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Abstract

While researchers have suggested that the social context in exercise settings is linked to individuals' physical activity motivation and potential exercise-related outcomes, few research designs have examined the nuance of those relationships. Moreover, interventions targeting the social context of exercise settings are sparse, so the potential impact of staff training on members' motivation to exercise are not well known. Drawing from two major motivation theories, achievement goal perspective theory and self-determination theory, this study considered an intervention with fitness center staff from the members' perspectives. Members completed a survey before and after an intervention designed to help staff create a high caring, task-involving, and low ego-involving motivational climate. Using a half-longitudinal structural equation model, participants' perceptions of the motivational climate, basic psychological needs, exercise motivation, and exercise experiences (including commitment to exercise, life satisfaction, body image) were modeled pre-post intervention. The model revealed significant latent mean differences for post-intervention constructs, with participants experiencing a more positive motivational climate, higher competence and relatedness, intrinsic motivation, commitment, life satisfaction, and body image. The final mediation model demonstrated tenable fit, with perceptions of climate having significant, direct and indirect effects on commitment, life satisfaction, and body image. Our study supports that the motivational climate contributes to an optimal social context for exercise where basic psychological needs are nurtured, intrinsic motivation is fostered, and individuals experience well-being benefits, including increased life satisfaction. Further, short and targeted training meetings with fitness center staff can result in members' perceiving a significant change in the motivational climate.

Key Words: climate, exercise, task-involving, caring, intrinsic motivation

Integrating Achievement Goal Perspective Theory and Self-Determination Theory in an Exercise Intervention

Despite communication efforts to educate the public on the known health benefits of regular exercise, sedentary behaviors continue to dominate the adult lifestyle (Matthews, George, Moore, 2012). The social milieu (i.e., motivational environment) of exercise settings have much potential to address individuals' psychological needs, thus impacting their motivation to continue to be active (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Two theoretical frameworks that have been used to further an understanding of exercise behavior are achievement goal perspective theory (AGPT; Nicholls, 1984; 1989) and self-determination theory (SDT; Deci & Ryan, 1985). Both theories suggest that important others play a key role in creating an environment that impacts whether individuals are likely to commit to their chosen activity long-term. A growing body of research in both the sport and physical education domains have been supportive of links between tenets of AGPT and SDT on individuals' need satisfaction, likelihood of continuing, and measures of well-being (Adie, Duda, & Ntoumanis, 2010; Harwood, Keegan, Smith, & Raine, 2015; Reinboth & Duda, 2006; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Standage, Duda, & Ntoumanis, 2003). However, less attention to these specific interrelationships has been applied to the exercise domain. Given the potential of both theories to identify the mechanisms by which individuals are likely to increase their commitment to exercise behaviors, researchers have advocated for more studies to advance an understanding of how AGPT and SDT together predict individuals' physical activity experiences (Duda, 2013; Moreno, González-Cutre, Sicilia, & Spray, 2010).

Motivational Climate in Exercise Settings

One of the major tenets of AGPT (Nicholls, 1984; 1989) is how individuals define

success in an achievement setting. Specifically, success can be defined using task-involving criteria such as exerting best effort and noticing personal improvements, or using ego-involving criteria such as demonstrating superiority over others in the same setting. According to Nicholls, important others, such as exercise leaders, can influence how individuals choose to define success by advancing either task- or ego-involving characteristics of the overall climate perceived by participants (Nicholls, 1989). In task-involving climates, leaders push individuals to pursue challenging tasks, exert high personal effort, and set self-improvement goals. In contrast, leaders who create ego-involving climates foster competition among participants and positive behavioral outcomes can only be achieved when individuals perceive they have outperformed those around them (Huddleston, Fry & Brown, 2012).

In addition to our understanding of the task- and ego-involving climate, researchers interested in motivation have also considered another aspect of the physical activity environment that impacts participants' motivation; the extent to which individuals perceive a caring climate. A caring climate is one where a safe and supportive environment fosters a sense of belonging and participants feel the leaders have a genuine concern for their well-being (Magyar et al., 2007). The caring climate construct has been shown to moderately correlate in a positive direction with task-involving climates and negatively correlate with ego-involving climates (Brown, Fry, & Little; 2013; Newton, Fry et al., 2007); thus offering a related, yet unique, aspect to the climate literature.

A growing number of researchers have considered individuals' perceptions of the motivational climate in physical activity settings, with a particular focus on perceptions of task-involving, ego-involving, and caring characteristics (Brown & Fry, 2014; Brown et al., 2013; Gano-Overway, 2013; Huddleston et al., 2012; Moore & Fry, 2014). This initial research in the

exercise domain aligns with similar motivational climate research in the sport and physical education domains (Harwood, et al., 2015). Specifically, the findings in the exercise domain point to the benefits of exercise leaders fostering task-involving, caring climate characteristics over ego-involving climate ones. A task-involving, caring climate has been linked to both exercise-specific outcomes, such as higher enjoyment and commitment, as well as outcomes that impact individuals beyond the exercise domain such as greater hope, happiness, and positive mood (Brown & Fry, 2014; Brown et al., 2013). Conversely, an ego-involving climate has been negatively associated with participants' reported exercise enjoyment and commitment, as well as more general outcomes, including life satisfaction (Brown & Fry, 2014; Brown et al., 2013).

