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The path from intrinsic aspirations to subjective well-being is mediated by changes in basic psychological need satisfaction and autonomous motivation: A large prospective test

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Abstract

The present study aimed to test the goal contents theory (Ryan and Deci, Self-determination theory: Basic psychological needs in motivation, development, and wellness, Guildford, New York, 2017a) proposal that prioritizing intrinsic aspirations over extrinsic aspirations leads to enhanced well-being through greater satisfaction of basic psychological needs and more autonomous self-regulation. By pooling four prospective studies with an identical five-wave design, we evaluated the impact of aspirations on changes in need satisfaction, goal motivation, and well-being over a school year in a sample of over 1400 university students. Cross-lagged, structural equation modelling (SEM) analyses revealed that relative intrinsic aspirations at baseline predicted experiencing greater need satisfaction, increased autonomous goal motivation, and improved well-being over time. The discussion highlights the value of exploring dynamic relations among the central constructs in self-determination theory.

Keywords Self-determination theory · Autonomous motivation · Intrinsic aspirations · Values · Basic psychological need satisfaction

Self-determination theory (SDT) has proposed that "not all goals are created equal" (Ryan et al. 1996) and that certain types of strivings as well as certain goal motivations are more adaptive than others. Specifically, intrinsic aspirations (relative to extrinsic aspirations) and autonomous motivation (relative to controlled) for goals seem to benefit well-being. Over two decades of research has supported this proposition, delineating independent effects on well-being for both the *what* and the *why* of goal pursuit (Ryan and Deci 2017a). In the present paper, we extend this research by prospectively examining the mediational role of goal motivation and basic psychological need satisfaction in the link between intrinsic versus extrinsic aspirations and subjective well-being.

We pooled four prospective studies examining students' life aspirations, personal goals, need satisfaction, and well-being over the academic year, offering a unique opportunity to examine the relationship between these variables in over 1400 individuals and across 5 distinct time points. The use of a multi-wave design also allowed us to test the dynamic relations among the central variables in self-determination theory's goal contents theory: intrinsic versus extrinsic aspirations, autonomous versus controlled goal motivation, basic need satisfaction, and well-being.

Ryan and Deci's SDT (2000, 2017a, b) is a macro theory of personality and motivation, which proposes that three basic psychological needs are fundamental to understanding human thriving. The three psychological needs identified in SDT are autonomy—feeling that one is *self*-regulating one's experience and actions, competence—feeling effective in one's actions, and relatedness—feeling socially connected (Ryan and Deci 2017a). The needs are thought to be innate and universal. Environments or social pressures which thwart satisfaction of the three innate psychological needs are considered detrimental to well-being.

SDT also highlights an important distinction in how individuals regulate goal-related behavior. The theory suggests

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that motivation for any behavior varies in the degree to which it is experienced as autonomous or controlled in nature (Ryan and Deci 2017b). The validity of the relative autonomy continuum has been empirically confirmed in multinational samples (Sheldon et al. 2017). Individuals are considered autonomously motivated to the extent that they experience goals and decisions to be self-generated and freely chosen, rather than controlled by external or internal pressures. Social contexts that support autonomy, competence and relatedness are thought to foster the development of volition by allowing intrinsic motivation to thrive and/or by facilitating the integration of previously external motives into the developing self (Ryan and Deci 2000).

SDT's focus on basic psychological needs and the quality of motivation have informed our understanding of the role of personal values over the life course. Values are considered to be relatively stable beliefs that specify a desired end-goal (Rokeach 1973). A person's values have also been said to be "guiding principles in life", influencing a person's judgment and behavior across situations (Schwartz and Bardi 2001, p. 269). SDT researchers Kasser and Ryan have contrasted two different types of life aspirations, based on how inherently satisfying of basic psychological needs the aspirations are expected to be (1993, 1996). Intrinsic aspirations are considered to be need satisfying in-and-of themselves, and include community contribution, building close relationships, and personal growth. In contrast, extrinsic aspirations are not directly satisfying of basic psychological needs (instead viewed as a means to an end, or need substitutes), and include striving for wealth, popularity/fame, and appearing physical attractive to others. In contrast to Rokeach's "value-free" approach of the study of life values (1973), Kasser and Ryan proposed (1993, 1996) that pursuing some values may be more conducive to living a thriving and satisfying life compared to others. Specifically, Kasser and Ryan hypothesized that prioritizing intrinsic life aspirations over extrinsic aspirations would be associated with increased well-being and decreased symptoms of ill-being or mental illness.

