solo. The research found that differences in the cortisol responses to the performance were linked to dancers' perceptions of needs satisfaction. Specifically, those with low basic needs satisfaction had higher cortisol responses, indicating higher levels of physiological deregulation. Further work by Bartholomew et al. (2011a) showed that the thwarting, but not satisfaction, of the basic psychological needs predicted the levels of secretary immunoglobin A (S-IgA), an immunological protein secreted by mucosa in the respiratory and gastrointestinal tracts which protects against the invasion of infection agents. S-IgA can be impacted by both chronic and acute stress. Within the context of this study, we were primarily interested in acute stress, which can lead to an increase in S-IgA (Bosch, Ring, de Geus, Veerman, & Amerongen, 2002). As controlled goal motivation is often underpinned by pressures, it is plausible that this may result in higher levels of acute stress felt prior to a training session and could impact upon S-IgA levels. However, to the best of our knowledge, links between goal motivation and S-IgA concentrations (or other psychobiological markers) have yet to be examined.

Purposes and Hypotheses

In summary, the present investigation had four aims. First, we explored the relations between coach behaviors, athletes' basic psychological needs, and athletes' goal motivation using Vallerand's (1997) hierarchical model of motivation. Second, we incorporated recent research in the wider SDT literature to explore not just coach autonomy support and needs satisfaction, but also controlling coach behaviors and need thwarting. Based on Vallerand's model and empirical evidence (Bartholomew et al., 2011a), we expected that coach autonomy support would positively predict needs satisfaction and negatively predict needs thwarting. The inverse pattern of relations was hypothesized between controlling coach environments and psychological need satisfaction and thwarting. These latter two variables were expected to be subsequently linked to greater autonomous and controlled motives for goal pursuit, respectively. The third aim was to examine the effects of goal motives on indicators of psychological and physical well- and ill-being. We expected that autonomous motives would be positively related to an indicator of well-being (subjective vitality), while controlled goal motives would be positively related to ill-being (burnout, physical symptoms, S-IgA concentration). We also expected that there would be some cross-over effects, whereby autonomous and controlled motives may be negatively related to some indices of ill- and well-being, respectively. Finally, in line with previous SC model research, we expected that initial autonomous, but not controlled, goal motivation would predict end-of-season goal attainment. However, when incorporating end-of-season goal motivation, we expected that autonomous goal motivation at the end of the season would be more strongly related to goal attainment, compared to initial autonomous goal motivation. Furthermore, we expected that initial and end-of-season goal motivation to show moderate stability over time, whereby individuals with autonomous or controlled motives at the beginning of the season would be likely to report the same type of motivation at the end of the season.

Method

Participants

Following institutional ethical approval, we recruited 241 athletes (158 males, 83 females; *M*age = 23.06, *SD* = 5.45) from regional level sports teams in the United Kingdom (hockey = 132, rugby = 16, soccer = 48, volleyball = 23, lacrosse = 11, gaelic football = 11). Initial contact with these teams was made through coaches and sport administrators. These athletes had been working with their coach for on average 1.13 years (*SD* = 1.51). Each week, athletes spent 3.26 hours (*SD* = 2.58) training with their coach.

Measures

Perceptions of coach behaviors. Athletes rated their perception of coach autonomy support using adapted items (e.g. “I feel that my coach provides me choices and options”) from the Health-care climate questionnaire (Williams, Grow, Freedman, Ryan, & Deci, 1996). They also completed the Controlling Coach Behaviors Scale (Bartholomew et al., 2010) to assess their perception of coach controlling behaviors (e.g. “My coach threatens to punish me to keep me in line during training”). 15 items for each scale were rated on 1 *(Strongly disagree)* to 7 *(Strongly agree)* scales.

Basic Psychological Needs Satisfaction and Thwarting. Basic psychological needs satisfaction and thwarting were measured using the Basic Needs Satisfaction in Sport Scale (BNSSS; Ng, Lonsdale, & Hodge, 2011) and the Psychological Need Thwarting Scale (PNTS; Bartholomew et al., 2011b) respectively. The BNSSS contains 20 items (e.g. “In my sport, I feel I am pursuing goals that are my own”) and the PNTS has 12 items (e.g. “I feel rejected by those around me”). Both scales were measured on 1 *(Not true at all)* to 7 *(Very true)* scales.

Goal-related variables. Athletes identified their most important personal goal that they would be striving for over the course of the season. In line with previous SC model research (Sheldon & Elliot, 1999; Smith et al., 2007, 2010, 2011) , athletes rated the extent that they were striving with extrinsic (“Because someone else wants you to”), introjected (“Because you would feel ashamed, guilty, or anxious if you didn’t”), identified (“Because you personally believe it’s an important goal to have”) and intrinsic (“Because of the fun and enjoyment the goal provides you”) motives. These items were rated on a 1 *(Not at all)* to 7 *(Very much so)* scale. Consistent with other SC model-based research in sport (e.g. Smith et al., 2007), autonomous and controlled goal motives variables were created by aggregating the intrinsic and identified, and introjected and extrinsic items, respectively.

At the end of the season, athletes indicated if they had stopped working towards their goal during the season. Those athletes who responded that they had continued to strive over the duration of the season then reported the extent to which they felt they had attained their goal using a single item on a 1 (*Not at all)* to 7 (*Very much so)* scale.

