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Are the benefits of autonomy satisfaction and the costs of autonomy frustration dependent on individuals' autonomy strength?

Jasper Van Assche[1] | **Jolene van der Kaap-Deeder**[1,2*] | **Elien Audenaert**[1] | **Maarten De Schryver**[3] | **Maarten Vansteenkiste**[1]

[1] Department of Developmental, Social, and Personality Psychology, Ghent University, Ghent, Belgium

[2] Research Foundation–Flanders

[3] Department of Experimental-Clinical and Health Psychology, Ghent University, Ghent, Belgium

Correspondence
Jasper Van Assche, Faculty of Psychology and Educational Sciences, Department of Developmental, Social, and Personality Psychology, Henri Dunantlaan 2, B-9000 Ghent, Belgium.
Email: Jasper.VanAssche@UGent.be

Abstract

Objective: From a self-determination theory perspective, individuals are assumed to benefit and suffer from, respectively, the satisfaction and frustration of the psychological need for autonomy, even if they score low on autonomy strength. Yet, previous studies on need strength are scarce, operationalized need strength differently, and produced inconsistent findings.

Method: In two studies among 224 South African adults (M_{age} = 24.13, SD = 4.25; 54.0% male) and 156 Belgian prisoners (M_{age} = 38.60, SD = 11.68; 88.5% male), we investigated the moderating role of autonomy valuation and desire in the relations of autonomy satisfaction and frustration with a variety of well-being and ill-being indicators.

Results: Study 1 provided some evidence for the moderating role of mostly explicit autonomy desire (rather than explicit autonomy valuation). In Study 2, neither explicit nor implicit autonomy desire played a consistent moderating role.

Conclusions: Overall, these findings are congruent with a moderate (albeit not with a strong) interpretation of the universality claim made within self-determination theory, provide initial evidence for a differentiation between deficit-based and growth-oriented interpersonal differences in need strength, and indicate that the potential moderating role of need strength deserves continued attention before any firm conclusions can be drawn.

KEYWORDS

autonomy desire, autonomy frustration, autonomy satisfaction, autonomy valuation, self-determination theory

1 | INTRODUCTION

Self-determination theory (SDT; Ryan & Deci, 2000) is an organismic-dialectic meta-framework on human motivation, which maintains that three psychological needs serve as nutrients for individuals' psychological growth, integrity, and well-being. Specifically, as stated within basic psychological need theory (BPNT; Vansteenkiste, Niemiec, & Soenens, 2010), one of the six mini-theories of SDT, these needs concern the experience of a sense of volition and psychological freedom (i.e., autonomy), a feeling of being connected with important others (i.e., relatedness), and the experience of mastery in daily tasks (i.e., competence). Previous research has indicated that need satisfaction relates to multiple well-being outcomes, including vitality, life satisfaction, and positive affect (e.g., Bartholomew, Ntoumanis, Ryan, Bosch, &

*Joint first author.

Thøgersen-Ntoumani, 2011). In contrast, need frustration has consistently been related to maladaptive outcomes, including emotional exhaustion (e.g., Van den Broeck, De Witte, Lens, & Vansteenkiste, 2008), depressive symptoms (Bartholomew et al., 2011), and physical symptoms (Unanue, Dittmar, Vignoles, & Vansteenkiste, 2014). Such findings have been obtained using both self-reports and ratings of adjustment (e.g., Ahmad, Vansteenkiste, & Soenens, 2013) and held in both correlational and experimental designs (e.g., Weinstein, Khabbaz, & Legate, 2016).

Nonetheless, studies examining whether the associations of need satisfaction and frustration with well-being and ill-being differ depending on individuals' need strength are relatively scarce (but see Schüler, Sheldon, Prentice, & Halusic, 2016). Herein, we operationalize need strength as people's interpersonal differences in the valuation of or desire to get a certain need met (Chen, Vansteenkiste, et al., 2015).

The present contribution specifically focused on the most debated need, that is, the need for autonomy, thereby examining whether individuals desiring to get their need for autonomy met or valuing the satisfaction of their autonomy would benefit more from its satisfaction, and, conversely, suffer more from its frustration.

1.1 | The need for autonomy

Within SDT, autonomy is defined as the extent to which one fully accepts, endorses, and stands behind one's actions (Ryan & Deci, 2000). Individuals who have their autonomy satisfied experience their behavior as volitional, willingly enacted, and in line with their interests and values. In contrast, individuals who report autonomy frustration experience their behaving, thinking, or feeling as controlled by external forces or internal compulsions. Note that within SDT, autonomy is not equated with independence (as is the case in some other theoretical notions; e.g., Iyengar & Lepper, 1999), but refers to a feeling of psychological freedom and volition.

SDT further postulates that because humans are active, growth-oriented organisms naturally pursuing higher levels of integration, autonomy satisfaction is essential for their growth. Conversely, autonomy frustration is associated with various forms of ill-being (e.g., Bartholomew et al., 2011; Unanue et al., 2014). Indeed, autonomy satisfaction and frustration represent relatively distinct constructs (Vansteenkiste & Ryan, 2013). This is because the absence of autonomy satisfaction does not necessarily imply autonomy frustration. Specifically, individuals' autonomy can be merely deprived, yet, for frustration to occur, their need has to be more actively thwarted. Consistent with this proposed distinction, an increasing number of studies have provided evidence for a dual pathway, indicating that autonomy satisfaction better predicts well-being outcomes, whereas autonomy frustration serves as a better predictor of ill-being outcomes (e.g., Jang, Kim, & Reeve, 2016).