Research has supported Kasser and Ryan's hypothesis. Prioritizing intrinsic aspirations over extrinsic aspirations has been associated with lower symptoms of depression and anxiety, fewer physical symptoms, increased self-actualization and vitality (Kasser and Ryan 1993, 1996). Moreover, the relationship between intrinsic aspirations relative to extrinsic aspirations and higher well-being has been replicated in diverse cultures, including in both Russia and the U.S. (Ryan et al. 1999), Germany (Schmuck et al. 2000), Hungary (Martos and Kopp 2012), China (Lekes et al. 2010), Singapore (Kasser and Ahuvia 2002), and South Korea (Kim et al. 2003). Similar trends connecting intrinsic aspirations to greater well-being emerge from recent longitudinal investigations. For example, across three longitudinal studies (with the longest spanning 12 years), Kasser et al. (2014) found that as individuals became less intrinsic and more materialistic in their aspirations over time, their well-being tended to decrease.

SDT's goal contents theory (Kasser and Ryan 1993; Ryan and Deci 2017a) proposes that intrinsic aspirations lead to subjective well-being by directly enhancing need satisfaction, but it also posits a second indirect path via autonomous self-regulation. Specifically, the effect of intrinsic rather than extrinsic aspirations on well-being may be "a function of the regulatory basis of goal pursuits, as extrinsic goals will, on average, tend to be less autonomously regulated than intrinsic goals" (p. 275, Ryan and Deci 2017a). Research has supported this assertion, as personal goals connected to more intrinsic aspirations have tended to be pursued for more autonomous reasons compared to personal goals connected to extrinsic aspirations (Sheldon and Kasser 1995; Sheldon et al. 2004).

Niemiec et al. (2009) examined the impact of college graduates intrinsic relative to extrinsic aspirations on actual attainment of aspirations, psychological need satisfaction, and psychological health 1-year later. Graduates who placed greater importance on intrinsic relative to extrinsic aspirations at baseline were more likely to attain related goals and reported greater psychological health 1-year later as a consequence of this goal attainment. In contrast, graduates' attainment of extrinsic aspirations negatively predicted psychological health. While Niemiec et al. (2009) investigated and found support for psychological need satisfaction as a mediator of the association between aspirations and psychological health, they did not consider graduates' motivation for their goals.

The independent effects of the "what" (aspirational content) and the "why" (motivation) of goals on subjective well-being were explored in three studies by Sheldon et al. (2004). In the first study, using a within person cross-sectional design, participants were asked to imagine pursuing different goals and rated how (a) autonomous and (b) happy they would feel pursuing each of three goals connected to intrinsic aspirations and three goals connected to extrinsic aspirations. As expected, participants imagined themselves as more autonomous and happier pursuing the more intrinsic aspirations. In study 2, a cross-sectional study on student's personal goals, students rated the relative intrinsic to extrinsic aspirational content of goals they were pursuing. Relative extrinsic (to intrinsic) aspirational content of goals was significantly negatively correlated to relative autonomous (to controlled) motivation for goals. Hierarchical regression analyses revealed independent main effects of both aspirational content and relative autonomy on well-being, putting to rest criticism that the effect of intrinsic/extrinsic aspirations on well-being is driven by motives alone (e.g., Carver and Baird 1998; Srivastava et al. 2001). In study 3,
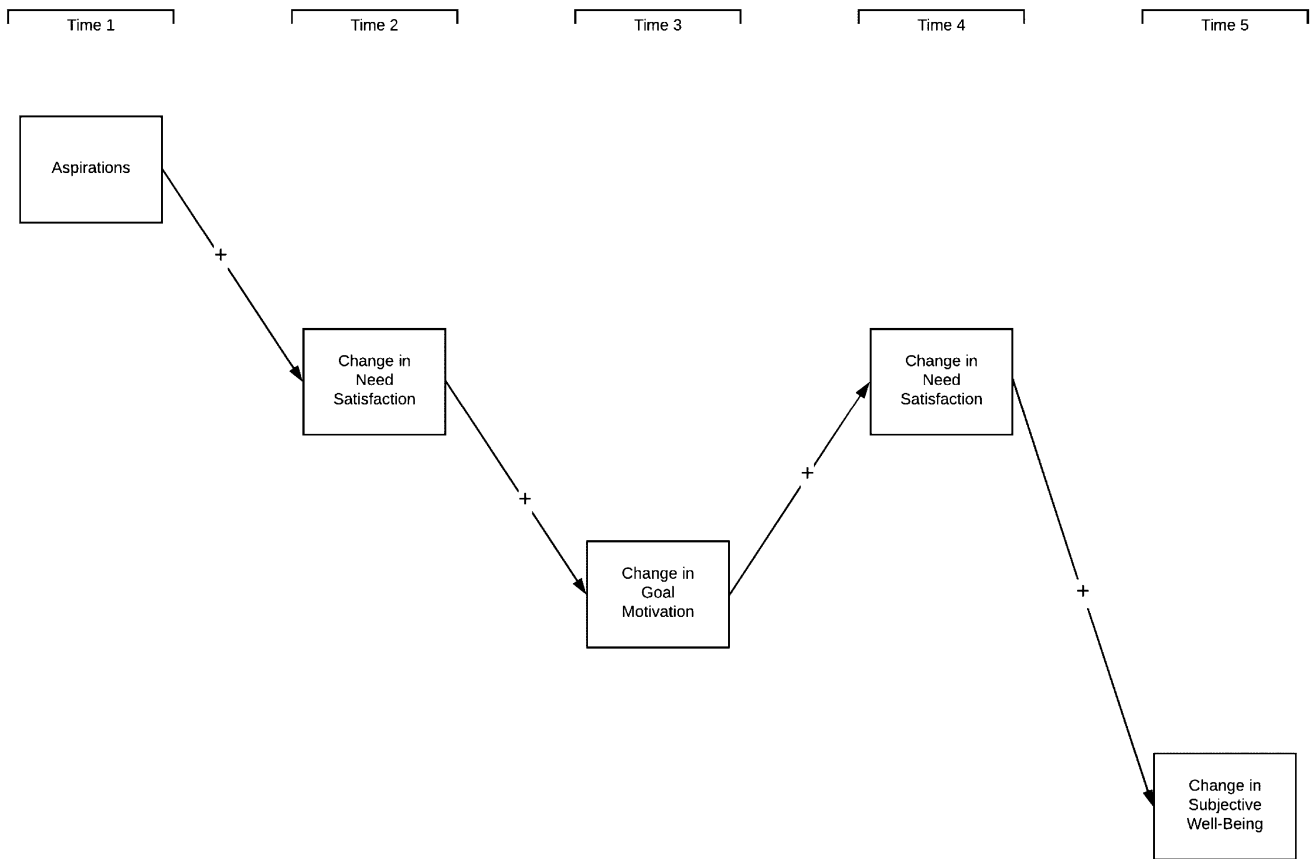
Fig. 1 Theoretical model illustrating predicted relationships between relative intrinsic aspirations, and changes in need satisfaction and goal motivation over time. Students prioritization of intrinsic aspirations at the start of the year expected to lead to increased need satis- faction (T2), leading to more autonomous relative to controlled goal motivation (T3). In turn, students' goal motivation is expected to lead to increased subjective well-being (SWB) at the end of the academic year (T5) through increased need satisfaction (T4)