Given that goal striving can be impacted by perceptions of goal difficulty (Locke & Latham, 2002), athletes rated their perceptions of goal difficulty (e.g. "How hard will it be for you to achieve this goal during the season?"). They also rated how much effort they intended to devote to pursuing their goal (e.g. "How much effort do you intend to devote towards this goal during the current season"). For each variable, participants rated three items on a 1 (*Not at all)/None or not very much)* to 7 *(Very much so/Maximum or very high)* scale. These goal measures were used as control variables.

Well-being and Ill-being. The Subjective Vitality Scale (SVS; Ryan & Frederick, 1997) was completed to assess psychological well-being. Specifically, athletes rated seven items (e.g. "I have energy and spirit") on a 1 *(Not at all true)* to 7 *(Very true)* scale. As a measure of psychological ill-being, athletes completed the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). Reflecting the multi-dimensional nature of burnout, participants responded to items on three subscales: Reduced sense of accomplishment (e.g. "I am not performing up to my ability in my sport"), Devaluation (e.g. I don't care as much about my sport performance as I used to") and Emotional/Physical exhaustion (e.g. "I feel "wiped out" from my sport"). These items were answered on a 1 (*Almost never)* to 5 (*Almost always)* scale. A composite burnout score was created from the three subscales. Physical ill-being symptoms were measured using the Physical Symptoms Checklist (Emmons, 1991). Specifically, the athletes rated, on a 1 *(Not at all)* to 7 *(All the time)* scale, the extent to which they had experienced ten symptoms (e.g. "headache" or "shortness of breath") in the past week.

S-IgA was measured using saliva samples collected prior to a training session using a similar technique described by Bartholomew et al. (2011a). Specifically, athletes were asked to empty any saliva from their mouths, before allowing secretions to accumulate in the floor of their mouths. Every 60 seconds participants spat the accumulations into a pre-weighted polypropylene cup for a total period of 3 minutes. Samples were stored in ice before being homogenized by vigorous shaking on a vortex on return to the laboratory. To eliminate buccal cells and oral micro-organisms, samples were clarified by centrifugations (4000 x g for 10 min at 4˚C). The clear supernatant was divided into 500 µl aliquots and stored at -80˚C until analysis. S-IgA were measured in duplicate using ELISA methods (IgA saliva ELISA, IBL International GMBH, Hamburg, Germany), and was completed in accordance with the manufacturer's instructions. The reported limit of detection of the assays was 0.5 µg/mL. The intra-assay and inter-assay Co-efficient of Variation (CV) percentage was < 10%.

Procedure

The athletes provided written informed consent prior to participating, were aware of their right to withdraw, and received no form of compensation for their participation in the study. Questionnaires were completed either before or after the team's regular training session. Saliva samples were taken from a sub-sample of 70 athletes. As S-IgA concentration can be affected by exercise (Gleeson, 2000), saliva samples were taken prior to training and participants were asked to avoid eating and drinking 30 minutes prior to samples being collected. At Time 1 (beginning of the competitive season; September-November), athletes identified their most important goal that they were striving for over the course of the season, and completed items for goal motivation, goal difficulty, effort, coach behaviors, basic needs satisfaction and thwarting, and well- and ill-being measures. At Time 2 (end of the season; March-April) participants rated their goal motivation and self-assessed goal attainment.

Results

Preliminary Analyses

Of the 241 athletes who completed the initial questionnaire at Time 1, only 98 completed measures at Time 2. Given this attrition rate, the data were analyzed in two ways. A cross-sectional analysis was conducted with the whole sample at Time 1, and a separate longitudinal analysis was used for those who had completed all measures. The cross-sectional results are presented first, followed by the longitudinal analysis.

Preliminary analyses were performed to test for differences between those who completed both time points and those who did not. Four multivariate analysis of variance (MANOVA) tests were performed separately for coach behaviors, needs satisfaction/thwarting, autonomous and controlled goal motives, and indicators of well- and ill-being. When comparing those who completed questionnaires at both time points and those who completed only Time 1 data, it was found that the former had higher levels of needs satisfaction and lower needs thwarting (Wilks'λ = .98, F (2, 238) = 4.06, p = .02, partial η^2 = .03). No other differences emerged. The S-IgA data is presented as total S-IgA concentration (in micrograms per millilitre), and we controlled for S-IgA output (in micrograms per minute, controlling for the effects of salivary flow rate) in line with previous research (Bosch et al., 2001). To calculate the latter variable, the total S-IgA concentration was multiplied by the salivary flow rate (total amount of saliva collected divided by the number of minutes samples were collected over). Both the total S-IgA concentration and S-IgA output had non-normal distribution therefore the data were log-transformed.

Cross-sectional Descriptive Statistics, Scale Reliabilities, and Pearson's Correlations

The descriptive statistics, scale reliabilities and Pearson's correlations for the cross-sectional data are presented in Table 1. The internal reliabilities for autonomous and controlled goal motives were .46 and .51, respectively. While lower than the reliabilities of the other measures used, there were only two items per scale, which may have contributed to the low Cronbach's alpha. Additionally, both the autonomous and controlled goal motives items reflect conceptually related but distinct regulations along the SDT motivation continuum. In our structural equation modeling we used a procedure recommended by Hayduk (1987) to ensure that measurement error did not attenuate the path coefficients (see below for more details).