Importantly, autonomy satisfaction is presumed to be a universally critical nutrient, whereas its frustration is presumed to serve as a universal poison. The universality claim of SDT has been examined in a variety of ways. First, autonomy seems to come with benefits, regardless of whether it is studied at the between-person or the within-person level (e.g., Van der Kaap-Deeder, Vansteenkiste, Soenens, & Mabbe, 2017). That is, individuals thrive more if they experience greater autonomy when compared to others, but they also report greater well-being on specific days they experience more autonomy. Second, the benefits of autonomy were found to apply across life domains, including work, sports, education, health care, and psychotherapy (see Deci & Ryan, 2000). Yet, the role of autonomy has received less attention in life contexts where individuals' autonomy is typically not well supported, such as senior adults living in a home or prisoners in detention. Third, individuals of various ages, from babies (e.g., Warneken & Tomasello, 2008) to late adults (Kasser & Ryan, 1999), were found to benefit from greater autonomy. Fourth, the cross-cultural role of autonomy has perhaps received the greatest attention, with both single-country (e.g., Yamauchi & Tanaka, 1998) and multi-country (e.g., Chen, Van Assche, et al., 2015) studies indicating that autonomy satisfaction yields positive outcomes for individuals in nations with very different cultural backgrounds. Finally, most recently, individuals' personality traits were considered as potential moderators (Hagger, Koch, & Chatzisarantis, 2015; Mabbe, Soenens, Vansteenkiste, & Van Leeuwen, 2016). There was little evidence for a systematic moderation effect, with adolescents, regardless of their personality, suffering from the experience of need frustration. In short, many studies have, consistent with BPNT, documented the benefits associated with need satisfaction in general, and autonomy in particular, at various levels of potential moderators. Overall, most of these potentially moderating factors yield a rather distal relation to the concept of needs. Perhaps the greatest potential for moderation and the chance to challenge the universality claims of SDT involves examining more proximal psychological characteristics (i.e., features that directly map onto one of the three needs), as exemplified by the work on need strength.

1.2 | Moderate and strong viewpoints on the universality claim

Although the extant literature suggests that currently studied moderators fail to systematically alter the effects of need satisfaction and frustration, the question needs to be addressed whether, theoretically speaking, there is any room for variation in the effect of the psychological needs within BPNT. Indeed, BPNT is often interpreted as holding a strong or

radical universalist viewpoint, assuming that all persons should benefit to the same degree from need satisfaction and pay the same price for experiences of need frustration, thus leaving little room for any moderating factors to play a role at all. Yet, such a strong viewpoint has more recently been complemented with a more *moderate* viewpoint on universalism (Soenens, Vansteenkiste, & Van Petegem, 2015), as moderating factors, such as interpersonal differences in need strength, may play a role in (a) the gradation of the effect and (b) the manifestation of the benefits and costs associated with, respectively, need satisfaction and need frustration (Chen, Soenens, Vansteenkiste, Van Petegem, & Beyers, 2016).

Specifically, based on the (de)sensitization hypothesis (Moller, Deci, & Elliot, 2010), it can be examined whether some individuals, depending on a history of accumulated need satisfaction, are more sensitive to the benefits of need satisfaction, thereby reaping greater benefits, while at the same time being more resilient against the costs associated with need frustration. In contrast, individuals who grow up in more need-thwarting environments may have become increasingly desensitized to the benefits associated with need satisfaction instead becoming more sensitive to the costs of need frustration. Some evidence for this (de)sensitization hypothesis has been reported. For instance, highly, compared to lowly, autonomously motivated students experienced a choice-conducive physical education class as more need satisfying and vitalizing (Mouratidis, Vansteenkiste, Sideridis, & Lens, 2011). Additionally, among individuals high in relatedness satisfaction, a new relatedness-conducive encounter yielded greater well-being benefits (Moller et al., 2010). Finally, adolescents whose home environment became increasingly autonomy-supportive over a 6-year period extracted greater autonomy satisfaction from a new autonomy-supportive interaction with their parents (Van Petegem et al., 2017).

Apart from variation in the gradation to which individuals benefit/suffer from need satisfaction/frustration, the specific way in which they manifest it may also differ depending on moderating variables. To illustrate, among individuals high in agreeableness, perceived psychologically controlling parenting (which involves the thwarting of autonomy) did not predict externalizing problems, yet it did relate to internalizing problems (Mabbe et al., 2016). Presumably, the type of cost associated with autonomy frustration may differ depending on interpersonal differences, a reasoning that can be generalized to the benefits of need satisfaction.

Whereas a radical universalist hypothesis would not be able to account for such variation, either in gradation or in specificity of the costs and benefits associated with, respectively, need satisfaction and need frustration, there is room for a more nuanced viewpoint within a moderate view on universalism. What would be equally problematic in the case of this moderate interpretation, however, is that findings would systematically indicate that some individuals do not reap *any* benefits from need satisfaction or do not pay *any* price for experiencing need frustration. One potential moderator that has been less studied (but see Schüler et al., 2016) involves individual differences in need strength, which are central in the present study.

1.3 | Individual differences in autonomy strength

Need strength reflects interpersonal differences in the preference to get a particular need met and has been operationalized in two different ways. First, individuals can differ with regard to how important they regard the satisfaction of a certain need to be (i.e., need valuation; Heine, Lehman, Markus, & Kitayama, 1999). According to motive disposition theory (MDT; McClelland, 1965), such need valuation is shaped through previous social learning processes. To illustrate, a child raised by parents focusing highly on the child's needs, interests, and self-development is expected to have a strong need for autonomy in later life. Second, individuals can differ in how much they desire or want the satisfaction of a certain need (i.e., need desire). Such need desire is often rooted in the frustration or the lack of satisfaction concerning this need (Sheldon & Gunz, 2009). That is, individuals feeling pressured in their daily activities (i.e., autonomy frustration) would experience a greater desire for autonomy satisfaction. Thus, whereas need valuation is expected to rise from previous encounters of need satisfaction, reflecting growth-based interpersonal differences in need strength, need desire has been found to stem from need-frustrating experiences, reflecting deficit-based interpersonal differences in need strength (Sheldon & Gunz, 2009).

It is important to note that the needs addressed from MDT (i.e., power, affiliation, and achievement; McClelland, 1965) do not match with the needs of autonomy, relatedness, and competence within SDT, which makes a direct comparison between these two theoretical notions difficult. Still, the more general reasoning within MDT can be applied to the SDT needs. That is, based on MDT, the argument could be forwarded that among individuals attaching greater importance to the fulfillment of autonomy or expressing a stronger desire to get their autonomy needs met, autonomy satisfaction yields a stronger contribution to their well-being (Schultheiss, 2008). An even more extreme interpretation would suggest that autonomy satisfaction *only* contributes to well-being among individuals high on need strength (e.g., Vallerand, 2000). Such an extreme interpretation cannot be forwarded from a BPNT perspective, neither from the strong nor the moderate viewpoint on universalism. Yet, as far as a more moderate viewpoint on universalism is defended in BPNT, there is room for moderation, with the strength of this association and the type of costs and benefits associated with, respectively, need frustration and need satisfaction,

potentially varying as a function of interpersonal differences in need strength.