a longitudinal study of university students' goal pursuit and well-being post-graduation, it was found that both relative autonomy and relative aspirational content made significant and independent contributions to changes in well-being over a year.

Present study

We pooled the data from four multi-wave, year-long, prospective longitudinal design studies to examine the relations among life aspirations, need satisfaction, goal motivation, and subjective well-being among a total of over 1400 University participants. All participants were surveyed about their life aspirations and goals near the start of the school year (T1) and then were followed up at in the middle of the fall semester (T2), at the end of the fall semester (T3), in the middle of the winter semester (T4), and at the end of the school year (T5). Subjective well-being (in the form of positive and negative affect and life satisfaction) and need satisfaction were also assessed.

Regarding temporal design of the study, after the baseline assessment, we planned to assess need satisfaction, goal motivation, and well-being sequentially at different follow- ups in order to assess for mediation over time. Research- ers have stressed the importance of establishing temporal precedence when evaluating for potential mediation (e.g., Kraemer et al. 2008), as well as multiple assessments of mediators and outcome variables in order to control for autoregressive (i.e., baseline) effects (Mitchell and Max- well 2013). To supplement the written hypotheses below, we have provided a conceptual model summarizing our predictions (see Fig. 1).

We hypothesized a sequence of four prospective relationships:

1. Relatively intrinsic aspirations at baseline (T1) would be associated with increased need satisfaction from base- line to mid-semester (T2).
2. Higher need satisfaction at mid-semester (T2) would be associated with increased relative autonomous goal motivation from baseline to the end of the semester (T3).

3. Higher relative autonomous goal motivation at the end of the first semester (T3) would be associated with increased need satisfaction in the middle of the second semester (T4) (controlling for baseline).

4. Higher need satisfaction in the middle of the second semester (T4) would be associated with greater subjective well-being at the end of the school year (controlling for baseline).

Finally, we planned to use cross-lagged, structural equations modeling to confirm the usefulness of our entire model conceptual model derived from goal contents theory.

Methods

Overview

The data for this study were drawn from four separate prospective year-long studies conducted in between 2013 and 2017. The studies had the same time-line for follow-ups and included the same core measures relevant to goal contents theory. Data from these individual studies have been used in the following articles but no previous study has explored the current set of hypotheses: Hope et al. 2016b; Holding et al. 2017; Moore et al. 2018.