Coaching Behaviors, Basic Psychological Needs, Goal Motives, and Well- and Ill-Being

The hypothesized model was tested with structural equation modeling (SEM) using MPlus 7.1 (Muthén & Muthén, 1998-2011). A single-indicator approach was employed, whereby each latent factor was represented by the mean score of the respective factor items. Such an approach is suitable when sample size is too small for a multiple-indicator model. The parameters of the structural model are not impacted by measurement error as reliability estimates are incorporated into the model. Using this method, the error variance for each measure was set equal to the variance of the measure multiplied by one minus its reliability. Thus, the path to the measured indicator from the latent variable is equal to the square root of the measure's reliability (Hayduk, 1987).

The SEM for the hypothesized model showed a poor fit to the data: χ^2 (17) = 38.82, *p* = .001, CFI = .95, NNFI = .89, SRMR = .05, RMSEA = .07, 90% confidence interval RMSEA = .04 to .10), and the modification indices suggested specifying a direct pathway from needs thwarting to burnout. This path was deemed conceptually appropriate, and this addition to the model resulted in a good fit to the data: χ^2 (16) = 27.63, *p* = .04, CFI = .97, NNFI = .94, SRMR = .04, RMSEA = .06, 90% confidence interval RMSEA = .02 to .09. Coach autonomy support was positively and negatively related to needs satisfaction and needs thwarting respectively, with the latter also being positively related to coach controlling behaviors. The hypothesized link between coach controlling behaviors and needs satisfaction was non-significant. Autonomous and controlled goal motives were positively related to needs satisfaction and thwarting, respectively. Burnout and physical ill-being symptoms were positively related to controlled motives, and negatively related to autonomous motives. Subjectively vitality was positively related to autonomous motives and unrelated to controlled motives. Based on recommendations by Preacher and Hayes (2008), bias-corrected bootstrapped 95% confidence intervals (BC-CI) were used to test for indirect effects. Coach autonomy support was related to autonomous goal motives through needs satisfaction (β = .38, $p < .001$, BC-CI = .20 to .56), and to controlled goal motives through needs thwarting (β = -.18, $p < .001$, BC-CI = -.28 to -.09). There was also a significant effect from coach controlling behaviors to controlled goal motives through needs thwarting (β = .20, $p < .001$, BC-CI = .09 to .31). Additionally, coach autonomy support was related to burnout through needs thwarting directly (β = -.12, $p = .006$, BC-CI = -21 to -.04), needs satisfaction and autonomous motives (β = -.13, $p = .001$, BC-CI = -.23 to -.05), and needs thwarting and controlled motives (β = -.05, $p = .03$, BC-CI = -.09 to -.003). Coach autonomy support was connected to physical ill-being symptoms through needs satisfaction and autonomous motives (β = -.12, $p = .009$, BC-CI = -.21 to -.03) and needs thwarting and controlled motives (β = -.06, $p = .03$, BC-CI = -.13 to -.006). Physical ill-being symptoms were associated with controlling coaching through needs thwarting and controlled motives (β = .06, $p = .04$, BC-CI = .002 to .13). Subjective vitality was linked to coach autonomy support through needs satisfaction and autonomous goal motives (β = .22, $p < .001$, BC-CI = .11 to .33), but not through needs thwarting and controlled goal motives (β = .006, $p = .75$, BC-CI = -.03 to .04). Overall, the model explained 51% of the variance in burnout, 24% in physical ill-being symptoms and 35% of the variance in subjective vitality. The final model is displayed in Figure 1.

We ran a separate SEM also in MPlus for the analysis of the S-IgA variables. Due to the lower sample size a Bayesian approach was employed, as previous research has indicated such methods may produce more accurate results that maximum likelihood estimates with very small sample sizes (Lee & Song, 2004). In this method, posterior predictive checking (PPC; Gelman, Carlin, Stern, & Rubin, 2004) is used to evaluate model fit, whereby an χ^2 test is conducted to compared the model estimates with observed data. A 95% confidence interval is generated for the PPC-χ^2; a model is deemed to be a good fit if this value encompasses 0, or the Posterior Predicted *p*-value is above .50. For each estimated parameter in a Bayesian SEM a 95% credibility interval (CI) is generated. A true relation is likely to exist between variables if this value does not contain 0. A further advantage of using a Bayesian approach is the potential to include prior knowledge into the analysis, whereby the model is tested against a set of known parameters rather than against a null hypothesis (van de Schoot et al., 2014; Zyphur & Oswald, 2013). These can be non-informative (making no assumptions about the direction or strength of relations) or informative (for example, based on values obtained from a maximum likelihood estimate, or from meta-analyses and the available literature). Given that the present study is the first to explore the relation between goal motivation and S-IgA levels, we were unable to use priors based on previous literature. We were therefore presented with the choice of using priors based on a maximum likelihood estimate, or to use no priors in the analysis. Given that it has been suggested that the former option is superior to the latter (van de Schoot et al, 2014), we first ran a maximum likelihood estimate, and used these pathway coefficients as informative priors.