Previous studies concerning the moderating role of need strength are relatively scarce and have produced mixed results (e.g., Chen, Van Assche, et al., 2015; Schüler & Brandstäter, 2013; Schüler, Brandstäter, & Sheldon, 2013). Additionally, most of these studies focused on relatedness or competence and less on autonomy (e.g., Schüler & Kuster, 2011) and assessed need valuation rather than need desire (but see Chen, Van Assche, et al., 2015, for an exception). For instance, Schüler, Sheldon, and Fröhlich (2010) showed across three studies among undergraduate students that competence satisfaction (during sports activities) had especially beneficial effects on a range of domain-specific positive outcomes (e.g., flow) for those individuals scoring high on implicit need for achievement (i.e., an acquired preference for competence-satisfying experiences). In contrast, the explicit measure of need for achievement did not serve as a significant moderator. Further, Sheldon and Schüler (2011) found that both implicit and explicit need strength with respect to the needs for achievement and affiliation failed to moderate the positive relation between, respectively, competence and relatedness satisfaction and global well-being.

With respect to autonomy, only two studies are available. First, Chen, Vansteenkiste, et al. (2015) found across four culturally diverse nations (i.e., Belgium, China, the United States, and Peru) that explicit autonomy desire failed to moderate the positive relation between autonomy satisfaction and well-being and between autonomy frustration and ill-being. Second, Schüler and colleagues (2016) showed in a first study among undergraduate students that autonomy satisfaction related more strongly to flow during learning among individuals with a strong implicit need for autonomy. Additionally, in a second study among physically inactive individuals, autonomy satisfaction only contributed to sports-related well-being among individuals with a strong or average (but not weak) implicit need for autonomy (Schüler et al., 2016). In line with the study of Schüler and colleagues (2010), they found no evidence for a moderating role of explicit need strength.

1.4 | Considerations when investigating the role of need strength

As previous studies on need strength have employed different methods and were rooted in theoretically diverse traditions, it is difficult to directly compare their results. Overall, apart from the scarcity of work that focuses on autonomy strength, we additionally identify a number of caveats that deserve greater attention. First, as alluded to before, a moderating effect of need strength has only been found when employing an implicit measure (Schüler et al., 2016). However, for both implicit and explicit measurements of need strength, a diversity of instruments has been employed that often do not directly or exclusively capture the valuation of or desire for a certain need, instead representing a variety of different issues. For instance, Schüler and colleagues (2016) assessed explicit autonomy strength by measures of autonomy orientation (i.e., the general orientation toward autonomous functioning; example item: "My decisions are steadily informed by things I want or care about"), which does not directly refer to the valuation of or the desire for autonomy. Second, previous need strength studies almost exclusively focused on need satisfaction rather than frustration (for the only exception, see Chen, Vansteenkiste, et al., 2015).

As the results obtained previously with regard to need satisfaction cannot be assumed to generalize to need frustration (Vansteenkiste & Ryan, 2013), it remains to be seen whether individuals high on need strength would not only benefit more from need-satisfying experiences, but would also suffer more from need-frustrating events.

Third, no study so far has systematically addressed whether need desire and need valuation may play a differential moderating role. Although they both reflect interpersonal differences in need strength, differences in need valuation and need desire may have arisen as a function of exposure to more need-supportive and need-thwarting environments, respectively (Sheldon & Gunz, 2009). As such, the (in)sensitivity that goes along with such interpersonal differences may manifest differently, with those high in need valuation especially reaping greater benefits from need satisfaction and those high in need desire suffering more from its frustration.

1.5 | The present research

Consistent with the trend in the motivational literature to study motivational phenomena from multiple theoretical perspectives (Vansteenkiste & Mouratidis, 2016), the general aim of the present study was to examine the potential moderating role of autonomy strength in the relation between autonomy-based experiences and both indicators of well-being and ill-being in two independent samples, one comprising South African students (Study 1) and one comprising Belgian prisoners (Study 2).[1] We chose to focus on autonomy because this need is the most debated of the three and because there is a paucity of studies that focused on need strength as a potential moderator in the case of autonomy. The study was also innovative compared to previous work, as (a) the role of both autonomy satisfaction and frustration in the prediction of both well-being and ill-being was explored, (b) the role of both autonomy valuation (Study 1) and autonomy desire (Studies 1 and 2) was examined, and (c) both explicit (Studies 1 and 2) and implicit (Study 2) measures of need desire were used. The inclusion of multiple outcomes, multiple predictors, and different operationalizations, as well as the study of these dynamics among individuals heavily threatened (i.e., prisoners) and more

protected (i.e., students) in their autonomy, allowed us to examine how systematic any documented main and interaction effects would be. Two hypotheses were proposed: one dealing with the main effect of autonomy-related experiences and the other with the interaction with differences in need strength.

First, based on BPNT, a main effect for autonomy-related experiences was hypothesized, with autonomy satisfaction being expected to relate positively to indicators of well-being and negatively to indicators of ill-being, whereas an opposite relation was expected for autonomy frustration. Second, based on a strong viewpoint on universalism, we can infer that autonomy need strength would play no moderating role, such that the conditional effects of autonomy satisfaction and frustration would apply for individuals both high and low in autonomy strength to the same extent. From a more moderate viewpoint on universalism, which is increasingly adopted within SDT (Soenens et al., 2015), it can be predicted that there is room for moderation. That is, measures of need strength may alter the strength of the association between autonomy-related experiences and outcomes such that the contribution of autonomy is less pronounced (yet not cancelled out) among individuals low in need strength.

Further, based on MDT and previous research (Schüler et al., 2010, 2016), it could be expected that especially implicit instead of explicit measures of need strength should play a moderating role. That is, while explicit measures are assumed to assess conscious self-attributed need strength, implicit measures are said to assess such need preference at a "deeper" and more significant level (Schüler et al., 2010). Capturing more deeply ingrained preferences may be especially critical to obtain interaction effects, as especially individuals with more strongly anchored preferences for a certain need would be sensitive to the benefits of experienced need satisfaction. That is, because implicit measures best capture individuals' capacity to experience need-based experiences as rewarding, they would be ideally suited to study interaction effects. Indeed, explicit self-reports may not be "subtle" enough to assess such deep-level preferences, as they are partially driven by demand characteristics and inaccurate self-theories. Also, based on MDT, individuals very low in need strength may not be affected by need-based experiences, a result that would stand in contrast to both strong and more moderate universalism viewpoints.