Participants, procedure, and longitudinal design

Participants were 1468 undergraduate students (78% female) at a Canadian university whose ages ranged from 17 to 54 years, with a mean age of 20.44 years. Participants were recruited to participate in a year-long study on personal goals. Once they had received the survey link, participants had 1 week to complete the survey online. During their initial survey at the beginning of the academic year, participants identified three personal goals and completed measures of aspirations, goal motivation, need satisfaction, and subjective well-being. Over the course of the school year, participants completed follow-up surveys assessing goal motivation, need satisfaction and subjective well-being. Aspirations were re-assessed at the final follow-up survey (T5). A total of five follow up surveys were completed, but we focus on the ones completed at 1 month (T2), 3 months (T3), 5 months (T4) and 8 months (T5). We did not consider the 4 month follow-up because it was intended to capture participants' experience during the winter holiday period. The completion rate for each of the surveys was: 1 month = 96%; 3 months = 91%; 5 months = 92%; and 8 months = 92%. The study was approved by the university's Research and Ethics Board. Participants were compensated $50 at the end of the academic year for completing the study.

One hundred and seventy participants (12%) failed to complete at least one of the follow-ups. Statistical tests were performed to compare the 1298 participants who completed every follow-up survey with the 170 participants who failed to complete at least one. The only variable on which the participants differed significantly was on aspirations with those who missed a follow up scoring lower on relative intrinsic aspirations ($M = 1.98$) than those who completed all surveys ($M = 2.04$), $t = 1.99$, $p < .05$.

Measures

Aspiration index (AI)

In order to measure prioritization of intrinsic relative to extrinsic aspirations, an adapted 12-item version of the Aspiration Index (AI; Kasser and Ryan 1996) was administered. Participants rated the personal importance of aspirations for community contribution, personal growth, building close relationships, fame/popularity, wealth, and physical beauty on a 7-point scale, from not at all important to very important. For example, two items for intrinsic aspirations were "to work for the betterment of society" and "to have committed, intimate relationships," while two items for extrinsic aspirations were "to have your name appear frequently in the media" and "to be financially successful." As suggested by Kasser and Ryan (1993, 1996), we calculated an index of relative prioritization of intrinsic aspirations for each participant by subtracting the mean score on items related to extrinsic aspirations from the mean score on items related to intrinsic aspirations. We refer to this variable as relative intrinsic aspirations. Participants' aspirations were assessed at baseline (T1). Cronbach's alpha for extrinsic aspirations = 0.91; for intrinsic aspirations 0.85; and for relative intrinsic aspirations = 0.87.

Personal goals

At baseline participants were asked to identify three personal in an open-ended format. Goals were defined for participants as "projects that people think about, carry out, and sometimes (though not always) complete or succeed at", and participants were asked to list three time-framed goals of their own that they intended to pursue during the semester. Goals written by participants included: "Achieve a GPA of 3.7 or higher", "Find some life-long friends in university", and "Start a game for varsity rugby."

Goal motivation

Participants were asked to rate their motivation for pursuing each goal using five items that assessed external, introjected, identified, integrated, and intrinsic reasons for goal

pursuit (Sheldon and Kasser 2016). The items are: "Because somebody else wants you to, or because you'll get something from somebody if you do" for external regulation; "Because you would feel ashamed, guilty, or anxious if you didn't—you feel that you ought to strive for this" for introjected motivation; "Because you really believe that it is an important goal to have—you endorse it freely and value it wholeheartedly" for integrated motivation; and "Because of the fun and enjoyment which the goal will provide you— the primary reason is simply your interest in the experience itself" for intrinsic motivation. All responses were made on a 7-point scale of 1 (*not at all for this reason*) to 7 (*completely for this reason*).

As in previous research, autonomous motivation was calculated as the mean of intrinsic, integrated, and, identified ratings, whereas controlled motivation was calculated as the mean of external and introjected regulation (Koestner et al. 2008). As is often done in the SDT literature, an index of autonomous versus controlled goal motivation was created by subtracting the mean of the controlled items from that of the autonomous items (Ryan and Deci 2017b; Sheldon 2014; Sheldon et al. 2017). We refer to this variable as goal motivation. Goal motivation was assessed at baseline (T1), and 3 months (T3). The motivation scales were reliable: Cronbach's alpha for autonomous motivation was 0.71 (T1) and 0.82 (T3); for controlled motivation 0.79 (T1) and 0.81 (T3); for index of goal motivation 0.74 (T1) and 0.76 (T3). We choose to assess goal motivation again at T3, corresponding to the end of the academic semester, in order to allow for sufficient time to pass for students' motivation for their goals to change, and to detect such change.