A model was tested which included goal motives and S-IgA concentration, and controlling for S-IgA output. This model had good fit: PPC-χ^2 confidence interval = -11.71 to 12.97, Posterior Predictive *p*-value = .73. Examination of the pathways showed a significant effect between autonomous goal motives and S-IgA concentration (β = -.21, 95 % CI = -.37 to -.02, p = .02). For all the other pathways, the CI encompassed 0 and the *p*-values were greater than .05. Overall, goal motives significantly explained 7% of the variance in S-IgA concentration. These results are displayed in Figure 2.[1]

Longitudinal Descriptive Statistics, Scale Reliabilities, and Pearson's Correlations

For the longitudinal data, athletes (*n* = 12) who reported that they had stopped working towards their goal as it had become unattainable were removed from the main analysis. This resulted in data of 86 athletes. Table 2 displays the means, standard deviations, internal reliabilities, and bivariate correlations for the longitudinal data.

Goal Motives and Goal Attainment over Time

Given the rather small sample size, we again used a Bayesian SEM approach when examining the longitudinal data. However, in this model we incorporated informative priors to the model based on previous SC model-based literature. We first tested a model where Time 1 autonomous and controlled goal motives predicted Time 2 goal attainment. This model showed a reasonable fit to the data: PPC-χ^2 confidence interval = -.6.50 to 15.10, Posterior Predictive *p*-value = .50. As expected, Time 1 autonomous motives significantly and positively predicted Time 2 goal attainment (β = .18, *p* = .01, 95% CI = .02 to .32), whereas controlled motives were unrelated to goal attainment (β = -.08, *p* = .21, 95% CI = -.26 to .09). Next, we added Time 2 goal motives into the model, specifying pathways from both Time 1 motives and Time 2 motives to goal attainment. This model demonstrated good fit: PPC-χ^2 confidence interval = -.25.39 to 15.41, Posterior Predictive *p*-value = .67. In this revised model, the pathway from Time 1 autonomous motives to goal attainment became smaller and non-significant (β = .13, *p* = .08, 95% CI = -.02 to .28). However, Time 2 autonomous motives were significantly related to goal attainment (β = .17, *p* = .02, 95% CI = .009 to .32). Controlled goal motivation at both time points was unrelated to goal attainment (Time 1 β = -.04, *p* = .10, 95% CI = -.25 to .15; Time 2 β = -.02, *p* = .42, 95% CI = -.23 to

.19). There were significant pathways from Time 1 autonomous and controlled goal motives to their respective Time 2 motives (autonomous $\beta = .47$, $p < .001$, 95% CI = .32 to .61; controlled ($\beta = .46$, $p < .001$, 95% CI = .31 to .58), as well as a significant indirect effect from Time 1 autonomous motives to goal attainment through Time 2 autonomous motives ($\beta = .14$, $p = .02$, 95% CI = .01 to .30). These results were unchanged when goal difficulty and goal efficacy were included as control variables. This model explained 10% of the variance in goal attainment, and is depicted in Figure 3.

Discussion

The present study had four aims. Addressing the first and second aims, we explored the relations between coach behaviors, basic psychological needs and goal motives, using the hierarchical model of motivation (Vallerand, 1997). Additionally, we incorporated into our model the independent relations between autonomous and controlled goal motives, and well- and ill-being. Finally, we explored goal motives over the course of a competitive season and how these relate to goal attainment.

Our findings provided a clear picture of how goal motives relate to coach behavior, through the satisfaction or thwarting of the basic psychological needs. When athletes perceive their coaches to be more autonomy-supportive, they report greater satisfaction of their basic psychological needs, and consequently strive for their goals with higher autonomous motives. Deci and Ryan (2000) proposed that individuals who are exposed to social environments which support the basic psychological needs are more likely to display intrinsically motivated behavior. Our findings provide further support to this proposition and are an extension of previous work (Adie et al., 2008; Adie, Duda, & Ntoumanis, 2012; Balaguer et al., 2012; Smith et al., 2007, 2011), showing that the extent to which coaches create an autonomy-supportive environment is also related to autonomous goal strivings via basic need satisfaction.

The present investigation took advantage of recent methodological developments in the SDT literature by incorporating measures of coach controlling behaviors (Bartholomew et al., 2010) and psychological needs thwarting (Bartholomew et al., 2011b). As expected, we found that the relation between controlling coach behaviors and controlled goal motives was mediated by psychological needs thwarting. The pathways linking controlling coaching, needs thwarting, and controlling goal motives were larger than those linking autonomy-supportive coaching to needs thwarting and controlled goal motives. This supports research which suggests that the “darker” side of athlete experience can better explain extrinsic motivation (Bartholomew et al., 2010, 2011a, 2011b). As such, it is important that both facets of coach behaviors, as well as both need satisfaction and thwarting are considered in the goal striving literature.

Our findings also provide insight into the independent relations between autonomous and controlled goal motives, and multiple indicators of well- and ill-being. Previously, SC model research had utilized relative well-being measures, where ill-being indices were subtracted from well-being indices (Sheldon & Elliot, 1999; Smith et al., 2007, 2010). By investigating well-being and ill-being independently, the present findings suggest that controlled motives are only related to indicators of ill-being, whereas autonomous motives can be linked with both well- and ill-being. Our findings support Deci and Ryan’s (2000) propositions regarding motivation and well-being. When individuals strive with more adaptive autonomous motives, this leads to positive psychological benefits (for example, higher well-being and the absence of ill-being). Conversely, controlled goal motivation may have significant negative consequences, such as no benefits for well-being and higher levels of ill-being. Previous research has found similar relations between the satisfaction or thwarting of the basic psychological needs, and well- and ill-being (Bartholomew et al., 2011a; Bartholomew et al., 2011b; Gunnell, Crocker, Wilson, & Mack, 2013). The amount of variance explained by the model in the well- and ill-being measures was less than other studies (e.g. Smith et al., 2007, 2010), although this is likely to be a result of prior studies utilizing relative well-being rather than exploring the independent relations from autonomous and controlled goal motives. Nevertheless, our findings demonstrate the importance of exploring these independent relations to fully understand how goal motives are related to well- and ill-being. Additionally, our model shows that psychological needs thwarting can predict burnout indirectly via controlled motives as originally hypothesized, as well as directly. This latter finding, although not hypothesized, is broadly in line with previous research (e.g. Balaguer et al., 2012; Bartholomew et al., 2011a) which did not measure goal motivation, but found that needs thwarting is positively related to burnout.