2 | STUDY 1

2.1 | Method

2.1.1 | Participants and procedure

A total of 224 South African young adults (54.0% males; $M_{age} = 24.13$, $SD = 4.25$) participated in this study. Based on power analysis regarding the optimal sample size to obtain a power of at least 80%, we found this number of participants to be sufficient to detect interaction effects that explain between 0% and 4% additional variance above and beyond the main effects. Additional sample information can be found in Appendix S1.

2.1.2 | Measures

Autonomy-related measures

Autonomy satisfaction and frustration To assess autonomy satisfaction and frustration, we used the eight autonomy items of the Basic Psychological Need Satisfaction and Need Frustration scale (BPNSNF). This scale was recently validated across four countries (Chen, Vansteenkiste, et al., 2015), and the Autonomy subscale is assessed with eight items, consisting of a balanced combination tapping into both satisfaction (e.g., "I feel my decisions reflect who I really am") and frustration (e.g., "I feel forced to do many things I wouldn't choose to do"). Items were rated on a 5-point Likert scale ranging from 1 (*Completely Untrue*) to 5 (*Completely True*). The satisfaction dimension yielded a reliable scale ($\alpha = .79$), but the reliability of the frustration dimension was less than optimal ($\alpha = .66$).

Autonomy desire Desire for autonomy satisfaction was assessed with three items from the Needs as Motives scale). An example item reads, "If you would have the chance to make a change in your life, how much would you like to have the following change? [stem] You manage to create a life style where others no longer pressure you, and you feel free to do what you really want to do." Items were rated on a 5-point Likert scale ranging from 1 (*No desire for this change*) to 5 (*Much desire for this change*; $\alpha = .71$).

Autonomy valuation Valuation of autonomy satisfaction was measured by adapting the four items of the Autonomy Satisfaction subscale. Each item was preceded by the stem "Please indicate how much you value the following experiences. How important is it for you personally to have each of the following experiences?" An example item is "How important is it for you to feel that your decisions reflect who you really are?" Items were rated on a 5-point Likert scale ranging from 1 (*Not important at all*) to 5 (*Very important to me*; $\alpha = .77$).

Outcomes

All well-being items were rated on a 5-point Likert scale ranging from 1 (*Completely Untrue*) to 5 (*Completely True*).

Life satisfaction Life satisfaction was measured with the five-item Satisfaction With Life Scale (Diener, Emmons, Larsen, & Griffin, 1985; $\alpha = .75$). An example item is "In most ways, my life is close to my ideal."

TABLE 1 Study 1: Descriptives of and correlations between the variables

	1	2	3	4	5	6	7	8
Autonomy-related measures								
1. Autonomy satisfaction								
2. Autonomy frustration	−.37***							
3. Autonomy desire	−.10	.14*						
4. Autonomy valuation	.28***	−.17*	.04					
Outcomes								
5. Life satisfaction	.52***	−.28***	−.16*	.20**				
6. Vitality	.53***	−.21**	−.03	.30***	.42***			
7. Self-acceptance	.56***	−.32***	−.17*	.29***	.62***	.56***		
8. Depressive symptoms	−.48***	.46***	.22***	−.27***	−.39***	−.44***	−.56***	
M	4.12	2.18	3.24	4.45	3.68	3.98	3.86	1.78
SD	0.74	0.84	1.10	0.61	0.84	0.75	0.63	0.62

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

Vitality Vitality, that is, feelings of energy and vigor experienced over the past few months, was assessed with the seven-item Subjective Vitality Scale (Ryan & Frederick, 1997; $\alpha = .81$). An example item is "I feel alive and vital."

Self-acceptance Self-acceptance, involving a positive attitude toward oneself and the past, was measured with nine items from the Psychological Well-Being Scale (Ryff, 1989; $\alpha = .74$). An example item reads, "In general, I feel confident and positive about myself."

Depressive symptoms Ill-being was measured by tapping into depressive symptoms, with the 10-item Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977), referring to how the participant has felt and behaved during the last week. Participants chose the appropriate number from 1 (*Less than one day*) to 4 (*More than 5 days*) to indicate how often they had a particular feeling (e.g., "I had trouble keeping my mind on what I was doing"). This scale was reliable ($\alpha = .82$).

2.2 | Results

2.2.1 | Descriptive statistics and preliminary analyses

Table 1 portrays the descriptive statistics and bivariate correlations between the study variables. These interrelations as well as the correlations between study and background variables are discussed in Appendix S2.

2.2.2 | Frequentist analyses

To investigate whether autonomy desire and valuation moderated the relation between autonomy satisfaction or frustration and well-being or ill-being, we performed 16 separate hierarchical regression analyses (four for each outcome).[2] In a first step, we simultaneously entered the centered score of either autonomy satisfaction or frustration in combination with either autonomy desire or valuation as predictors, and in a second step, their respective interaction term was added. These results are displayed in Table 2 (with the left panel presenting results for autonomy desire and the right panel for autonomy valuation). First, across all analyses, autonomy satisfaction related positively to well-being and negatively to ill-being, whereas autonomy frustration showed an opposite pattern of results. Furthermore, autonomy desire related negatively to self-acceptance and positively to depressive symptoms, and autonomy valuation related positively to vitality and self-acceptance, and negatively to depressive symptoms. Further, of the 16 investigated interaction terms, five were significant, with three of them concerning autonomy desire and two concerning autonomy valuation. Specifically, autonomy desire moderated the relation between autonomy satisfaction and self-acceptance, between autonomy satisfaction and depressive symptoms, and between autonomy frustration and depressive symptoms. Autonomy valuation moderated the relations between autonomy satisfaction and vitality, and between autonomy frustration and depressive symptoms. For all these interactions, the associations tended to be more pronounced among those high in autonomy desire or valuation. These five significant interactions were further examined by means of simple slope analyses, in which the significance of the slopes of the regressions at four levels of the moderator are calculated, that is, at very and moderately low (i.e., < 2 and < 1 standard deviation below the mean) and very and moderately high (i.e., > 2 and > 1 standard deviation above the mean) levels of autonomy desire or valuation (Hayes & Matthes, 2009). The slopes for the effects of autonomy

TABLE 2 Study 1: Hierarchical regression analyses with autonomy satisfaction or autonomy frustration, autonomy desire or autonomy valuation, and their interaction predicting life satisfaction, vitality, self-acceptance, or depressive symptoms