Psychological need satisfaction

The satisfaction and frustration of the needs for autonomy, competence and relatedness were assessed using the balanced measure of psychological needs (BPMN; Sheldon and Hilpert 2012). The scale includes 18 items, 6 items per need with half reflecting need satisfaction and need frustration. The scale was adapted to inquire about experiences over the past 2 weeks. Items were rated on a 1 (*not at all true*) to 7 (*very true*) scale. An example of autonomy satisfaction is "I was free to do things my own way." An example of autonomy frustration is "I had a lot of pressure I could do without." Need-thwarting items were reverse scored and we calculated a mean across the 18 items to capture the participants' recent level of need satisfaction. This approach of combining scores on each of the needs to compute mean BPNS has been used in previous research (e.g., Milyavskaya et al. 2013; Tsang et al. 2014) and is appropriate given the high alpha reliability for the total scale. Need satisfaction was assessed at baseline (T1), T2, and T4. Cronbach's alpha

across the items ranged from 0.82 to 0.87 for timepoints T1, T2, and T4.

Subjective well being

Subjective well-being was assessed using a composite measure of mood and of life satisfaction (Diener 1984). We employed the mood report (Diener and Emmons 1984) to assess the emotional component of subjective well-being. For each item, participants rated the extent to which they experienced a specific emotion on a 7-point Likert scale ranging from not at all to extremely. The scale consists of nine items, four describing positive affect (e.g., joyful, happy) and five describing negative affect (e.g., anxious, worried). The five-item satisfaction with life scale (SWLS; Diener et al. 1985) was employed to assess the cognitive component of subjective well-being. Participants rated the extent to which they agreed with statements regarding how satisfied they felt about the current conditions in their life on a 7-point Likert scale ranging from not at all true to very true. A composite index of subjective well-being was calculated with the mean standardized scores of positive affect, reversed negative affect, and satisfaction with life (Diener 1984). This method of assessing SWB has been used in over 100 published articles (e.g., Diener et al. 2002). For the purpose of testing our hypotheses in the present study, SWB was computed at baseline (T1) and at 8 months (T5). Cronbach's alpha for positive affect was 0.84 (T1) and 0.90 (T5); for negative affect 0.87 (T1) and 0.85 (T5); for life satisfaction 0.88 (T1) and 0.91(T5); and for the composite index of SWB 0.88 (T1) and 0.90 (T5).

Results

Preliminary analyses

The means, standard deviations and correlations for all variables are reported in Table 1. It can be seen that participants generally tended to have more intrinsic rather than extrinsic aspirations and autonomous rather than controlled motivation for their personal goals. High positive correlations were obtained between measures of need satisfaction and subjective well-being. Significant positive associations were also obtained between both relative intrinsic aspirations and relative autonomous goal motivation with need satisfaction and subjective well-being.

Previous cross-sectional studies reported significant positive correlations between relatively intrinsic (vs. extrinsic) aspirations and autonomous (vs. controlled) goal motivation (e.g., Sheldon et al. 2004). We replicated this finding, obtaining a correlation of $r = .20$, $p < .001$ between relative intrinsic aspirations and relative autonomous goal

Table 1 Correlations, means, and standard deviations for all key variables

	1	2	3	4	5	6	7	M	SD
1. Aspirations T1								2.10	1.32
2. Goal motivation T1	0.20***							2.16	1.49
3. Need satisfaction T1	0.17***	0.31***						4.46	0.80
4. Subjective well-being T1	0.15***	0.26***	0.61***					−0.02	0.91
5. Need satisfaction T2	0.19***	0.28***	0.60***	0.47**				4.37	0.83
6. Goal motivation T3	0.21***	0.66***	0.35***	0.27**	0.36**			1.74	1.57
7. Need satisfaction T4	0.19***	0.28***	0.49***	0.41**	0.50**	0.33**		4.71	0.82
8. Subjective well-being T5	0.16***	0.24***	0.40***	0.53**	0.41**	0.29**	0.43**	0.00	0.89

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

motivation at baseline (n = 1468). To examine the dynamic, over time associations between aspirations and goal motivation we conducted partial correlation analyses of relative intrinsic aspirations at baseline with goal motivation at 3 months and 8 months, controlling for baseline goal motivation. The results yielded significant correlations at T3, $r = .11$, $p < .001$ and T5, $r = .14$, $p < .001$. Thus, participants with relatively more intrinsic aspirations actually became more autonomous in their regulation of personal goals as the school year unfolded.