A novel aspect of the present investigation was the measurement of aspects of ill-being that have not been examined within goal striving research. The results showed that physical symptoms of ill-being are positively and negatively related to both autonomous and controlled motives respectively. Additionally, autonomous motives were linked to lower levels of S-IgA prior to training, a biological marker of stress. While we expected that controlled (rather than autonomous) motives would be related to S-IgA, this finding might be explained by athletes in this study generally having low controlled motives for their goals. Despite only a small amount of variance in S-IgA being explained by autonomous goal motives, this was still a significant proportion and as such the results indicate that when athletes strive with autonomous motives, biological markers of stress are lower prior to training sessions. This could lead to athletes being less likely to feel physically unwell; a proposition supported by the physical ill-being results.

With regard to our final hypothesis, the longitudinal results show that proximal autonomous goal motivation was a significant predictor of self-reported goal attainment at the end of the season, whereas initial autonomous goal motivation was no longer a significant predictor when end-of-season autonomous motivation was controlled for. As expected from past literature, controlled goal motivation at both time points was unrelated to goal attainment. Our results replicate those of several previous investigations (Ntoumanis et al., 2014; Sheldon & Elliot, 1999; Smith et al., 2007, 2011) and further support the benefit of striving for goals with autonomous motives. It is worth noting that only a small proportion of the variance in goal attainment was explained by autonomous goal motives, although this was a significant amount. This may suggest that over time it is important to consider other factors pertaining to goal attainment, perhaps combining the cross-sectional and longitudinal aspects of the present study to give a more coherent picture of goal striving. However, given that initial goal motivation predicted end-of-season goal motivation, the findings suggest the importance of not only initiating goal striving with autonomous motives, but also maintaining these more adaptive motives throughout goal pursuit. This has implications for coaches, who may need to consider how they can best facilitate their athletes when engaged in goal pursuit by creating need supportive motivational environments (Ntoumanis & Mallett, 2014).

Limitations, future research directions and practical implications

When interpreting the findings of the present results, it is important to consider the limitations of this investigation. First, it would have been worthwhile if we could have explored the relations examined in the cross-sectional analyses at multiple time points over the course of the competitive season. Additionally, with the exception of the S-IgA analyses, the study relied on self-report measures of the psychological constructs. Given recent developments in observational measures of coach behaviors (for example, Tessier et al., 2013), researchers may wish to adopt a multi-method approach so that athlete perceptions can be investigated alongside observing coaches in action. The comparatively lower internal reliabilities for autonomous and controlled goal motives found at both time points in the present study might also be considered a limitation. Given that these measures only contained one item per motivational regulation, future research might consider using several items for each regulatory type to improve the internal reliabilities of both autonomous and controlled goal motives. A further limitation is the attrition experienced within the study. The second time point of the present study coincided with severe weather, which registered as the coldest UK spring since 1962. This hampered data collection efforts, as many training sessions were outdoors and therefore were cancelled due to snow-covered and frozen pitches. Furthermore, given that training time was limited due to the poor weather, players may have felt that completing questionnaires would further impact on their schedule. It is plausible that these reasons could account for the attrition experienced in the study. Nevertheless, the only significant difference found was that those who completed both time points reported higher needs satisfaction and lower needs thwarting. Hence, it seems that participant dropout was not systematic in any substantive way.

A potential limitation is that the present study did not measure other aspects of perceived coaching style. Structure and involvement are also important aspects to consider within the coach-athlete relationship (Deci & Ryan, 2000; Pope & Wilson, 2012), yet in the present study we focused on autonomy support and controlling coach behaviors. Future explorations in this area may wish to incorporate structure and involvement into the model in order to offer a more comprehensive examination of the relations between coach behaviors, basic psychological needs and the motivation for goal striving.

Future research could build on the findings of the present study in various ways. First, this study only looked at one goal which athletes were working towards over the course of the season. However, individuals are often working towards several goals at one time (Louro, Pieters, & Zeelenberg, 2007), either just in sport or across different domains. It would be interesting to know how athlete goal motivation might impact goal progress and attainment in these situations, and how coaches might help facilitate optimal goal striving towards multiple goals. Further, it is important to note that goal persistence is not always the most adaptive goal self-regulation behavior. There may be certain situations where disengagement from an unattainable goal, and reengagement in an alternative goal is beneficial, both for performance and health (Wrosch, Scheier, Carver, & Schulz, 2003). Recent research has demonstrated that goal motivation might predict the self-regulatory responses to unattainable goals (Ntoumanis, Healy, Sedikides, Smith, & Duda, in press), and therefore future research may wish to investigate how the coach can facilitate disengagement from unattainable goals and reengagement in other worthwhile pursuits. Additionally, future work could look at the satisfaction or thwarting of each need separately (rather than grouping these related constructs as “needs”), given that research (e.g. Wilson & Rogers, 2008) has found different relations between these needs and motivation regulations.

