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Motivational processes in college freshmen's exercise participation: A goal content theory perspective

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ABSTRACT

Objective: Grounded in goal content theory, this study tested two mediation models that examined the direct and indirect effects of intrinsic and extrinsic goals on exercise participation and subjective vitality in college freshmen. **Methods:** Participants were 181 college freshmen ($M_{\text{age}} = 18.12$ years) who completed an online survey that assessed their goal content, psychological need satisfaction, motivational regulations, exercise participation, and subjective vitality in the context of exercise. **Results:** Path analysis revealed an acceptable model fit for the hypothesized model, indicating that psychological need satisfaction mediated the positive relationships between intrinsic goals and, relative autonomy index (RAI), exercise participation, and subjective vitality, while RAI mediated the negative relationships between extrinsic goals and, exercise participation and subjective vitality. **Conclusions:** Findings expand current knowledge of goal content, indicating that emphasizing social affiliation, health management, and skill development is conducive to exercise participation, whereas focusing on appearance and social recognition could be detrimental.

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It is well established that regular physical activity produces significant health benefits, yet more than half of the college students in the U.S. do not meet the recommended physical activity guidelines.¹ As students transition from high school to college, the overall levels of physical activity decline and little success is seen in their tendencies to engage in regular exercise.² Recent U.S. national health data showed that 41.4% of high school seniors meet the recommended guidelines of at least 60 minutes of moderate-to-vigorous physical activity on five days per week,^{3,4} while 43.9% of college students meet the lower recommendations for adults—at least 30 minutes of moderate exercise on five days per week or 20 minutes of vigorous exercise on three days per week.¹ Physical inactivity of those students, particularly college freshmen, who do not meet the guidelines can be detrimental to their health for both short and long term if this trend continues throughout adulthood. In light of these health risks, exercise and health researchers have advocated for support toward enhancing college students' motivation to engage in regular exercise.^{5,6} More specifically, research evidence has indicated that exercise goals relate to exercise motivation and participation and thus warrant further investigation,^{7–9} contributing to the purpose of this study to investigate these motivational processes through direct and indirect effects of exercise goals on exercise participation and subjective vitality.

Goal content and motivational regulations

Self-determination theory (SDT)^{10,11} is a prominent theoretical framework developed to explain the mechanisms behind motivation and subsequent behavior. SDT research has shown consistency over the past decades in understanding the relationships between exercise motivation and behavior.¹² Within SDT, goal contents theory (GCT) is one of the six mini-theories, postulating that the reasoning and the goals behind motivation are essential to determining the quality of that motivation and subsequent behaviors.^{10,11}

GCT distinguishes two types of goal content—intrinsic and extrinsic. Intrinsic goals stem from internal factors such as personal interests and enjoyment, whereas extrinsic goals are based upon external factors including recognition and accolades that do not necessarily lead to self-development.^{10,11} Intrinsic goals generally evoke greater physical and psychological feelings of wellness (e.g., less physical and depressive symptoms) than extrinsic goals do.¹³ Within the context of exercise, Sebire and colleagues postulate that intrinsic goals consist of social affiliation, health management, and skill development, and that extrinsic goals are composed of image (i.e., appearance) and social recognition.⁷ Sebire and colleagues provided further support for GCT in a sample of British government employees, whose goals with greater intrinsic than extrinsic contents (i.e., relative intrinsic goals) were more conducive to not only exercise participation but also physical and psychological well-being.⁸

It is worthy of note that goal content indirectly, rather than directly, predicts behavior and well-being through other motivational variables.^{10,11} Past studies have primarily examined and supported that goal content acts as the antecedent of motivational regulations in exercise contexts, creating a viable means of predicting exercise participation and well-being.^{6,8,9,14,15} This is in line with the theoretical underpinnings of organismic integration theory (OIT), another SDT mini-theory, which posits that different forms of motivational regulation influence behaviors differently.¹¹

OIT defines intrinsic motivation as a completely internalized motivation characterized by fun and enjoyment in an activity. In contrast, extrinsic motivation is characterized by separable outcomes instead of intrinsic reasons when engaging in an activity. It consists of four forms of motivational regulations—integrated, identified, introjected, and external regulations—with descending degrees of internalization in a continuum.¹ Intrinsic motivation and integrated/identified regulation can be further categorized as autonomous motivation. With autonomous motivation, individuals participate in exercise due to enjoyment, personal values, and/or a mastery of activities. On the other hand, introjected regulation and external regulation can be categorized as controlled motivation. With controlled motivation, individuals may engage in exercise because they experience pressure from others to do so and/or want to reduce negative physical or psychological symptoms.¹¹ Research has also used a relative autonomy index (RAI)¹⁶ to represent the degree of self-determined motivation by combining different forms of motivational regulation to predict motivational outcomes. In any given social context, higher autonomous motivation and RAI, as well as lower controlled motivation, predict greater involvement (e.g., exercise participation) and well-being.^{10,11}