Cross-lagged structural equation modeling

Prior to analyses, all variables included in the subsequent path analyses were examined for accuracy of data entry, missing data, and fit between their distributions and the assumptions underlying maximum likelihood procedures (Tabachnick and Fidell 2007). All structural equation modeling analyses in the present study were performed on a raw data file using robust maximum likelihood estimation (MLR) procedures with MPLUS 7.3 (Muthén and Muthén 2012) because this method is able to handle potential deviations in normality. Indirect effects were tested using the bias-corrected bootstrap method (5000 samples with 95% bias-corrected confidence intervals (CIs)) using the maximum likelihood procedure (ML) because bootstrapping is unavailable using MLR estimation. Moreover, the missing values (12%) appeared to be missing at random (Little's MCAR $\chi^2(df = 75) = 90.77$, $p = .104$). Thus, to maximize statistical power and minimize the loss of information, missing data were imputed with the full information maximum likelihood (FIML) estimation method (Graham 2003). FIML is considered to be the most effective method to estimate models with missing data (Allison 2003; Enders 2010). Finally, the following fit indices were given priority in model evaluation: the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR). According to Kline (2011), as well as Tabachnik and Fidell (2007), the CFI should be 0.95

or higher. RMSEA values lower than 0.05 represent excellent fit, while RMSEA values between 0.05 and 0.08 represent good model fit.

With regards to our main hypotheses, results of the SEM (Fig. 2) revealed that aspirations were positively associated with T2 need satisfaction ($\beta = 0.09$, $p < .001$), while controlling for baseline measures of need satisfaction ($\beta = 0.59$, $p < .001$). Subsequently, T2 need satisfaction was positively associated with T3 goal motivation ($\beta = 0.20$, $p < .001$), while controlling for baseline measures of motivation ($\beta = 0.62$, $p < .001$). In turn, T3 goal motivation was positively associated with T4 need satisfaction ($\beta = 0.13$, $p < .001$), after controlling for T2 need satisfaction ($\beta = 0.33$, $p < .001$). Finally, T4 need satisfaction was positively associated with T5 subjective well-being ($\beta = 0.26$, $p < .001$), after controlling for the baseline assessment of subjective well-being ($\beta = 0.43$, $p < .001$). Overall, the proposed model had a good fit to the data: MLR $\chi^2(df = 13) = 112.84$, $p < .001$, CFI = 0.96, RMSEA = 0.07 (0.06, 0.08), SRMR = .04.

Results of indirect effects provided support for the proposed mediation sequence on the role of aspirations on changes in subjective well-being controlling for baseline measures of subjective well-being, need satisfaction, and goal motivation ($\beta = 0.008$; 95% CI 0.003–0.012, $p < .001$).

Overall, these results highlight the dynamic associations between aspirations and subjective well-being over time, through changes in goal motivation and need satisfaction.

Discussion

Goal contents theory (Ryan and Deci 2017a) proposes that intrinsic aspirations lead to increased well-being through two pathways: (1) directly satisfying psychological needs, and (2) enhancing autonomous self-regulation. 25 years of research on goal contents theory has confirmed positive associations between aspirations and well-being indicators. The associations appear to be robust and cross-culturally replicable (e.g., Kasser and Ryan 1993, 1996; Ryan et al.
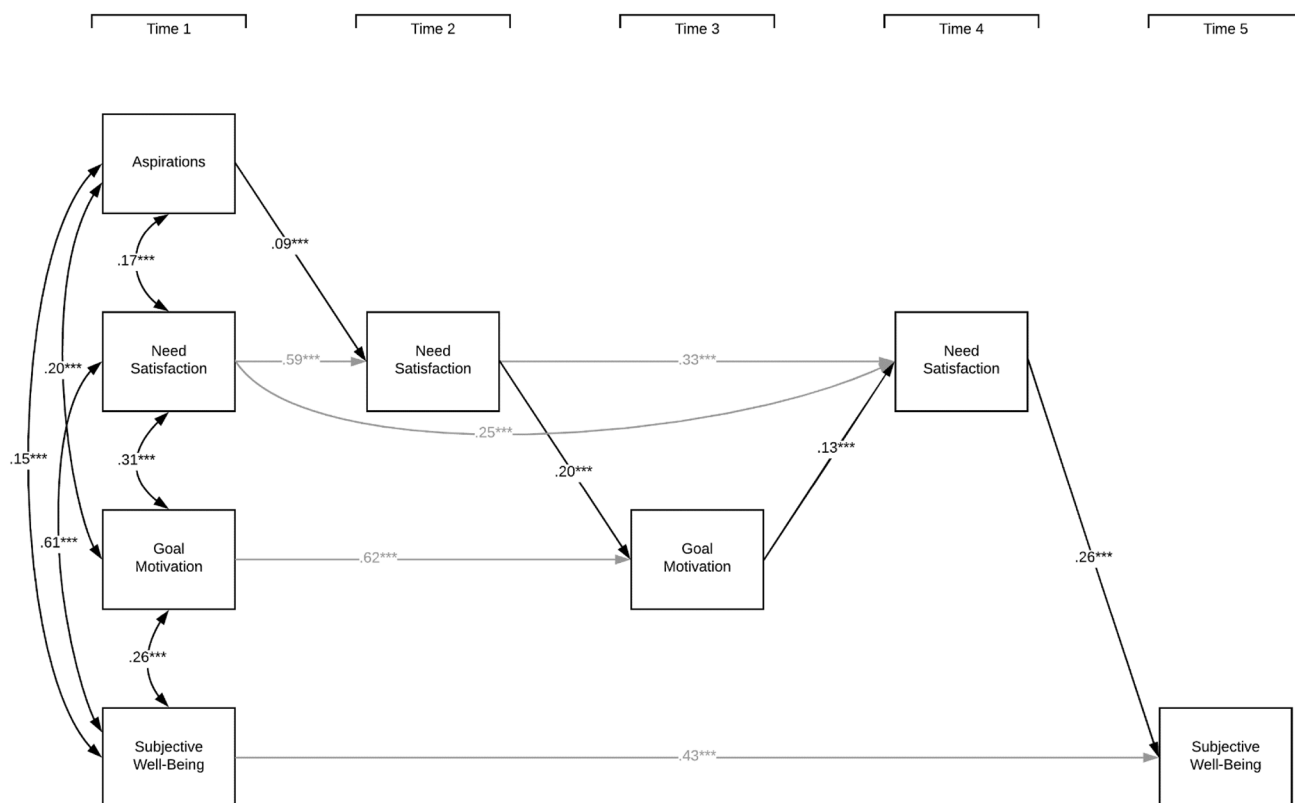
Fig. 2 Structural Equation Modeling (SEM) of impact of relative intrinsic aspirations at baseline (T1) on subsequent changes in SWB over the academic year (T5) through changes in need satisfaction and autonomous goal motivation. *$p < .05$; **$p < .01$; ***$p < .001$