	Autonomy Desire								Autonomy Valuation							
	Life satisfaction		Vitality		Self-acceptance		Depressive symptoms		Life satisfaction		Vitality		Self-acceptance		Depressive symptoms	
	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β	Step 1 β	Step 2 β
Autonomy satisfaction	.51***	.49***	.53***	.50***	.55***	.49***	−.46**	−.41**	.50***	.51***	.48***	.46***	.52***	.50***	−.43***	−.42***
Autonomy strength	−.10	−.11	.02	.00	−.11	−.16**	.17**	.22***	.06	.05	.17**	.19**	.15*	.17**	−.15*	.17**
Interaction		.04		.10		.22***		−.19**		−.03		.14*		.11		−.11
ΔR^2	.28	.00	.28	.01	.32	.04	.26	.03	.27	.00	.31	.02	.33	.01	.25	.01
F for ΔR^2	39.68***	0.47	40.56***	2.72	50.01***	13.66***	35.86***	9.19**	36.87***	0.21	44.47***	5.19*	50.33***	3.64	33.12***	2.95
Autonomy frustration	−.26***	−.23***	−.21**	−.20**	−.30***	−.28***	.43***	.38***	−.26***	−.24***	−.16*	−.16*	−.28***	−.27**	.42***	.40***
Autonomy strength	−.12	−.14*	.00	−.01	−.12	−.14*	.16**	.20**	.15*	.18*	.28***	.29***	.25***	.27***	−.20***	−.24***
Interaction		−.11		−.05		−.08		.18**		−.08		−.05		−.09		.13*
ΔR^2	.09	.01	.05	.00	.12	.01	.23	.03	.17	.01	.12	.00	.16	.01	.25	.01
F for ΔR^2	10.60***	2.55	4.91**	0.39	13.84***	1.44	31.50***	8.03**	21.33***	1.73	13.67***	0.59	19.45***	1.56	32.92***	4.32*

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

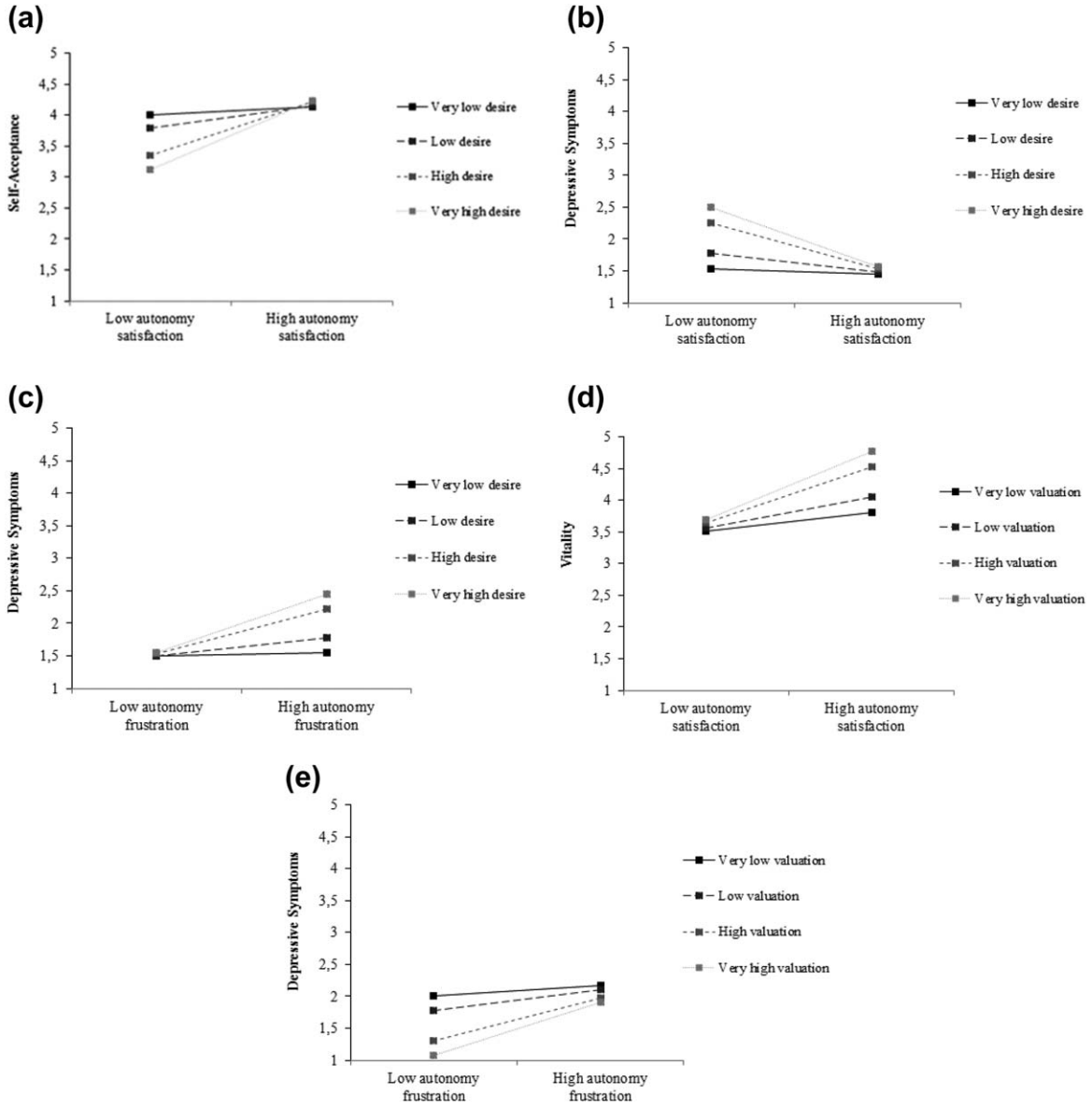

FIGURE 1 Study 1: Two-way interactions of autonomy satisfaction or frustration and autonomy strength predicting well- or ill-being
(a) Autonomy Satisfaction × Autonomy Desire predicting self-acceptance
(b) Autonomy Satisfaction × Autonomy Desire predicting depressive symptoms
(c) Autonomy Frustration × Autonomy Desire predicting depressive symptoms
(d) Autonomy Satisfaction × Autonomy Valuation predicting vitality
(e) Autonomy Frustration × Autonomy Valuation predicting depressive symptoms

satisfaction and frustration on the outcomes were always significant among those scoring very high, moderately high, and moderately low on either autonomy desire or autonomy valuation. Notably, the slopes for those scoring very low on autonomy desire or valuation were not significant. The following specific pattern of findings was obtained.