Supporting GCT and OIT, the extant literature has consistently shown that goal content and motivational regulations work together to predict exercise participation and associated psychosocial outcomes. Using structural equation modeling to analyze data from British adults, British adolescents, and Flemish children, past studies indicated that (relative) intrinsic goals positively predicted, and extrinsic goals negatively predicted, physical activity through autonomous motivation, but not through controlled motivation.^{9,15,17} Similarly, intrinsic goals positively predicted, and extrinsic goals negatively predicted, exercise participation and quality of life through RAI in British adolescents. As the only study to date that has examined exercise goal content in college students, Sibley and colleagues⁶ found that relative intrinsic goals positively predicted physical activity through RAI in U.S. college students who were enrolled in university weight training, jogging and conditioning, and aerobic classes. Due to a dearth of research on college students' exercise goal content, particularly among freshmen who tend to gain

weight and engage in less physical activity during their first year of college,^{2,18} further investigation of the relationships among exercise goal content, motivation, and participation is warranted.

Mediating relationships between goal content and exercise outcomes

Another SDT mini-theory—basic psychological needs theory (BPNT)—holds that all individuals have three basic psychological needs that must be satisfied in order to achieve autonomous motivation.^{10,11} These three psychological needs are autonomy (i.e., a sense of volition), competence (i.e., a sense of effectiveness), and relatedness (i.e., a sense of belonging). Psychological need satisfaction has been shown to play a significant role in mediating the relationships between exercise goal content and, exercise participation and psychological well-being. Specifically, Sebire and colleagues⁸ demonstrated that relative intrinsic goals positively predicted physical self-worth and psychological well-being, and negatively predicted exercise anxiety, through psychological need satisfaction. Gunnell, Crocker, Mack, Wilson, and Zumbo's¹⁹ study is the only one to date that has examined both psychological need satisfaction and motivational regulations along with goal content in an exercise context. Using a longitudinal design, these researchers found that, contrary to BPNT assumptions, changes in Canadian adults' psychological need satisfaction did not mediate the relationships between changes in relative intrinsic goals and changes in motivational regulations. Instead, motivational regulations were antecedents of psychological need satisfaction, revealing that changes in autonomous motivation, but not controlled motivation, mediated the positive relationships between changes in relative intrinsic goals and changes in psychological need satisfaction, which in turn predicted increases in physical activity, subjective vitality, and positive affect, as well as a decrease in negative affect. Yet, these findings were far from conclusive since these two studies were, to our knowledge, the only exercise goal content research that has included psychological need satisfaction. Because little, if any, evidence is available to support Gunnell and colleagues'¹⁹ findings, examination of motivational regulations as an antecedent of psychological need satisfaction was replicated in this study.

The present study

As goal content can impact an individual's behavior and well-being,^{8,11} GCT (addressing the “what” of motivation) should be tested more extensively beyond the widely studied OIT (addressing the “why” of motivation). After the initial studies were conducted about a decade ago,^{7,8,14} the application of GCT in the context of exercise has been sparse. Supporting Gunnell and colleagues' notion that “evidence is limited based on the use of only one or two mini-theories being considered simultaneously^{9,14” 19(p20)}, the present study combined GCT, OIT, and BPNT to investigate the relationships among goal content, psychological need

¹Integrated regulation is considered the most self-determined form of extrinsic motivation. In addition to intrinsic and extrinsic motivations, SDT defines amotivation as a form of motivation that represents an absence of internalization and intention for a behavior.¹¹ In line with the exercise goal content literature,^{6,8,9,15,19} and due to insufficient validation of newer measures during planning of this study, we did not measure integrated regulation.

satisfaction, RAI, and exercise outcomes (i.e., exercise participation and subjective vitality). Subjective vitality—the feeling of being alive, well, and energetic both physically and psychologically—is an important indicator of well-being and significantly associated with motivational regulations.²⁰ In addition to physical health benefits, higher quantity (e.g., frequency) and quality (e.g., intrinsic goals, RAI) of exercise participation has been found to relate to greater subjective vitality as indication of psychological health benefits.^{8,19–21}