1999; Kim et al. 2003). However, the vast majority of studies testing goal contents theory have been conducted using cross-sectional research designs, thus obscuring the temporal relationships between intrinsic aspirations, autonomous motivation, need satisfaction, and subjective well-being. The few prospective, longitudinal studies that have been completed support the basic hypothesis that prioritizing intrinsic aspirations leads to increased subjective well-being (e.g., Kasser et al. 2014) but these studies have never included all four central constructs or more than two time points.

The present five-wave prospective study across the school year thus offered a unique opportunity to examine whether aspirations, motivation, need satisfaction and well-being are temporally related to one another over time the way GCT suggests. Indeed, we considered it important to test whether changes in subjective well-being that appear to be tied to intrinsic versus extrinsic aspirations are actually mediated prospectively by changes in goal motivations and need satisfaction. Supporting Kasser and Ryan's (1993, 1996) goal contents theory assertion that some values may be more helpful than others, we found that students' prioritization of intrinsic values at the start of the academic year predicted higher subjective well-being, feeling more free in one's goal pursuit, and experiencing greater psychological need

satisfaction over time. The findings of the present multi-wave, large-scale longitudinal study have implications for theory and future research. Not only do individuals that tend to prioritize more intrinsic values tend to pursue goals they feel more autonomous and less controlled towards, but they actually become *more* autonomous towards their goals over time.

Values can be thought of as guiding principles (Schwartz and Bardi 2001) and may influence the types of goals that a person chooses to pursue, and the types of daily experiences a person has. GCT has posited that certain types of values, namely, intrinsic aspirations, are more conducive to pursing autonomous goals and satisfying psychological needs. We found support for intrinsic aspirations contributing to autonomous self-regulation and greater need satisfaction. In this study we found both a correlation between aspirations and goals, and that relative intrinsic aspirations predicted changes in motivation towards ones goals over time. That is, individuals prioritizing intrinsic aspirations pursued more autonomous goals at baseline, and became less controlled towards their goals over time. Internalization of goals, becoming more autonomous towards goals that are initially less volitional (e.g., internalizing a goal that is not intrinsically enjoyable or interesting, such as keeping

up with dental hygiene), is an important topic in SDT. Our results suggest that prioritizing intrinsic aspirations may be one path towards more autonomous internalization of goals.

These differences in adaptive outcomes between students who were higher in relative intrinsic aspirations at the start of the academic year, and those who were lower, are congruent with previous research findings. Other studies have connected prioritizing intrinsic aspirations over extrinsic to more satisfying close relationships and less engagement in experientially avoidant activities. For example, Kasser and Ryan (2001) found relative intrinsic aspirations was positively related to well-being and negatively related to television use, alcohol consumption, and drug use. Prioritizing intrinsic aspirations has also been connected to more empathy for others (Sheldon and Kasser 1995), less interpersonal distress (Auerbach et al. 2011) and greater relationship satisfaction (Law 2012). As these studies were cross-sectional, directionality in the relationship between aspirations and these outcomes could not be determined. It may be that when people are more satisfied in their relationships, more empathetic towards others, and less engaged in television and alcohol use, they choose to prioritize intrinsic over extrinsic aspirations. Therefore, the present study extends past research by connecting prioritization of intrinsic aspirations to later changes in motivation, need satisfaction, and well-being. Not only do happier, more autonomous, and more need satisfied individuals tend to prioritize intrinsic over extrinsic aspirations, but prioritizing intrinsic aspirations seems to bring about *more* autonomous motivation, greater need satisfaction, and greater well-being over time.