Motivational Regulation in Exercise Settings

In addition to AGPT, SDT has received extensive attention in the exercise behavior literature (Ng et al., 2012). SDT is a macro-theory and suggests that individuals' self-determination for engaging in activity is low when motivated by external factors, such as rewards, gains, and others' approval, or due to their own self-induced guilt for not participating. When self-determination for an activity is low, Deci and Ryan identify this type of motivation as extrinsic, and suggest that extrinsic motivation varies along a continuum depending upon the degree to which the motivation of the activity has been internalized. In contrast, individuals' self-determination for engaging in activity is high when motivated by internal factors, such as their own interests, curiosity, and the inherent satisfaction experienced during the activity. Deci and Ryan describe this as intrinsic motivation, and suggest that supportive others play a critical role in fostering the development of more self-determined motivation (Ryan & Deci, 2000).

An important component of SDT is the degree to which an activity has been internalized for individuals, which is based partly on the satisfaction of their need for competence, autonomy,

and relatedness (BPN; Deci & Ryan, 2002). Deci and Ryan argue that when these BPN are satisfied within social environments, then individuals are more likely to be intrinsically motivated, and their well-being is positively impacted. In contrast, ill-being results when those needs are not met by the social environment (Ng et al., 2012). To address whether individuals BPNs are met, SDT researchers consider the environment created by important others (Duda, 2013; Ryan & Deci, 2000).

The Need for Motivational Climate Interventions to impact Exercise Motivation

Both AGPT and SDT are theories that incorporate how important others may promote or thwart motivational facets of the social environment. Researchers interested in these two theories with respect to sport and physical education classes have considered implications of autonomy-supportive and task-involving behaviors (Reinboth, Duda, & Ntoumanis, 2004; Standage et al., 2003). For example, in her recent review of the theoretical framework for the PAPA (Promoting Adolescent Physical Activity) Project, Duda (2013) outlined how both SDT and AGPT were central to understanding how to promote empowerment and engagement in physical activity. Duda used both theories to intentionally raise coaches' awareness of motivational processes to promote coaches' purposeful adoption of strategies to support athletes' competence and autonomy as well as create a sense of comradery among the group (i.e., relatedness).

Given the similarities between the coaching role and exercise leaders (Brown & Fry, 2011), similar opportunities to increase intentionality seem valid for the exercise domain. Likewise, Vallerand (2001) proposed a model suggesting that social factors influenced by important others, including exercise leaders, can lead to psychological need fulfillment. Indeed, the two theories propose key dimensions of the motivational processes that may impact individuals' exercise motivation via the climates and BPN satisfaction; however, limited research

on these issues in exercise settings exists.

A major benefit of the motivational climate framework specific to applied work is that it provides tangible strategies that exercise leaders can implement in their daily job duties to illicit positive behavior change (Brown & Fry, 2011). The strategies associated with creating task-involving and caring climates apply universally to exercise leaders, regardless of their specific interaction opportunities with clients. Likewise, high task-involving climates have been associated with more self-determined motivation in physical education classes (Cox & Williams, 2008) and thus the same relationship is likely to occur in exercise settings.

Yet, despite the evidence for potential benefits of creating a task-involving and caring climate in physical activity settings, motivational climate and caring climate designs are more common in the physical education (Barkoukis, Tsorbatzoudis, & Grouios, 2008; Digelidis, Papaioannou, Lapidis, & Christodoulidis, 2003) and sport domain (Newton, Watson et al., 2007; Smith, Smoll, & Cumming, 2007). The studies specific to exercise settings are mostly cross-sectional in nature, and therefore our knowledge is based on theoretically-driven predictive models and correlational designs (Brown & Fry, 2014; Huddleston et al., 2012; Moore & Fry, 2014). Few studies exist that outline successful interventions with exercise leader staff specifically targeting strategies framed in the motivational and caring climate literature. Thus, to further our understanding of how exercise leaders might incorporate the theoretical tenets of AGPT and the caring literature, intentional intervention designs are needed. Therefore, as part of the design of this study, AGPT was used as the foundation for staff training sessions developed to increase the awareness and ability of all facility staff to promote a high caring, task-involving, and low ego-involving motivational climate.

To determine the impact of this intervention from the members' perspective, the purpose

of this study was to examine the direct and indirect effects of the motivational climate on individuals' BPN, motivation to exercise, plus commitment to exercise and psychological well-being (body image and life satisfaction), specifically in an exercise setting (see Figure 1). Thus, the following positive, indirect effect pathway from the caring and task-involving climates to the outcomes was hypothesized: Caring/task-involving → BPN → intrinsic motivation → outcomes. Conversely, the negative indirect effect pathway for the ego-involving climate was hypothesized: ego-involving → BPN → intrinsic motivation → outcomes. To achieve the purpose, the interrelationships between theoretical tenets of AGPT and SDT were explored using a half-longitudinal design, with an intervention developed for fitness facility staff on how to create a caring, task-involving climate provided between data collection time periods. As a result of the intervention, the facility users' post-intervention perceptions of the caring and task-involving motivational climates, BPN, intrinsic motivation, and general life outcomes were hypothesized to significantly increase; while their perceptions of the ego-involving climate and extrinsic motivation were expected to decrease.