The purpose and the significance of the present study were threefold. First, this study focused on the exercise motivational processes in U.S. college freshmen, a population that is most likely to be away from their family for the first time and thus experience a shift in lifestyle.^{2,21} The findings of this study would add not only empirical evidence to the scarce goal content literature on college students,⁶ but also important practical implications for understanding college freshmen's exercise goals and their potential contributions to exercise participation and well-being. Second, the present study examined the specific effects and strengths of both intrinsic goals and extrinsic goals, rather than the overall effect and strength of relative intrinsic goals,^{8,9,19} on exercise participation and subjective vitality. Our approach makes greater practical sense because we would be able to understand how having intrinsic versus extrinsic goals might have differential strengths on motivation in order to design interventions accordingly. Third, building on the exercise goal content literature and replicating Gunnell and colleagues'¹⁹ research, this study tested two mediation models, a hypothesized model and an alternative model that respectively included RAI as a consequence and as an antecedent of psychological need satisfaction. This approach would aid in theory testing for us to better understand the mediating roles of psychological need satisfaction and motivational regulations, particularly in exercise contexts.

Methods

Participants and procedures

Participants were 181 college freshmen ($M_{\text{age}} = 18.12 \pm 0.63$ years; 73 male, 108 female) from a large-sized public university in the southwestern U.S. The majority of the participants were White (51.9%), followed by Hispanic/Latino (23.2%), Black (12.2%), Asian (7.2%), and other races (5.5%). On average, participants engaged in episodes (15 min minimum) of vigorous exercise 2.58 times/week, moderate exercise 3.41 times/week, and mild exercise 2.36 times/week. Following the approval of the university's institutional review board (IRB), recruitment emails with the online survey link were sent out by the Director of Student Activities to all college freshmen for them to enter and consent to participate. After providing consent, participants spent approximately 20 minutes completing the online survey.

Measures

Demographic information

Questions were asked about participants' age, sex, and race/ethnicity to characterize the sample.

Exercise goal content

The 20-item Goal Content for Exercise Questionnaire (GCEQ)⁷ was used to assess intrinsic (skill development, social affiliation, and health management) and extrinsic (social recognition and image) goals for exercise, with a 7-point Likert scale ranging from 1 (*not at all important*) through 4 (*moderately important*) to 7 (*extremely important*). An intrinsic goal variable and an extrinsic goal variable were computed by averaging the 12 intrinsic goal items (e.g., "to learn and exercise new techniques") and the eight extrinsic goal items (e.g., "to gain favorable approval from others"), respectively. This scores for this measure have been shown valid and reliable in college populations across countries including the U.S.^{6,7}

Psychological need satisfaction

The 18-item Psychological Need Satisfaction in Exercise Questionnaire (PNSE)²² was used to assess satisfaction of three basic psychological needs—autonomy (e.g., "I feel free to exercise in my own way"), competence (e.g., "I feel confident I can do even the most challenging exercises"), and relatedness (e.g., "I feel attached to my exercise companions because they accept me for who I am")—with a 6-point Likert scale ranging from 1 (*false*) to 6 (*true*). A psychological need satisfaction variable was computed by averaging all 18 items. The scores for this measure have been shown valid and reliable in college populations across countries including the U.S.^{22,23}

Exercise motivation

The 15-item Behavioral Regulations in Exercise Questionnaire (BREQ)²⁴ was used to assess four different types of exercise motivation—*intrinsic motivation* (e.g., "I exercise because it's fun"), *identified regulation* (e.g., "I value the benefits of exercise"), *introjected regulation* (e.g., "I feel ashamed when I miss an exercise session"), and *external regulation* (e.g., "I exercise because other people say I should")—with a 5-point Likert scale ranging from 1 (*not true for me*) through 3 (*sometimes true for me*) to 5 (*very true for me*). Given the length of the survey and that all of the participants had exercise behaviors and intentions, their amotivation was not assessed in this study. An RAI score was computed using the formula [(intrinsic motivation \times 2) + (identified regulation \times 1) – (introjected regulation \times 1) – (external regulation \times –2)], which reflects the continuum structure of motivation, with higher scores representing more autonomous motivation.¹⁶ The scores for the subscales and the corresponding RAI have been shown valid and reliable in college populations across countries including the U.S.^{6,7}

Exercise participation

The Leisure Time Exercise Questionnaire (LTEQ)²⁵ was used to assess corresponding number of episodes in more than 15 minutes of strenuous (e.g., running), moderate (e.g., volleyball), and mild (e.g., golf) exercise participation during