A final area which may be of interest to explore with further research is goal contagion and motivation contagion. It has been established that individuals can “catch” goals from those around them (Aarts, Gollwitzer, & Hassin, 2004), also known as goal contagion. Additionally, learners may adopt the inferred motivation of their teacher (i.e., motivation contagion), impacting their own motivation and how autonomy supportive they are when teaching a peer (Radel, Sarrazin, Legrain, & Wild, 2010). Recent research by Ntoumanis et al. (2014) showed goal persistence could be primed with videos depicting someone striving for their goal with either autonomous or controlled goal motives. As such, it may be worthwhile to explore how a coach’s motivation for their own personal goals, or the motivation of some of the athletes within a team setting, might transfer to the rest of the athletes.

The results of the present investigation have implications for coaches, athletes, and applied practitioners engaged in goal setting. The findings add to the wealth of evidence showing that more positive coaching behaviors are linked to more adaptive motives for goal striving, which over time can lead to greater levels of goal attainment. As such, coaches may want to consider how they can be autonomy supportive, particularly when working with their athletes to identify important goals, and throughout the goal striving process. Applied practitioners may also try to establish ways of helping coaches to be more autonomy supportive (for examples, see Ntoumanis & Mallett, 2014). Additionally, while the present study used sport as a setting, the findings may have implications for other goal setting environments, such as education and business.

To conclude, the present study supports and extends the literature by demonstrating that both autonomy supportive and controlling coach behaviors can predict autonomous and controlled goal motives through the satisfaction or thwarting of athletes’ basic psychological needs. Such processes have implications for psychological and physical well- and ill-being. Over time, those striving with autonomous motives are more likely to attain their goals. By using these findings and being autonomy-supportive in their delivery, coaches may be able to create optimal conditions for their athletes to reach their goals.

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[1] . Based on a comment from an anonymous reviewer, we re-ran the analyses after removing two participants with exceptionally high S-IgA values (potentially indicating the presence of an infection). This resulted in a slight drop in model fit (PPC-$\chi 2$ confidence interval = -12.84 to 26.59, Posterior Predictive p-value = .52), although this still represented a good fit. The model estimates remained largely unchanged. Given that we cannot guarantee that these individuals actually had an infection which caused their elevated S-IgA levels, and that the results are largely similar regardless of their exclusion, we did not feel there was a strong enough rationale for not presenting data from the whole sample.

Table 1

Descriptive Statistics, Internal Reliabilities, and Pearson's Correlations among Cross-sectional Variables

	M	*SD*	α	1	2	3	4	5	6	7	8	9	10
1. Coach Autonomy Support	4.81	.84	.86	-									
2. Coach Controlling Behaviors	3.12	.84	.87	-.26**	-								
3. Needs Satisfaction	5.32	.68	.89	.51**	-.13*	-							
4. Needs Thwarting	2.87	.95	.88	-.44**	.46**	-.54**	-						
5. Autonomous Goal Motives	5.83	.97	.46	.16*	-.09	.36**	-.24**	-					
6. Controlled Goal Motives	2.59	1.37	.51	-.16*	.26**	-.10	.30**	-.11	-				
7. Burnout Symptoms	2.33	.57	.87	-.25**	.18**	-.40**	.53**	-.34**	.30**	-			
8. Physical Ill-being Symptoms	2.35	.98	.81	-.18**	.21**	-.22**	.31**	-.21**	.19**	.32**	-		
9. Subjective Vitality	4.89	.97	.85	.23**	.06	.40**	-.18**	.29**	-.10	-.35**	-.11	-	
10. S-IgA concentration (mg/ml) #	73.62	99.46	-	.11	.19	-.11	.06	-.22	-.13	.17	.06	-.06	-
11. S-IgA output (mg/min) #	38.04	56.75	-	.12	.18	-.10	.06	-.21	-.15	.19	.05	-.13	.89**