Method

Participants

At the start of the spring semester, students who had been to the student fitness center at least five times¹ since the start of the new semester were invited to participate. Participants ($N = 779$; 390 females, 300 males, 89 unknown; 72% white; $M_{\text{age}} = 20.33$, $SD = 3.301$ years) completed the survey during the end of the month of January, before the intervention with the staff took place. Of those who completed the pre-survey, 282 completed the post survey, which

¹ Given that the current literature on time frames to form motivational climate perceptions in fitness centers is sparse, a panel of motivational climate researchers were consulted until a consensus was reached. The group concluded that at least five visits seemed a reasonable time frame for participants to form a perception of the motivational climate in the fitness center pre-intervention.

resulted in a 36% completion rate. The survey contained the same measurements at Time 1 and Time 2. Permission to survey the members was granted by the University Institutional Review Board and all participants signed an informed consent before receiving the surveys.

Intervention

The staff ($N = 150$; 72 female, 75 male, 3 unknown; $M_{age} = 21.61$, $SD = 2.58$; age range = 18-33) of the targeted fitness center received training on the necessary background and tools to enhance the overall climate of the facility. The staff was comprised of the University's students. The intervention consisted of 60-minute sessions that were tailored to address each staff grouping's unique job duties (e.g., group fitness instructors, personal trainers, front desk workers). Each group received role-specific examples of how to implement the strategies associated with creating a caring, task-involving climate. Specific details of the intervention including the staff's perceptions are described elsewhere (further details regarding this intervention are available in Authors, 2015).

For purposes of this study, it is necessary to demonstrate that the motivational climate strategies taught during the staff training were understood and attempted by the staff. Therefore, a manipulation check was incorporated as a measure of intervention fidelity. The staff were asked to report their perceptions of their own behaviors both before and after the intervention. The 10-item measurement was created for this study and utilized a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Sample items included "When working at the rec, I make an attempt to know members' names" (caring) and "When working at the rec, I encourage members to try new skills" (task-involving) (Authors, 2015). Staffs' perceptions of their caring, task-involving behaviors significantly increased from pre-intervention, $M_{pre} = 3.07$, $SD = .29$, to post-intervention, $M_{post} = 4.34$, $SD = .43$, $t(55) = -21.00$, $p < .001$, suggesting that the intervention

impacted how staff perceived they performed their job responsibilities. Likewise, one of the study's authors remained present at the fitness center during the data collection time period to answer any questions staff may have about specific strategies and to be an ongoing reminder of the skills everyone was taught to incorporate in their daily interactions with members.

Procedures

Pre-survey responses were collected on-site from fitness center users over the four weeks prior to the staff intervention sessions. Participants were given small tokens of appreciation (i.e., water bottles and granola bars) for their survey completion. The post surveys were collected six weeks after the last training session of the intervention to allow time for the fitness center users to experience the post-intervention climate. Participants were contacted via email to complete the post-survey collection and asked to only complete the survey if they used the fitness center during the intervention period. The survey was available in a written or on-line format during both time points, depending on the participant's preference.

Measures

Motivational Climate. The 27-item Perceived Motivational Climate in Exercise Questionnaire (PMCEQ) measured the extent to which individuals perceived a task or ego-involving climate in the exercise setting and utilized a scale of 1 (*strongly disagree*) to 5 (*strongly agree*) (Huddleston, et al., 2012). The PMCEQ has demonstrated reliable fit (i.e., configural model's CFI \geq .90, TLI \geq .90, RMSEA \leq .08), and passed strong measurement invariance (Little, 2013) when measuring male and female college-aged participants' perceptions of the climate in exercise settings (Brown et al., 2013; Moore & Fry, 2014).

Caring Climate. The 13-item Caring Climate Scale (CCS; Newton, Fry, et al., 2007) measured the participants' perceptions of multiple caring elements, including support, concern

and acceptance, and utilized a scale of 1 (*strongly disagree*) to 5 (*strongly agree*). Previous research has shown evidence of CCS responses to reliably measure both youth's (Newton, Fry et al., 2007; Newton, Watson et al., 2007) and adults' perceptions of the climate as caring (Brown & Fry, 2014; Moore & Fry, 2014).

Basic Needs Satisfaction. The 18-item Psychological Need Satisfaction in Exercise scale (PNSE; Wilson, Rogers, Rodgers & Wild, 2006) measured the degree to which participants experience satisfaction of the three basic needs in exercise, and utilized the anchors 1 (*false*) and 5 (*true*). Wilson, et al. (2006) provided initial evidence supporting the structural and convergent validity of the PNSE among young adult exercisers. Wilson & Rogers (2008) found reliability support (Cronbach's alpha ranged from .91 – .93) for the PNSE subscales among a sample of undergraduate students and college staff enrolled in aerobic classes.

Behavioral Regulation in Exercise. The 15-item Behavioral Regulation in Exercise Questionnaire (BREQ; Mullen, Markland & Ingledew, 1997) measured the participants' level of motivation on the self-determination continuum, and utilized the anchors of 1 (*not true for me*) to 5 (*always true for me*). Structural validity for the instrument has been supported (Wilson, Rodgers, & Fraser, 2002) and measurement reliability (Cronbach's alpha levels range is .70 — .92 for the four-factor structure) demonstrated across research studies including both young adults and university student participants (Edmunds, Ntoumanis, & Duda., 2006; Mullen et al., 1997).