As displayed in Figure 1a, individuals showing a very high ($\beta = .89$; $t = 8.24$; $p < .001$), high ($\beta = .69$; $t = 10.18$; $p < .001$), and low desire for autonomy ($\beta = .29$; $t = 3.34$; $p < .001$) benefited from autonomy satisfaction in terms of higher self-acceptance. Yet, the slope was not significant for individuals expressing a very low desire for autonomy ($\beta = .10$; $t = 0.72$; $p > .05$). Similarly, and as displayed in Figure 1b, among individuals scoring very high ($\beta = –.67$; $t = –5.78$; $p < .001$), moderately high ($\beta = –.57$; $t = –7.77$; $p < .001$), and moderately low in autonomy desire ($\beta = –.20$; $t = –2.15$; $p < .05$), autonomy satisfaction related negatively to depressive symptoms, whereas this was not the case among individuals scoring very low in autonomy desire ($\beta = –.06$; $t = –0.32$; $p > .05$). Third, as displayed in Figure 1c, individuals scoring very high ($\beta = .76$; $t = 6.25$; $p < .001$), moderately high ($\beta = .56$; $t = 7.54$; $p < .001$), or

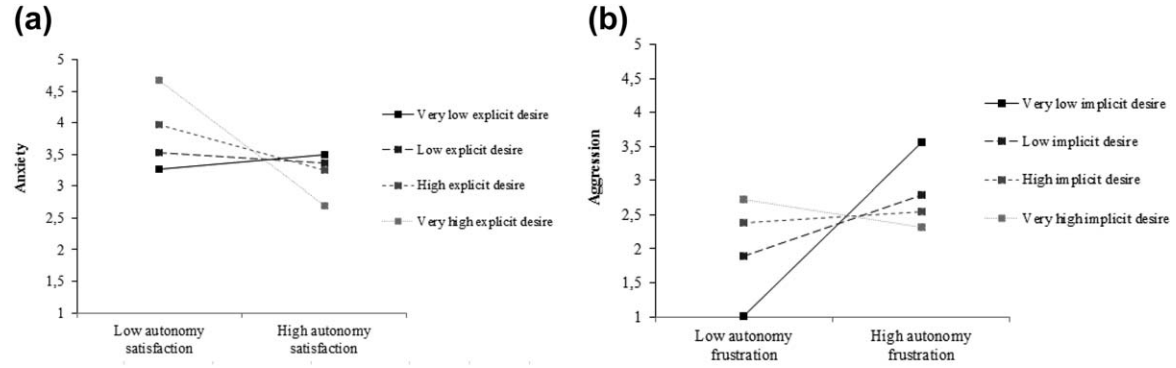

FIGURE 2 Study 2: Two-way interactions of autonomy satisfaction or frustration and autonomy strength predicting well- or ill-being
(a) Autonomy Satisfaction × Explicit Autonomy Desire predicting anxiety
(b) Autonomy Frustration × Implicit Autonomy Desire predicting aggression

moderately low on autonomy desire ($\beta = .22$; $t = 2.23$; $p < .05$), but not those scoring very low on autonomy desire ($\beta = .07$; $t = 0.46$; $p > .05$), suffered from autonomy frustration in terms of higher depressive symptoms. As for the two interactions involving autonomy valuation, the pattern of findings was very similar. That is, as can be noticed in Figure 1d, among those individuals scoring very high ($\beta = .70$; $t = 5.65$; $p < .001$), moderately high ($\beta = .58$; $t = 7.53$; $p < .001$), or moderately low on autonomy valuation ($\beta = .32$; $t = 3.48$; $p < .001$), autonomy satisfaction related positively to vitality, whereas this was not the case among those scoring very low on autonomy valuation ($\beta = .16$; $t = 1.14$; $p > .05$). Finally, as Figure 1e shows, among individuals scoring very high ($\beta = .65$; $t = 4.78$; $p < .001$), moderately high ($\beta = .53$; $t = 6.38$; $p < .001$), and moderately low on autonomy valuation ($\beta = .26$; $t = 2.76$; $p < .01$), autonomy frustration was positively related to depressive symptoms, whereas this association was not significant among those very low on autonomy valuation ($\beta = .12$; $t = 0.79$; $p > .05$). In sum, in case significant interaction effects were obtained, the fine-grained analyses of the slopes for the conditional effects of autonomy satisfaction and frustration indicated that these effects were more pronounced among those scoring high in autonomy desire or valuation, with the effect becoming gradually less strong and even not significant among individuals scoring very low in autonomy strength.

2.2.3 | Bayesian analyses

A second strategy to investigate the relative importance of autonomy strength in the associations of autonomy satisfaction/frustration and well- or ill-being involved conducting Bayesian analyses. Using default priors from the BayesFactor package in R (Morey, Rouder, & Jamil, 2015), we calculated Bayes factors for the main effect of autonomy satisfaction or frustration (against the null model), for the main effect of autonomy desire or valuation (against the null model), and for their respective interactions (against an alternative model including only both main effects; see Table 3). Bayes factors quantify the support for a specified model versus an alternative model. To illustrate, a Bayes factor of 5 suggests that the proposed model is about five times more likely than an alternative model, whereas a Bayes factor of 0.2 suggests the opposite. Crucially, in the present study, all indices of the main effect for autonomy satisfaction or frustration yielded extreme support (> 100) in favor of the proposed model ("there is a main effect") versus the null model ("there is no main effect"). For example, the Bayes factor for autonomy frustration on life satisfaction suggests that it is about 2,100 times more likely that autonomy frustration relates to life satisfaction than that it does not yield a relation. On the other hand, the Bayes factor for autonomy desire on vitality suggests that it is about 5.88 (i.e., 1/0.17) times more likely that autonomy desire does not relate to vitality than that it does yield a relation. Most importantly, the indices of the interaction effects indicated only weak (1–3) or moderate (3–10) support in favor of the proposed model ("there are two main effects and an additional interaction effect") versus the alternative model ("there are only two main effects"). Only for the interaction between autonomy satisfaction and autonomy desire in the prediction of self-acceptance and depressive symptoms was there strong support (10–30) in favor of a model including the interaction term above and beyond the respective main effects. Interestingly, the indices for the interaction effects with autonomy valuation even indicate weak support (0.33–1) in favor of a model excluding an interaction and only including the two main effects.