Using cross-lagged SEM analyses, we found evidence that need satisfaction and goal motivation accounted for the prospective relationship between baseline relative intrinsic aspirations and later subjective well-being. Changes in need satisfaction and goal motivation at follow-ups explained the positive relationship between baseline relative intrinsic aspirations and increased SWB at T5. These results support the GCT (Ryan and Deci 2017a) proposal that intrinsic aspirations may contribute to well-being through two pathways: satisfaction of psychological needs and more autonomous self-regulation.

Vansteenkiste and Ryan have suggested basic psychological need satisfaction as a "unifying principle" accounting for both helpful and harmful effects of motivation on functioning (2013). In the present investigation, changes in need satisfaction accounted for the impact of both aspirations and goal motivation on functional outcomes. In addition to need satisfaction influencing important functional outcomes (e.g., subjective well-being; becoming more autonomous towards one's goals; changes in aspirations), need satisfaction may be an important end in itself. Numerous theorists, dating back to Artistotle (1947, as cited in Ryff 1989), have contrasted hedonic versus eudaimonic conceptualizations well-being.

While traditional measures of well-being are more aligned with hedonic well-being (e.g., *feeling* good), researchers are increasingly turning to eudaimonic indicators (e.g., *doing* good: contributing to relationships; enacting positive values; acting with agency; and developing mastery over tasks) to understand and assess human thriving (see Ryan and Deci 2001; Ryff and Singer 2013 for reviews). Basic psychological need satisfaction is congruent with eudaimonic conceptualizations of well-being, and thus may be as meaningful of an outcome to consider as subjective well-being.

Limitations and future directions

There are several limitations of the present study. First, the study sample was relatively homogeneous, consisting of undergraduate students from the same Canadian University. Therefore, it will be important to conduct additional prospective examinations to see if these findings replicate in more diverse samplings, at different life stages. Secondly, the follow-up of participants was limited to 8 months. While this provides a window into participants' functioning over a meaningful length of time, an academic "year" at the institution, we cannot determine whether increases and decreases in well-being, motivation, and need satisfaction as a function of baseline aspirations were maintained (e.g., 1 year later). A limitation of interpretability of the results of the study is the relatively small effect size for impact of aspirations on changes in motivation and subjective well-being. As we controlled for baseline variables in order to look at change, and there is a high degree of stability in repeatedly measured variables, it is difficult to expect any other predictors to explain a large amount of variance. Related to this, the effect size examining indirect effect of aspirations on subjective well-being are very low, nonetheless, significant. The indirect effect sizes are expected to be low as they are multiplicative of all the individual links between the independent variable (i.e., aspirations), mediators (changes in goal motivation and changes in need satisfaction), and dependent variable. Lastly, despite the prospective nature of the design, we cannot make conclusions about causality. It is still unknown whether intrinsic aspirations *cause* changes in motivation and need satisfaction, or whether these changes are simply correlated with baseline aspirations due to an associated third variable we did not consider.

Given the inability to determine causality from the present study, future research should consider experimental designs. For example, an experimental study demonstrated that individuals exposed to intrinsic aspirations through a weekly reflection exercise became more intrinsic in their aspirations, and reported improved well-being compared to students in an active control condition (Lekes et al. 2012). Such an intervention could be used to examine whether participants that are experimentally exposed to intrinsic

aspirations (a) choose personal goals that they are more autonomous towards and (b) *become* more autonomous towards personal goals that they are already pursuing after the intervention. Moreover, future experimental interventions could consider changing the environment in order to change values.[1] For example, could exposing students to peer models (e.g., other students) who strongly endorse intrinsic aspirations result in shifts in students' aspirations, and subsequent goal motivation? Additional research is needed to answer such questions. Previous research has supported an impact of social environment on prioritization of extrinsic relative to intrinsic aspirations (e.g., Sheldon and Krieger 2004; Hope et al. 2016a).

In conclusion, the present study provides new support for dynamic relationships between aspirations and goal motivation. We found evidence for goal contents theory's proposal that relative intrinsic aspirations lead to well-being through two pathways: increased satisfaction of basic psychological needs, and more autonomous self-regulation of goals (Ryan and Deci 2017a). This study contributes to existing literature emphasizing the importance of considering the impact of both the *what* and *why* of goal pursuit on well-being and psychological need satisfaction, and extend theory by considering dynamic effects between relative intrinsic aspirations and autonomous motivation.

The privilege of a lifetime is to become who you truly are—C.G. Jung

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