Commitment. The four-item Exercise Commitment Scale (Alexandris, Zaxariadis, Tsorbatzoudis, & Grouios, 2002) measured the participants' commitment to exercise in a health club setting, and utilized a scale of 1 (*not at all*) to 5 (*extremely*). Alexandris, et al. (2002) reported support for the reliability of the measure (Cronbach's alpha = .86), and confirmatory

factor analysis support of the factor structure.

Satisfaction with Life. The five-item Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) measured participants' cognitive judgment of their own perceptions of their life overall as compared to what they consider a normal standard, and utilized a scale of 1 (*strongly disagree*) to 7 (*strongly agree*). In their study with undergraduate students, Diener, et al., reported reliability support (Cronbach's alpha = .87).

Body Image. The six-item Body Image States Scale (BISS; Cash, Fleming, Alindogan, Steadman & Whitehead, 2002) measured participants' evaluation of their physical appearance at that moment in time. The BISS is sensitive to positive and negative situation contexts, and utilized a scale of 1 (*extremely dissatisfied*) to 9 (*extremely satisfied*) for items 1-4 and a scale of 1 (*a great deal worse*) to 9 (*a great deal better*) for items 5-6. Higher BISS scores on the 9-point dimension indicated more favorable body image states. The Cronbach alpha level of the scale has ranged from .78 to .84 across studies. In addition, both construct and convergent validity has been supported with university populations (Cash, et al., 2002).

Demographics. Participants were asked to report their age and gender.

Missing Data

Prior to imputation, the skewness and kurtosis values of all variables were examined to check for any violations of multivariate normality assumptions in the sample. Results suggested that the data were distributed normally, both univariate and multivariate (Tabachnick & Fidell, 2007). The total percentage of missing data values was 35%, which was assumed to be missing at random following the guidelines set by Schafer and Graham (2002). Graham, et al. (2007), among others, have shown through simulation studies that even when 50% of data is missing, power is maintained and less biased, more generalizable parameter estimates result when 100

imputations are conducted with all the informative data that is present. Therefore, we followed best practice recommendations and using Amelia (R Development Core Team, 2013), ran 100 imputations with all of the variables within the dataset included to inform the imputation process to maximize the calculation of unbiased parameter estimates and standard errors (Graham, Olchowski, & Gilreath, 2007; Little, Jorgensen, Lang, & Moore, 2014; Schafer, & Graham, 2002). Then, the covariances and means were calculated across the 100 imputed datasets and read into Mplus to analyze the structural equation model (SEM) (Lang & Little, 2014).

Data Analysis

SEM was used to examine the research questions using MPlus 6 (Muthén & Muthén, 2008). Given that our current design included two time points, the model is referred to as a “half-longitudinal” design (Cole & Maxwell, 2003). An advantage of SEM is conducting an initial confirmatory factor analysis (CFA) and measurement invariance (e.g., factor loadings and intercepts) of all constructs across time with the half-longitudinal model (Little, 2013). This allowed us to determine if we were measuring the same constructs at Time 1 and Time 2. Maximum likelihood (ML) was used to estimate the models, because it is an appropriate and sufficiently robust estimator with normally distributed data (Little, 2013). For latent variable identification, the fixed-factor method (e.g., pre-setting each latent construct’s variance to 1.0) was used to create a metric scale.

In order to determine model fit, researchers recommend using several fit indices to determine the adequacy of the model (Little, 2013). The chi-square goodness of fit test assessed absolute fit of the model to the data (χ^2). Although reported, the chi-square was not used in interpretation of the CFA, because the statistic tests the null hypothesis of perfect fit to the data, which is implausible and usually rejected in models with large samples (Little, 2013). Therefore,

for the relative fit indices (i.e., comparative fit index (CFI) and Tucker-Lewis fit index (TLI)), a minimum value of .90 was considered an adequate model fit cutoff value (Bentler & Bonett, 1980). To properly calculate these fit indices, an alternative, properly specified half-longitudinal null model was analyzed due to the half-longitudinal nature of the data (Little, 2013). In addition, for the absolute fit indices (i.e., root mean square error of approximation (RMSEA) and standardized root mean residual (SRMR), with a maximum value of .08 was considered a justifiable fit of the data (Little, 2013).

Upon meeting these values for the configural, half-longitudinal model, the measurement model was tested for weak invariance (i.e., factor loadings constrained to equivalence across time) and strong invariance (i.e., intercepts constrained to equivalence across time). The tenability of these invariance constraints was assessed by comparing the constrained model's fit indices to the prior, unconstrained model's fit indices; specifically, the CFI changed .01 or less (Cheung & Rensvold, 2002), and the constrained model's RMSEA was within the prior RMSEA's 90% CI (Little, 1997). If an invariance model's fit did not meet the tenability criterion above, then partial invariance was sought by releasing the fewest constraints necessary to attain tenability compared to the prior, unconstrained model to reach partial invariance (Little, 2013). Once, measurement invariance was attained, the latent constructs could be confidently viewed as measuring the same constructs over time. Thus, enabling the assessment of homogeneity of the constructs' latent parameters (i.e., variances, covariances, and means) over time. Not passing the homogeneity of variances, covariances, or means tests provides support for a significant change in the construct's parameter(s) due to the intervention. Finally, the correlations and hypothesized indirect model's regression paths were tested for significance. All the above latent parameter testing was done by utilizing the change in chi-square to compare the constrained model nested

within the unconstrained model (Little, 2013).