2.3 | Brief discussion

Confirming our first hypothesis, we found that autonomy satisfaction was consistently positively related to well-being and negatively to ill-being, whereas autonomy frustration showed an opposite pattern. Regarding our second hypothesis, results

TABLE 3 Study 1: Bayes factors for the main effects of autonomy satisfaction or frustration, the main effects of autonomy desire or valuation, and the respective interaction effects

	Desire		Valuation	
	Life satisfaction	Vitality	Life satisfaction	Vitality
Autonomy satisfaction	$3.35e^{+11}$	$3.48e^{+13}$	$3.35e^{+11}$	$3.48e^{+13}$
Autonomy strength	1.37	0.17	6.24	1,483.84
Interaction	0.17	0.54	0.18	1.63
Autonomy frustration	2,106.48	8.79	2,106.48	8.79
Autonomy strength	1.37	0.17	6.24	1,483.84
Interaction	0.63	0.32	0.40	0.28
	Self-acceptance	**Depressive symptoms**	**Self-acceptance**	**Depressive symptoms**
Autonomy satisfaction	$5.46e^{+14}$	$3.24e^{+11}$	$5.46e^{+14}$	$3.24e^{+11}$
Autonomy strength	1.29	19.41	1,218.88	241.98
Interaction	58.52	16.73	0.83	0.61
Autonomy frustration	34,175.06	1,589,739,993	34,175.06	1,589,739,993
Autonomy strength	1.29	19.41	1,218.88	241.98
Interaction	0.46	8.65	0.42	1.28

Note. For the main effects of autonomy satisfaction or frustration and the main effects of explicit autonomy desire or implicit autonomy desire, Bayes factors represent the probability of the Ha model (i.e., "there is a main effect") being true as opposed to the H0 model (i.e., "there is no main effect") being true; for the respective interaction effects, Bayes factors represent the probability of the Ha model (i.e., "there are two main effects and an interaction effect") being true as opposed to the H0 model (i.e., "there are only two main effects") being true. e^{+}** stands for an exponential power of 10. To get the exact number, one should multiply the number by 10 to the power of ** (i.e., $\times 10^{**}$). For example, $3.35e^{+11}$ equals 335,000,000,000.

showed that some interaction effects were significant, and simple slope analyses indicated that the contribution of autonomy satisfaction and frustration in the prediction of well- and ill-being were not significant among those having very low levels of autonomy strength. Importantly, Bayesian analyses indicated that the relative importance of such interaction effects is rather modest compared to the evidence in support of the main effects for autonomy satisfaction and frustration. Finally, the interactions account for a fairly small portion of incremental variance above and beyond the main effects.

3 | STUDY 2

Study 2 differed from Study 1 in two significant ways. First, in Study 2, we focused only on autonomy desire (and not autonomy valuation) as an indicator of autonomy strength. This was done for two reasons. First, based on the results of Study 1, autonomy desire seemed to have the most potential to moderate the relation between autonomy satisfaction or frustration and psychological functioning. Second, as Study 2 focused on a sample of prisoners, autonomy desire was assumed to be more prominent than autonomy valuation. Indeed, prison is a context where individuals' autonomy is heavily thwarted (Bukstel & Kilmann, 1980), and, as a result, prisoners may strongly long for or even crave autonomy. However, even within the restrictive context of prison, there is likely to be considerable variation in the perceived degree of autonomy experienced by inmates. Satisfaction of autonomy in the prison context is apparent when prisoners willingly conform to prison rules or when they feel free to voice their irritation vis-à-vis prison staff. In contrast, autonomy frustration is characterized by feelings of pressure and inner conflict, such as when prisoners feel forced to take part in nonvalued activities.

Second, in accordance with the majority of studies on the moderating role of need strength, autonomy desire was assessed both with an explicit and an implicit measure. From a dispositional motivational approach (McClelland, 1965), implicit measures of need strength are of more value than their explicit counterparts. Whereas implicit measures are assumed to assess nonconscious need strength, explicit measures are said to assess conscious self-attributed need strength. Therefore, to more fully capture the possible moderating role

of autonomy desire, we assessed this construct explicitly as well as implicitly.

It is important to note that we chose to assess implicit autonomy desire in a rather different way compared to most previous assessments of need strength. That is, need strength has mostly been assessed with picture-based tasks (e.g., the Picture Story Exercise; McClelland, Koestner, & Weinberger, 1989; Schüler et al., 2016) in which participants are asked to write stories based on a picture (e.g., of a boxer). These stories are subsequently coded in terms of the displayed amount of need strength in these stories. For several reasons, we chose not to employ such a picture-based task in this study. First, the coding of such story tasks is often rather time-consuming and requires a high level of expertise (Schüler, Brandstäter, & Wegner, 2015). Additionally, these tasks involve very different stimuli (i.e., ambiguous pictures) than explicit measures of need strength (i.e., structured questions), which limits the comparability between implicit and explicit measures (Brunstein & Schmitt, 2004). Finally, with regard to these picture-based tasks, it might be less clear what these stories exactly tap into. An interpretation of a story as reflecting personal causation could indicate that this participant experiences a high level of autonomy satisfaction in life, strongly values experiencing autonomy satisfaction, desires to feel more autonomous, or a mix of these three features. Therefore, we employed the Implicit Association Test (IAT), which, via reaction times, measures the extent to which autonomy-related cues are related to "I desire."

3.1 | Method

3.1.1 | Participants and procedure

Participants were 156 Belgian, mostly male (88.5%), prisoners and were on average 38.60 years old ($SD = 11.68$). With regard to participants' prison status, 65.0% were convicted of a crime, 26.1% were accused (but not yet convicted), and 8.3% were interned[3] (vs. 58.5%, 31.7%, and 8.2%, respectively, in the general prison population; Justice Federal Public Services, 2015). Based on power analyses, we found this number of participants to be less than optimal but still sufficient (i.e., the power was 70.55%) to detect interaction effects that explain between 0% and 4% additional variance above and beyond the main effects. Data were collected between December 2014 and March 2016 in seven prisons within Flanders (i.e., the Dutch-speaking part of Belgium).[4] Additional sample information can be found in AppendixS1.

3.1.2 | Measures

All items were answered on a Likert scale ranging from 1 (*Not At All True*) to 5 (*Completely True*), unless indicated otherwise.