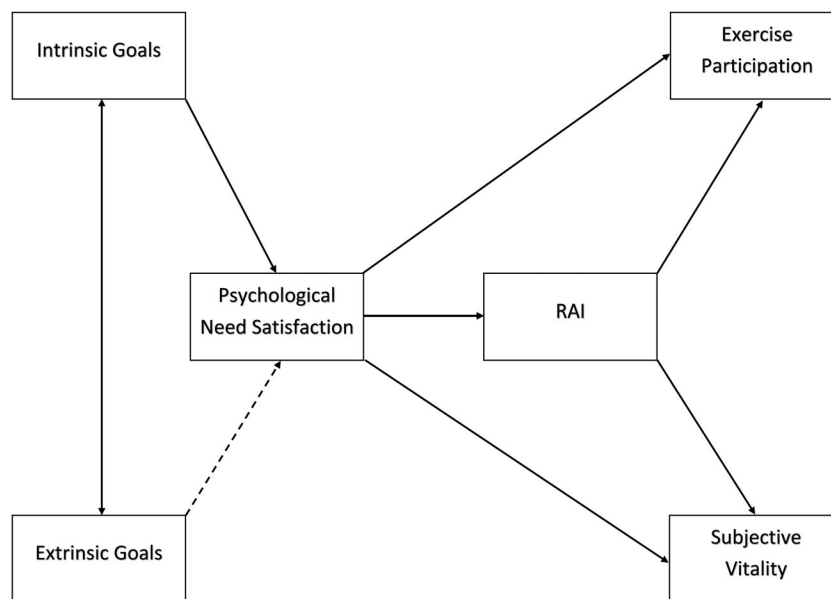


Figure 1. Hypothesized model showing expected direct and indirect effects of goal contents on psychological need satisfaction, relative autonomy index (RAI), and exercise outcomes. Solid lines represent positive paths; dashed lines represent negative paths.

a typical week. A total exercise participation score was computed using the formula [(number of strenuous exercise episodes \times 9) + (number of moderate exercise episodes \times 5) + (number of mild exercise episodes \times 3)]. The LTEQ scores have demonstrated adequate validity comparable to objective physical activity assessment such as accelerometers,²⁶ as well as adequate validity and reliability in college populations across countries including the U.S.¹²

Subjective vitality

The 7-item Subjective Vitality Scale (SVS)²⁰ was used to assess subjective vitality (e.g., “I feel energized”) in the context of exercise, with a 7-point Likert scale ranging from 1 (*strongly disagree*) through 4 (*neutral*) to 7 (*strongly agree*). After transforming the one reverse-scored item (i.e., “I don’t feel very energetic”), a subjective vitality variable was computed by averaging all seven items. The scores for this measure have been shown valid and reliable in college populations across countries including the U.S.^{20,21}

Data analysis

After checking the data set for invalid values, missing values, outliers, and normality using the graphical method MULTINOR,²⁷ expectation maximization (EM) algorithm was used for data imputation as less than 5% of data missed at random based on the MCAR test.²⁸ Three steps of statistical procedures were then conducted using a significance level of $p < .05$ for all analyses. First, descriptive statistics and internal reliability were computed to examine the characteristics of the study variables. Second, correlation analysis was conducted to investigate the associations among the study variables, as a preliminary analysis, to demonstrate their adequacy for subsequent path analysis. Third, path analyses were conducted for one hypothesized model (see Figure 1) and one alternative model (see Figure 2) using

AMOS Version 25.0.² As previously mentioned, the alternative model was tested since Gunnell and colleagues¹⁹ proposed and supported that exercise motivation was an antecedent of psychological need satisfaction in their path model. The sample size of this study was deemed sufficient, larger than the proposed $N=137$ in a priori calculation (<http://www.quantpsy.org/rmse/rmse.htm>) based on the desired power ($\pi = .80$), statistical significance ($\alpha = .05$), degree of freedom in the hypothesized model ($df=30$), and anticipated null and alternative RMSEA values (.05 and .10, respectively).

The fits of the path models were evaluated using normed chi-square index ($\chi^2/df < 3$), comparative fit index ($CFI > .90$), Tucker-Lewis Index ($TLI > .90$), and root-mean-square error of approximation with 90% confidence interval ($RMSEA$ (90% CI) $< .10$) as acceptable fits; $\chi^2/df < 3$, $CFI > .95$, $TLI > .95$, and $RMSEA$ (90% CI) $< .05$ as excellent fits.²⁹ Additionally, Akaike’s Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were used to compare the hypothesized model against the alternative model (not nested), with lower values indicating better-fitting models. To examine the mediating roles of psychological need satisfaction and RAI, a bootstrap procedure with 5,000 resamples and bias-corrected 95%CI was used.³⁰ A significant mediation exists when the bias-corrected 95%CI does not include zero.