In the measurement model, there were a total of 22 latent constructs, 11 representing Time 1 and the same constructs repeated in Time 2. The latent constructs were as follows: three representing perceptions of the climates (caring, task, ego), three representing BPN (autonomy [aut], competence [com], relatedness [rel]), two representing the ends of the self-determination continuum (intrinsic regulation [int], external regulation [ext]) and finally three representing exercise outcomes (satisfaction with life [life], body image [body] and commitment to exercise [commit]). Based upon support for the simplex structure of the BREQ-measured self-determination continuum's constructs (Walls & Little, 2005), their strong correlations in the current study's data, and in the interest of model parsimony, only the external regulation and intrinsic regulation constructs were included in the model to represent the opposite ends of the continuum.

Given the size of this model, utilizing parcels allowed for the maintenance of measurement error free variance (i.e., latent construct true score), while reducing the number of parameters to improve model convergence. Parcels (i.e., averaging the sum of two or more indicators) were created to form three manifest indicators for each of the latent constructs by utilizing the item-to-construct balancing technique (Little, 2013; Little, Rhemtulla, Gibson, & Schoemann, 2013), which averaged the strongest and weakest indicators based upon their factor loadings from an initial configural model, resulting in three tau-equivalent parcels as indicators.

Results

Means, standard deviations, composite reliability (CR), and average variance extracted (AVE) for each of the latent constructs are reported in Table 1. For the CR, we used .60 as the criterion cut-off for acceptable reliability (Bagozzi & Yi, 1988). For the AVE, we used .50 as the

criterion cut-off for acceptable explained variance (Fornell & Larcker, 1981).

Longitudinal Invariance

The freely estimated configural invariance model demonstrated acceptable fit (RMSEA = .052, SRMR = .040, TLI = .944, CFI = .917) (see Table 2 for model fit indices). Following standard procedures to evaluate measurement invariance stated above, the weak invariance (equated loadings) model passed; the strong invariance (equated intercepts) model met partial strong invariance after allowing the first and second parcel on intrinsic regulation to freely estimate across time. Given the measurement model provided evidence of consistency, the next step was to examine the homogeneity of the latent parameters. Based upon the change in chi-square, there were significant differences in the variances of the constructs between time points, as well as correlations, and latent means (Table 2). The effect sizes for time ranged from small to moderate (see Table 1).

Hypothesized Model Testing

Since the heterogeneity of latent parameters suggested that a change had occurred between Time 1 and Time 2, a change model was created. The purpose of the change model was to test the predictive nature of the relationships between the Time 1 and Time 2 constructs, after regressing the Time 2 indicators on the matching Time 1 indicators; thus, controlling for the influence of Time 1. Therefore, the regression coefficients of the change model are properly interpreted as the predictive ability of the T1 construct to predict change in the other T2 constructs.

Focusing on the overall time-lagged affects (see Figure 2 for specific beta values), results supported the majority of the study hypotheses. First, the Time 1 climate (i.e., caring, task- and ego-involving) predicted the change in BPN. Second, the Time 1 BPN predicted the change in

motivation to exercise. Third, change in the outcomes (i.e., commitment, life satisfaction, and body image) was positively predicted by intrinsic regulation and negatively predicted by external regulation. However, the well-being outcomes were also significantly, directly predicted by the climate (i.e., caring and task-involving), which was not hypothesized. This final structural model demonstrated a tenable fit ($\chi^2(1928, n = 779) = 6205.72, p < .001$, RMSEA = .053 [90% CI: .052 -- .055], SRMR = .06, TLI = 0.88, CFI = 0.89), and is presented in Figure 2. Overall, the model accounted for a significant proportion of variance for each of the three outcomes variables; specifically, the final model accounted for 12% of life satisfaction, 13% of body image, and 39% of commitment to exercise at Time 2.

Discussion

The purpose of this study was to examine the direct and indirect effects of an intervention designed to influence the motivational climate and its impact on members' BPN, motivation to exercise, commitment to exercise, body image, and life satisfaction. The results partly supported the hypothesized relationships between AGPT and key components of SDT; specifically, there were unidirectional, cross-lagged effects between perceptions of climate and the BPN; between the BPN and motivation to exercise; and between motivation to exercise and the outcome measures of commitment to exercise, body image, and life satisfaction. In addition, perceptions of the task-involving and caring climate directly and positively predicted life satisfaction and body image.

Result Highlights

Invariance of the Loadings and Intercepts. The comparability of the eleven latent constructs was evaluated between Time 1 and Time 2. Ensuring that the loadings and intercepts of each of the latent constructs were equivalent provided a basis for comparing the constructs'

variances, correlations and means (Little, 1997). The successful establishment of factorial invariance provides a basis for future research comparing and assessing these constructs in exercise settings.