Note: * $p < .05$, ** $p < .01$ # n = 70

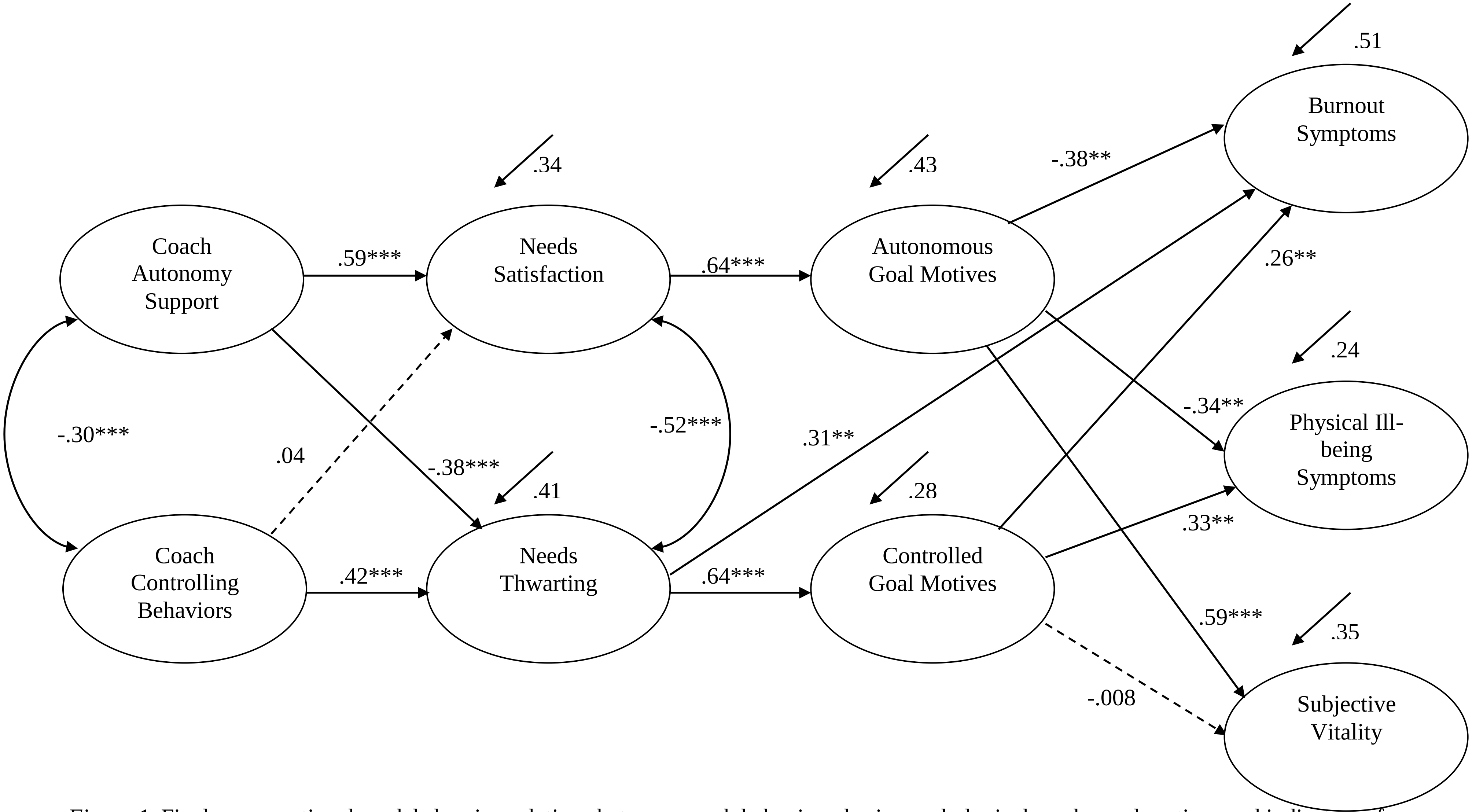

Figure 1. Final cross-sectional model showing relations between coach behaviors, basic psychological needs, goal motives and indicators of well- and ill-being (N=241). Direct pathway from needs thwarting to burnout symptoms was not hypothesized but was deemed conceptually acceptable. *Note*: ** $p < .01$ *** $p < .001$

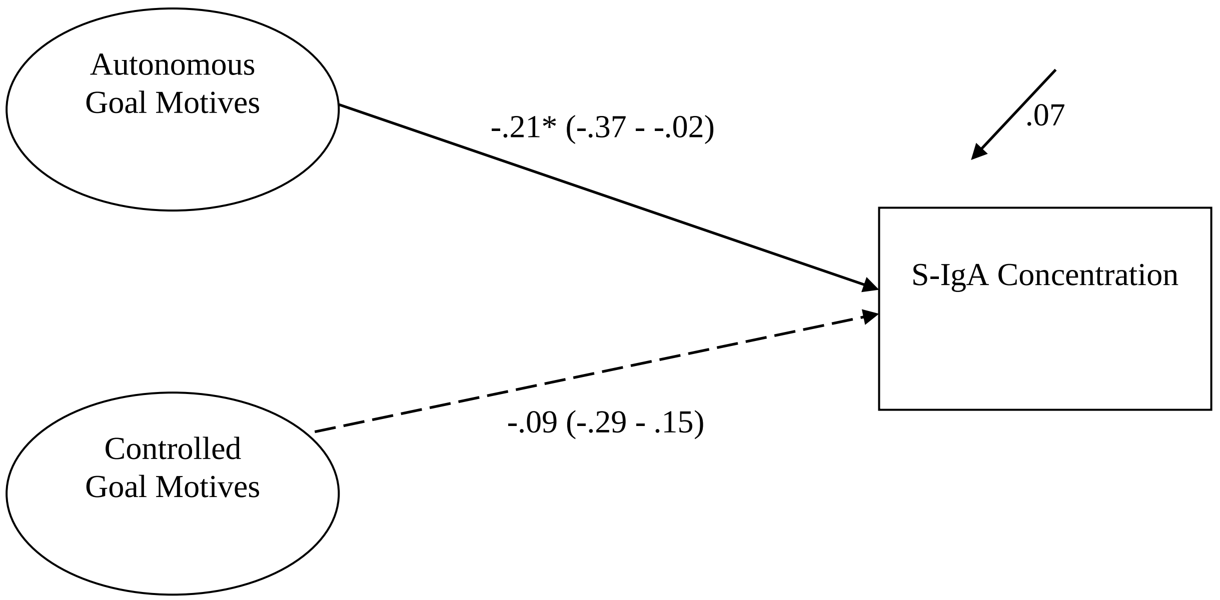

Figure 2. Cross-sectional model showing relations between goal motives and S-IgA.
Posterior Predictive Checking-$\chi 2$ confidence interval = (-11.71, 12.97), Posterior Predictive P-Value = .73.
Note: * $p < .05$

Table 2.