Results

The skewness and kurtosis of all study variables except need satisfaction (kurtosis = 2.46) were between -2 and 2 , indicating normal distributions of the data. Further,

²Based on the reviewers’ comments, we conducted path analyses for two additional models, using autonomous motivation and controlled in place of RAI, and three separate psychological need satisfaction variables in place of one. Yet, both models produced a poor fit.

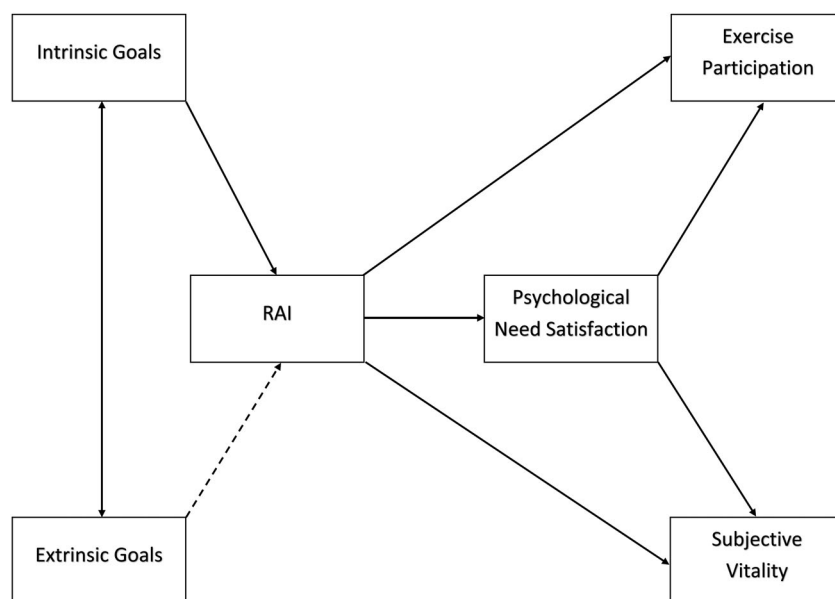


Figure 2. Alternative model showing expected direct and indirect effects of goal contents on relative autonomy index (RAI), psychological need satisfaction, and exercise outcomes. Solid lines represent positive paths; dashed lines represent negative paths.

Table 1. Descriptive statistics, internal reliability, and bivariate correlations among study variables ($N = 181$).

		<i>M</i>	<i>SD</i>	1	2	3	4	5	6
1	Intrinsic goals	4.78	1.16	(.89)					
2	Extrinsic goals	4.76	1.41	.51***	(.90)				
3	Psychological need satisfaction	4.56	0.80	.55***	.29***	(.92)			
4	RAI	4.10	3.69	.19*	-.19*	.36***	—		
5	Exercise participation	46.47	21.02	.29***	.11	.33***	.31***	—	
6	Subjective vitality	4.81	0.95	.40***	.01	.57***	.49***	.38***	(.87)

Note. RAI = relative autonomy index. Cronbach's alphas are in parentheses on the diagonal.

* $p < .05$; ** $p < .01$; *** $p < .001$.

the MULTINOR analysis revealed multivariate normal plotted chi-square values against Mahalanobis distance (D^2) without outliers. Thus, all data were kept for further analyses. Table 1 shows the descriptive statistics and bivariate correlations among the study variables. On average, participants had similar moderate-to-high levels of intrinsic and extrinsic goals, as well as relatively high self-determination and subjective vitality in exercise. Correlation analysis revealed a pattern of significant positive relationships among the study variables except extrinsic goals.

Path analysis indicated that the initial hypothesized model produced a poor fit to the data: $\chi^2/df = 6.21$; CFI = .88; TLI = .74; RMSEA (90% CI) = .17 (.12, .22). The modification index (18.26) suggested adding a direct path from extrinsic goal to RAI, and the nonsignificant path coefficient ($\beta = .02$, $p = .82$) suggested removing the direct path from extrinsic goal to need satisfaction. These corresponding modifications resulted in a model that showed close-to-acceptable fit to the data: $\chi^2/df = 3.20$; CFI = .95; TLI = .89; RMSEA (90% CI) = .11 (.06, .16). The modification index (4.93) further suggested adding a direct path from exercise participation to subjective vitality. The final modified model produced an acceptable fit to the data: $\chi^2/df = 2.75$; CFI = .97; TLI = .91; RMSEA (90% CI) = .10 (.04, .16).