Effectiveness of the Intervention. While the intervention is described elsewhere (see Authors, 2015), we want to highlight that it was possible to train fitness center staff to create a more caring, task-involving climate. By establishing strong invariance across the two time points, the equivalence of the constructs' variances, covariances, and means were evaluated, and demonstrated there were significant differences across time for the variances, correlations, and means. While the means of the caring and task-involving climate significantly increased, the ego-involving climate mean decreased, thus suggesting the effectiveness of the staff intervention in changing members' perceptions of the fitness center climate. Likewise, the means for competence, relatedness, intrinsic motivation to exercise, commitment to exercise, and life satisfaction significantly increased. The results are consistent with previous research that has employed longitudinal designs to study changes in need satisfaction and more self-determined motivation for exercise (Gunnell, Crocker, Mack, Wilson, & Zumbo, 2014; Wilson, Rodgers, Blancard, & Gessell, 2003). Likewise, the results are in-line with other intervention designs that have demonstrated the motivational climate can be manipulated by training leaders in other physical activity settings such as sport and physical education (e.g., Barkoukis, Tsorbatzoudis, & Grouios, 2008; Newton, Watson et al., 2007; Smith, Smoll, & Cumming, 2007)

While most the variables changed post-intervention, external regulation for exercise and perceived autonomy did not significantly change between time points. The mean for autonomy at Time 1 was high (i.e., 4.40 out of 5.00) suggesting the members already felt autonomous in

their exercise choices. In addition, they did not report external motives for exercising (i.e., 2.04 out of 5.00) at Time 1. This may reflect the nature of a fitness center environment, which is purposefully set-up to allow members to exercise when and how they wish. Members are free to choose which equipment or type of exercise they want to perform without seeking permission. In other studies specific to exercise settings, autonomy has not emerged as a predictor of changes in well-being, and researchers have suggested that autonomy may be more important to protect against negative affect rather than increase positive affect in exercise settings (Gunnell et al., 2014).

Another interesting finding from the study was the decrease in body image from pre to post intervention. The pre-surveys (i.e., Time 1) were completed during January and the post surveys (i.e., Time 2) were completed in late Spring. As the study participants were all college students, the timing of survey collection could have played a role in influencing their body image. Spring time can be associated with warmer weather and more revealing clothes, and thus could have influenced participants' body image score. College students, in particular, have a high rate of distorted self-body image and perceptions of ideal body weight, and there are numerous correlates associated with the likelihood of body image dissatisfaction among this age cohort (Forrest & Stuhldreher, 2007). Thus, the study could have been swayed by survey timing.

Intercorrelations Between Constructs. The change model included a correlational analysis between both Time 1 constructs and Time 2 constructs, and demonstrated positive relationships between perceptions of a caring, task-involving climate, BPN, intrinsic motivation for exercise, commitment to exercise, life satisfaction, and body image. Likewise, negative relationships existed between perceptions of an ego-involving climate and the subsequent

measures. These findings are consistent with previous research (Kowal & Fortier, 2000; Wilson, et al., 2003) and theory (Nicholls, 1989; Ryan & Deci, 2000), and imply that positive outcomes are associated with individuals perceiving a high caring, task-involving, and low ego-involving climate. The BPN were moderately and positively intercorrelated, which is consistent with previous research (Reinboth et al., 2004). While intrinsic regulation was positively related to satisfaction with life, body image, and commitment to exercise, external regulation was negatively related. These findings are consistent with SDT, which suggests that self-determined motivation should lead to enhanced well-being (Deci & Ryan, 2002). Likewise, these findings are aligned with current applied sport psychology efforts which train coaches to target both a caring, task-involving motivational climate and autonomy-supportive climate in sport settings, as they complement one another to create an environment where needs are supported and intrinsic motivation is fostered (Duda, 2013; Quested & Duda, 2010; Tessier et al., 2013).

Change Model: Cross Lagged Paths. While the correlational analysis revealed support for the interconnectedness of the constructs, the cross-lagged path analysis identified how the constructs influenced one another. Our study suggests that perceptions of the motivational climate influence members' motivation to exercise by satisfying their needs for autonomy, competence, and relatedness. Previous research in exercise settings has supported the role of motivational climates influencing the BPN (Cox & Williams, 2008). In addition, and in line with theoretical underpinnings (Ryan & Deci, 2000), the BPN had direct effects on both intrinsic and external regulation, which is consistent with previous research (Kowal & Fortier, 2000; Wilson, et al., 2003). Interestingly, in our study, only autonomy positively predicted the change in intrinsic regulation. While theoretically, all three BPN play important roles in influencing motivation to exercise, few studies have examined this mediation with longitudinal data with all

three BPN modeled separately in an exercise context (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). As our study included college students who may be independent for the first time in their lives, and potentially participating in solitary training, the role of autonomy on intrinsic motivation to exercise may be stronger among college students than other groups. In addition, competence was fairly high in our sample, and a third time point collection might have allowed for the relationship between competence and intrinsic motivation to emerge. Regardless, our study lends support to the notion that all the BPNs are important in the fostering of intrinsic motivation and decreasing external regulation, which is consistent with previous research in exercise settings (Teixeira, 2012).

Both internal and external regulation predicted the well-being measures, with the highest regression being between intrinsic motivation and commitment to exercise. Researchers argue that motivation can potentially enhance positive consequences in exercise settings (Ryan & Deci, 2000), which our results support. In addition, perceptions of the task-involving and caring climate can have a direct, positive effect on increasing life satisfaction and body image. The potential of perceptions of the climate at an exercise facility to influence well-being measures in life has dramatic implications for exercise promotion. Not only can the climate increase individual's likelihood of committing to exercise, but it can also influence the value those individuals place on their overall positive appraisal of their lives.