Descriptive Statistics, Internal Reliabilities, and Pearson's Correlations among Longitudinal Variables

	M	*SD*	α	1	2	3	4
1. Time 1 Autonomous Goal Motives	5.91	.83	.40	-			
2. Time 1 Controlled Goal Motives	2.50	1.29	.56	-.15	-		
3. Time 2 Autonomous Goal Motives	5.81	.81	.41	.49***	-.10	-	
4. Time 2 Controlled Goal Motives	2.39	1.33	.56	-.15	.47***	-.13	-
5. Time 2 Goal Attainment	4.83	1.45	-	.25*	-.11	.29**	-.08

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

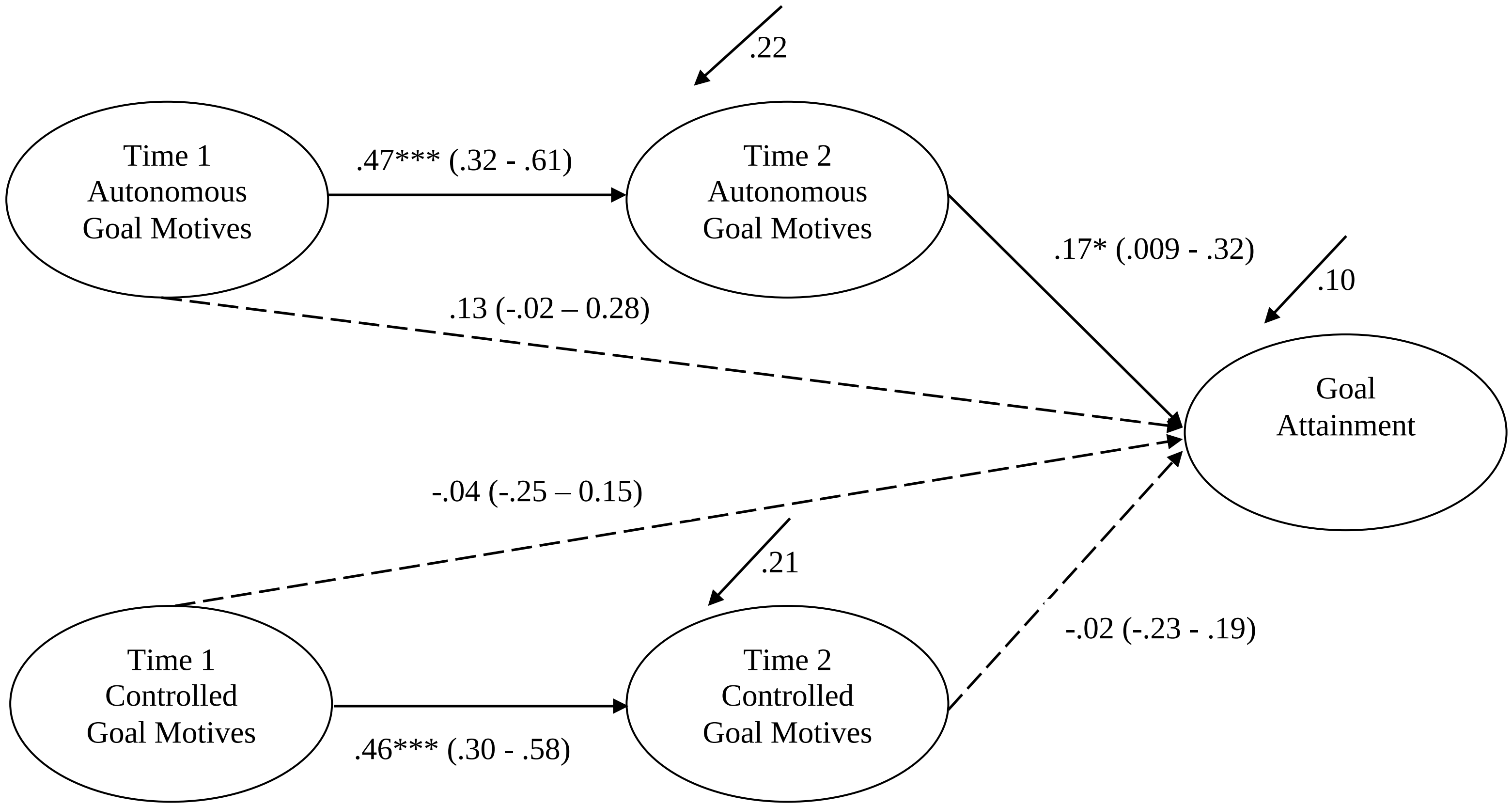

Figure 3. Longitudinal model showing relations between time 1 goal motives, time 2 goal motives, and goal attainment. For clarity only the final model is displayed. Posterior Predictive Checking-$\chi 2$ confidence interval = (25.39,15.41), Posterior Predictive P-Value = .67.
Note: * $p < .05$ *** $p < .001$