When testing the alternative model, path analysis indicated that this initial model produced a poor fit to the data: $\chi^2/df = 11.20$; CFI = .76; TLI = .49; RMSEA (90% CI) = .24 (.19, .29). The modification indices (26.86, 47.23, and 4.93, respectively) suggested adding direct paths from intrinsic goal to need satisfaction, from extrinsic goal to need satisfaction, and from exercise participation to subjective vitality. These corresponding modifications resulted in a model that demonstrated acceptable fit to the data: $\chi^2/df = 2.95$; CFI = .97; TLI = .90; RMSEA (90% CI) = .10 (.04, .18). Comparing the AIC and BIC values of the models, the hypothesized model had a slightly higher AIC (46.49 vs. 45.81) but a lower BIC (94.47 vs. 100.18) than the alternative model. The hypothesized model was selected as the better-fitting model for final interpretation of the results, because (a) the BIC difference (5.71) was larger than the AIC difference ($0.68 < 2$ indicating nonsignificance³¹) between the hypothesized and alternative models; (b) AIC is more sensitive and less specific (i.e., higher false positive rate) than BIC³²; and (c) AIC reflects the target model only for the sample at hand, whereas BIC assumes the target model as the true model for the population.³¹

The final hypothesized model accounted for 30%, 23%, 15%, and 44% of the variance in psychological need satisfaction, RAI, exercise participation, and subjective vitality, respectively (see Figure 3). All of the paths specified in the

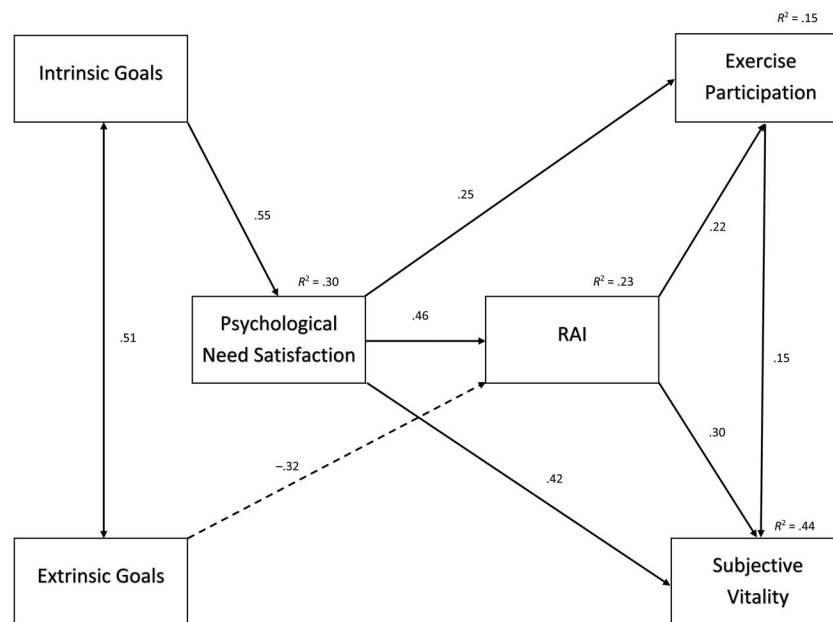


Figure 3. Final model showing direct and indirect effects of goal contents on psychological need satisfaction, relative autonomy index (RAI), and exercise outcomes. Solid lines represent positive paths; dashed lines represent negative paths. All paths shown are significant ($p < .05$).

Table 2. Statistical significance and standardized estimates of specific indirect effects based on the bootstrap procedure ($N = 181$).

Indirect path	Lower 95% CI	Upper 95% CI	β
Extrinsic Goals \rightarrow RAI \rightarrow Exercise Participation	-1.987	-0.445	-.07**
Extrinsic Goals \rightarrow RAI \rightarrow Subjective Vitality	-0.131	-0.045	-.10***
Intrinsic Goals \rightarrow Need Satisfaction \rightarrow RAI	0.558	1.038	.25***
Intrinsic Goals \rightarrow Need Satisfaction \rightarrow Exercise Participation	1.377	3.986	.14**
Intrinsic Goals \rightarrow Need Satisfaction \rightarrow Subjective Vitality	0.159	0.317	.23***
Need Satisfaction \rightarrow RAI \rightarrow Exercise Participation	1.068	4.459	.10*
Need Satisfaction \rightarrow RAI \rightarrow Subjective Vitality	0.117	0.300	.13***
Need Satisfaction \rightarrow Exercise Participation \rightarrow Subjective Vitality	0.016	0.122	.04*
RAI \rightarrow Exercise Participation \rightarrow Subjective Vitality	0.003	0.023	.03*

Note. RAI = relative autonomy index.