Study Limitations & Future Directions

While other studies have suggested a mediating role between BPN and self-determined motivation to exercise (Standage et al., 2003; Cox & Williams, 2008), these studies have utilized single data collections so the interpretations have been limited by the data's cross-sectional nature (Cole & Maxwell, 2003). Our current study design did include two time points allowing a

half-longitudinal model to be tested. This permitted for the passage of time to further support the directionality and causality of the model's regression paths (Little, 2013). We advocate for continued research that includes multiple time points to consider the predictive impact of the motivational climate on exercise-related outcomes. In addition, future studies might expand the full SDT continuum, as inclusion of additional regulations may expand our understanding of the climate's impact on individuals' motivation to exercise (Pelletier, Fortier, Vallerand, & Briere, 2001).

We should also note a number of limitations with our study's population and the challenges of intervention-based designs. Our research design did include an intervention and a control group would be ideal to include in the future. We did experience a fairly high drop-out rate as well, and while we used imputation to correct for the missing data, ideally studies of this nature would boost a lower attrition rate. Also, the variables that we were interested in require self-reporting, and therefore subjectivity of answers is part of the overall data design. Finally, our study targeted college students and cannot be generalized to the entire adult population. While fitness centers have similar missions and goals, the nuances of a college fitness center may be different from those found in the general population.

Nicholls (1984, 1989) advocated for opportunities to maximize others' motivation in achievement settings through the motivational climate. Likewise, Ryan and Deci (2000) believe that creating social environments that satisfy psychological needs and increase intrinsic motivation is essential to influencing personal development and well-being. Including the theoretical tenets of AGPT and SDT such as in the present work should be of particular interest for those in health promotion who strive to employ intervention strategies that positively influence exercisers' experiences. Influencing the positive experiences of exercisers by

reengineering the motivational climate offers a practical tool fitness center personnel can implement.

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Table 1

Means, sd, alpha levels of latent constructs, Time 1 and Time 2

Construct	<u>Time 1 (pre-intervention)</u>				<u>Time 2 (post intervention)</u>				<u>Cohen's d</u>
	Mean	SD	AVE	CR	Mean	SD	AVE	CR	
<u>Climate</u>									
Caring	3.92	.64	.88	.96	4.10*	.61	.88	.96	.28
Task-involving	3.36	.60	.80	.92	3.54*	.64**	.90	.96	.28
Ego-involving	2.92	.55	.68	.86	2.69*	.69**	.83	.93	.29
<u>BPN</u>									
Autonomy	4.40	.76	.89	.96	4.38	.62	.82	.93	.04
Competence	4.10	.78	.79	.92	4.37*	.62**	.82	.93	.37
Relatedness	3.53	.97	.77	.91	3.75*	.82	.79	.92	.24
<u>Motivation to Exercise</u>									
Intrinsic Regulation	3.72	.87	.55	.78	3.97*	.66**	.60	.81	.28
External Regulation	2.04	.85	.53	.77	2.00	.94	.56	.79	.04
<u>Outcomes</u>									
Commitment	3.74	.84	.60	.82	4.11*	.63**	.62	.83	.50
Life Satisfaction	5.22	1.09	.69	.88	5.43*	.93	.68	.87	.20
Body Image	5.76	1.44	.77	.91	5.54*	1.19**	.60	.82	.17

Note. Life satisfaction reported on a 7-point Likert scale. Body image reported on 9-point Likert scale. All other scales reported on 5-point Likert scale.

Note. * indicates that the difference between the Time 2 and Time 1 mean was statistically significant, $p < .01$;

** indicates that the Time 2 and Time 1 standard deviations were statistically significant from each other (heterogeneous), $p < .01$

Table 2

Fit Indices for the Pre-Post Confirmatory Factor Analysis

Model	χ^2	Df	<i>P</i>	$\Delta\chi^2$	<i>p</i>	RMSEA		SRMR	CFI	TLI	Tenable?
						RMSEA	90% CI				
Alternative Null	47608.38	2220	.000	---	---	---	---	---	---	---	---
Configural Invariance	5591.05	1815	.000	---	---	.05	.05-.05	.04	.92	.94	---
Weak Invariance	5851.36	1837	.000	---	---	.05	.05-.06	.04	.91	.90	Yes
Partial Strong Invariance ¹	6179.63	1856	.000	---	---	.06	.05-.06	.04	.91	.89	Yes
Homogeneity of Variances ²	5999.25	1848		147.89	.000	.05	.05-.06	.05	.90	.88	No
Homogeneity of Variances & Covariances ²	8740.02	2025		2560.39	.000	.06	.06-.07	.12	.85	.89	No
Equality of Means ²	6329.99	1867		150.37	.000	.06	.05-.06	.06	.89	.88	No

Note. ¹Allowing first and second parcel on intrinsic to freely estimate. ²Evaluated with the χ^2 difference test.

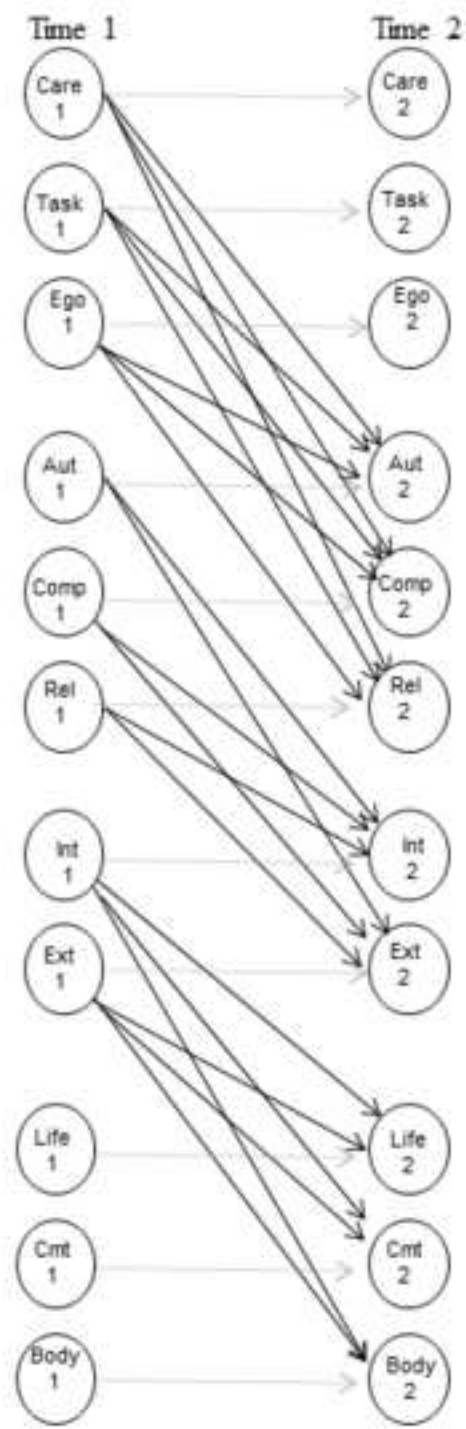


Figure 1: Proposed Model.

The proposed meditational model in relation to motivational climate and psychological well-being. Care = caring climate. Task = task-involving climate. Ego = ego-involving climate. Aut = autonomy. Comp = competence. Rel = relatedness. Int = intrinsic regulation. Ext = external regulation. Life = life satisfaction. Cmt = commitment. Body = body image.. Dark line = cross lagged path; Gray line = autoregressive path.

Note: Correlational paths are not represented in this model but were present in the hypothesis.

Figure

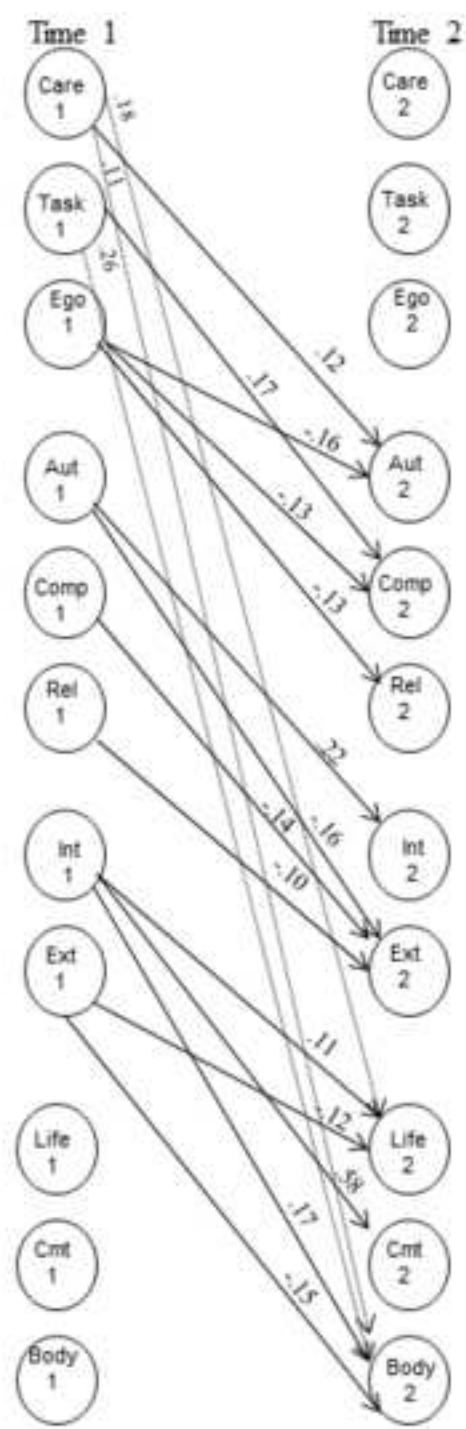


Figure 2: 1/2 Longitudinal Structural Model.

1/2 longitudinal change model between motivational climate, basic psychological needs, motivation to exercise, life satisfaction, commitment to exercise body image.

Model Fit:

$\chi^2(1928, n = 779) = 6205.72, p < .001, RMSEA = .05; SRMR = .06, TLI = 0.88, CFI = 0.89$

Note: Correlational paths are not represented in this model but are present in the analysis. Life satisfaction $R^2 = 3.46$, body image $R^2 = 3.61$, commitment to exercise $R^2 = 6.24$.