* $p < .05$; ** $p < .01$; *** $p < .001$.

model were significant. Specifically, intrinsic goals positively predicted psychological need satisfaction, which in turn positively predicted RAI, exercise participation, and subjective vitality. Though not predicting psychological need satisfaction, extrinsic goals negatively predicted RAI, which in turn positively predicted exercise participation and subjective vitality. The bias-corrected CIs from the bootstrap procedure revealed that both psychological need satisfaction and RAI significantly mediated the effect of intrinsic goals on exercise participation and subjective vitality, while RAI also significantly mediated the effect of extrinsic goals on exercise participation and subjective vitality (see Table 2). Exercise participation further mediated the effect of psychological need satisfaction and RAI on subjective vitality. Yet, no significant direct effects of extrinsic goals on psychological need satisfaction exist.

Discussion

The present study aimed to combine three SDT mini-theories—GCT, OIT, and BPNT^{10,11}—to examine the direct and indirect effects of intrinsic and extrinsic goals on exercise participation and subjective vitality in college freshmen. The

findings partially support the hypothesized relationships based on these SDT mini-theories. In addition, the alternative model is also partially supported, although the hypothesized model resulted in a better model fit.

In support of the hypothesis and Sebire and colleagues⁸ findings, intrinsic goals positively predicted psychological need satisfaction, which in turn positively predicted RAI, exercise participation, and subjective vitality. The significant mediating role of psychological need satisfaction between intrinsic goals and RAI as well as exercise outcomes, and that of RAI between psychological need satisfaction and exercise outcomes, are in accord with BPNT and OIT, respectively. However, this result is conflicting with Gunnell and colleagues' finding that autonomous motivation was an antecedent of psychological need satisfaction.¹⁹ One plausible explanation is that Gunnell and colleagues used a longitudinal design to study relationships among the changes in their motivational variables. Within six months, their participants' need satisfaction and motivation in physical activity might have changed in different degrees for different reasons (i.e., confounding variables such as season and weather). Additionally, Gunnell and colleagues used relative intrinsic goals instead of separate intrinsic and extrinsic goals in their

analyses. Since the mean score of relative intrinsic goals in their sample was close to zero, many of their participants might have similar levels of intrinsic and extrinsic goals. Their approach reduced the possibility of significantly predicting psychological need satisfaction, which is in theory less related to extrinsic than intrinsic goals.¹⁰

Psychological need satisfaction may serve as an antecedent of motivational regulations for three more reasons: (a) the variance of psychological need satisfaction explained by intrinsic goals ($R^2 = .30$) in this study is much larger than that of autonomous motivation explained by relative intrinsic goals ($R^2 = .04$) in Gunnell and colleagues'; (b) OIT posits that "supports for the basic needs for competence, relatedness, and autonomy facilitate the internalization and integration of non-intrinsically motivated behaviors"^{10(p203)}; and (c) GCT postulates that "intrinsic goals are directly satisfying of basic needs for autonomy competence, and relatedness"^{10(p279)}. Our study was cross-sectional so further longitudinal investigation of these variables in various contexts and samples is needed, especially since a recent longitudinal study showed that goal aspirations predicted changes in need satisfaction and motivation over time, and that the relationship between need satisfaction and motivation was reciprocal and dynamic.³³

Contrary to the hypothesis, extrinsic goals did not predict psychological need satisfaction. Based on the bivariate correlation, extrinsic goals were even positively correlated with psychological need satisfaction ($r = .29$) and intrinsic goals ($r = .51$). Previous research has indicated similar strong positive association between intrinsic and extrinsic goals,^{15,17} and that exercisers who predominantly pursued either intrinsic or extrinsic goals reported social comparison in their goal content.³⁴ This social comparison, especially if in a downward direction, could potentially satisfy relatedness and competence through social affiliation (intrinsic) and social recognition (extrinsic) that are strongly and positively linked.⁶ This mechanism may be particularly prominent for college freshmen who seek friendship and social approval in their transition to a new environment.³⁵ Therefore, rather than eliminating extrinsic goals completely, university recreation and wellness staff may work with college freshmen to find ways to satisfy their psychological needs, and in turn, internalize the reasons ("want to" rather than "have to") for exercising. For instance, instead of worrying about gaining acceptance from friends for their physique (competence/relatedness frustration), college freshmen can be taught to seek acceptance from themselves and trusted friends for their time and effort in regular exercise participation (competence/relatedness satisfaction).³⁴ More research on the process and nature of developing intrinsic and extrinsic goals that could or could not be internalized, especially using qualitative design, is needed in order to understand how and why the same goal content may have different effects on psychological need satisfaction.

Though not predicting psychological need satisfaction, extrinsic goals directly and negatively predicted RAI, which in turn positively predicted exercise participation and subjective vitality. This finding supports previous empirical

evidence that extrinsic goals negatively predicted adaptive physical and psychological outcomes through RAI or autonomous motivation.^{14,15,17} Some extrinsic goals, such as to have a better body shape, probably do not have any bearing on autonomy, competence, and relatedness for their effect on exercise motivation. As this study was the first to examine the mediating roles of both psychological need satisfaction and RAI, future studies should investigate if these findings could be replicated. Furthermore, psychological need frustration, the opposite of psychological need satisfaction, has not been assessed in any exercise goal content studies. Basic psychological needs, thus, potentially still play a role in the effects of extrinsic goals through the negative pathways (the "dark side") of the motivational processes.³⁶

As expected and proposed by GCT, goal content did not predict exercise participation and subjective vitality directly,³ but rather, through significant mediations of psychological need satisfaction and RAI in the present study. It is worthy of note that few studies did find significant direct effects of goal content on exercise participation and psychological outcomes.^{8,17} However, these studies included only psychological need satisfaction or motivational regulations as a mediator. If they included both variables as mediators, the direct effects would potentially be masked. Another benefit of including both psychological needs and motivational regulations is manifested in the relatively large variance explained in this study. Exercise participation and well-being (i.e., subjective vitality) were accounted for, respectively, 15% and 44% in this study, compared to about 10% and 30% in previous studies.^{8,9,15}

Overall, the current study illustrates the efficacy of intrinsic goals in influencing college freshmen's exercise motivational processes. By fostering internalized goals and satisfying psychological needs in college freshmen through exercise programming and education, it appears that a successful campaign to increase college students' physical activity is feasible. Universities should consider training the recreation and wellness staff to provide support for students through SDT-based workshops or support groups. A group-constructed social setting can further foster social goals that satisfy students' psychological needs.³⁷

Limitations and future directions

Although this study offers important insights into both theoretical and practical implications of goal content, several limitations should be addressed. First, the construct validity of some measures was somewhat limited. Physical activity was measured using self-report, which was subject to social desirability as some participants might report greater exercise participation than they actually had. Future research should use accelerometers or pedometers to assess participants' objective exercise participation. Moreover, different

³Although the modification index did not suggest direct paths from intrinsic goals and extrinsic goals to exercise participation, we tested an additional modified hypothesized model with these direct paths that were shown to be nonsignificant ($p > .05$) and contributed to a worse fit to the data: $\chi^2/df = 3.18$; CFI = .97; TLI = .89; RMSEA (90% CI) = .11 (.04, .18).

versions of and scoring protocols for BREQ result in different findings and interpretations, and thus the use of BREQ and RAI in this study has its own limitations of not identifying the multidimensional nature of motivational regulations for interpretation. Future investigation may therefore consider using multiple scoring protocols to compare corresponding results or implement a person-centered approach to analyze and reflect this multidimensionality.^{38,39} Second, this study used a cross-sectional design, which could not demonstrate any causal effects of goal content. Further experimental and longitudinal studies are needed to understand the impact of setting intrinsic and extrinsic exercise goals. Additionally, qualitative studies will help further our understanding of how intrinsic and extrinsic goals are manifested in different individuals as well as their perceived impacts. Third, our data were collected at only one large-sized public university in the southwestern U.S., so the findings might not be generalizable to universities in other geographical areas. A larger and diverse sample is necessary for examining the replicability of the findings in this study, as well as any differences across sex and other demographic variables. Finally, other important components of SDT including psychological need frustration and social environments (e.g., autonomy support) should be tested in future research in order for us to understand their relationships with exercise goal content.

Conclusions

The present study is one of the first to date that focuses on college freshmen's motivational processes and incorporates three SDT mini-theories—GCT, OIT, and BPNT—in examining exercise goal content. This study also extends the current literature by examining the mediating roles of both psychological need satisfaction and motivational regulations as well as differential effects of intrinsic versus extrinsic goals. Consistent with the SDT mini-theories and previous research evidence, psychological need satisfaction mediated the positive relationships between intrinsic goals and, RAI, exercise participation, and subjective vitality; RAI mediated the negative relationships between extrinsic goals and, exercise participation and subjective vitality. These findings indicate that emphasizing social affiliation, health management, and skill development as exercise goals is conducive to exercise participation and well-being, whereas focusing on appearance and social recognition could be detrimental to these motivational processes in college freshmen. Therefore, university recreation and wellness staff should offer motivational interventions and supportive environments for college freshmen to internalize their exercise goals and, in turn, live a healthy lifestyle with regular exercise participation.

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Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States and received approval from the IRB of the university.

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