Background variables

We assessed age, gender, nationality, education, marital status, parental status (i.e., having at least one child), prison (one of the seven prisons), prison status (i.e., accused, convicted, or interned), prison regime (i.e., open, half open, or closed), months spent in prison, received sentence time (in months, for those who were convicted), previous imprisonment, and reason for imprisonment. Imprisonment reasons reported by the prisoners were later coded based on a subscale of the European Addiction Severity Index-Treatment Demand Indicator (EuropASI-TDI; Kokkevi et al., 1993), a standardized screening measurement mainly used for individuals with substance-use-related problems. The following categories were obtained: 1 = *possession or trafficking of illegal drugs*; 2 = *crimes of property* (e.g., burglary, theft/shoplifting, fraud, forgery, extortion, and trading in or distributing stolen goods); 3 = *crimes of violence* (e.g., battery, robbery, arson, sexual assault, rape, manslaughter, and murder); 4 = *other crimes* (e.g., distribution of child pornography, prostitution, stalking); 5 = *multiple crimes*.

Autonomy-related measures

Autonomy satisfaction and frustration As in Study 1, we employed the Autonomy subscale of the BPNSNF scale (Chen, Van Assche, et al., 2015).

To ensure that the items would be understandable, we used a simplified version (Van der Kaap-Deeder et al., 2015). For example, "I feel I have been doing what really interests me" was changed into "What I do, really interests me." Both the Autonomy Satisfaction ($\alpha = .84$) and Autonomy Frustration ($\alpha = .79$) subscales were reliable.

Autonomy desire–explicit In this study, autonomy strength was operationalized as desire for autonomy, using four items based on the Autonomy Satisfaction subscale of the BPNSNF scale (Chen, Van Assche, et al., 2015) and preceded by the stem "At this moment I desire. . .." An example item is ". . . to do what I think is really interesting." This scale had a good reliability ($\alpha = .87$).

Autonomy desire–implicit We employed an Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998). Participants were first informed via written instructions on the computer screen that they needed to categorize each depicted sentence into one of four possible categories, namely, *I desire freedom, I desire coercion, true*, and *not true*. On an AZERTY keyboard, they could indicate their answer by pressing either the left yellow response key (Q, yellow sticker) or the right blue response key (M, blue sticker), meaning that the sentence belongs to the category portrayed, respectively, in the left upper corner highlighted in yellow or the right upper corner highlighted in blue. Furthermore, participants were told to respond as quickly as possible without making too many mistakes.

We developed stimuli related to desiring autonomy satisfaction or frustration on the basis of the BPNSNF (Chen, Van Assche, et al., 2015).

Stimuli for *I desire freedom* were "I yearn to be myself," "I want to make decisions that fit with who I am," "I long for choice," and "I desire to experience a sense of freedom." Stimuli for *I desire coercion* were "I yearn for pressure," "I want to be restricted in what I do," "I long for obligations," and "'I desire pressure." The stimuli belonging to the categories *true* and *not true* were based on previous research employing the autobiographical IAT (Sartori, Agosta, Zogmaister, Ferrara, & Castiello, 2008). For the *true* category, these were "I am sitting in front of the computer," "I am in a room," "I am participating in a study," and "I am sitting on a chair." For the *not true* category, these were "I am climbing a mountain," "I am in the bathroom," "I am exercising," and "I am eating" (see Appendix S1 for more information on the IAT procedure). The stimuli were displayed in the center of a black computer screen in white uppercase letters (Arial font). The categories were presented in the upper corners of the screen using black bold uppercase letters (Courier font) in two filled (left: yellow; right: blue) squares. The interstimulus interval was 400 ms, and within each block, stimuli were shown randomly. When a participant made an error, a red X appeared and participants needed to press the correct key to continue with the task. The IAT was programmed using the INQUISIT Milliseconds software package (INQUISIT 3.0.6.0, 2011; 4.0.7.0, 2014).

Outcomes

Vitality Vitality as experienced within prison was assessed with three adapted items (e.g., "Within prison, I feel alive") of the Subjective Vitality Scale (Ryan & Frederick, 1997; $\alpha = .84$).

Quality of life Quality of life was assessed by the eight-item index European Health Interview Survey–Quality of Life (EUROHIS-QOL; Schmidt, Mühlan, & Power, 2006), a short measure derived from the World Health Organization–Quality of Life measures (i.e., WHOQOL-100 and the WHOQOL-BREF), which has been also been used in previous studies among prisoners (e.g., Zwemstra, Masthoff, Trompenaars, & De Vries, 2009). This scale represents quality of life in the psychological, physical, social, and environmental domains. An example item is "How would you rate your quality of life?" Items were rated on a 5-point Likert scale ranging from 1 (V*ery Bad/Very Unsatisfied/Not At All*) to 5 (*Very Good/Very Satisfied/Completely*). This scale was reliable ($\alpha = .79$).

Anxiety Anxiety, as experienced within prison, was assessed with six items from the State subscale of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; $\alpha = .84$). An example item is "Within prison, I feel tense."

Aggression Aggression, as experienced within prison, was measured with an abbreviated 13-item version of the Buss-Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992). The BPAQ measures four types of aggressive traits: physical aggression (e.g., "If somebody hits me, I hit back"), verbal aggression (e.g., "I can't help getting into arguments when people disagree with me"), anger (e.g., "When frustrated, I let my irritation show"), and hostility (e.g., "When people are especially nice, I wonder what they want"). This scale was reliable ($\alpha = .83$).

3.2 | Results

3.2.1 | Descriptive statistics and preliminary analyses

First, as for the responses on the IAT, we found that five participants had a reaction time of 300 ms or less on at least 10% of the trials or had an error rate of at least 40% on either the practice trials (Block 3 and Block 6) or test trials (Block 4 and Block 7) on which the final score is calculated. IAT data of these participants were, therefore, excluded. Next, IAT scores were calculated using the (improved) D4-scoring algorithm (Greenwald, Banaji, & Nosek, 2003). Latencies on error trials were replaced by the mean of the correct responses plus a penalty of 600 ms, and the IAT effect was determined by subtracting the latencies of Blocks 3 and 4 (self + no autonomy desire) from the latencies of Blocks 6 and 7 (self + autonomy desire). To obtain IAT scores reflecting the strength of the association between *I desire freedom* and *true* (autonomy desire IAT), scores were multiplied by –1. To estimate the reliability, we randomly split our data in two equal halves. We then calculated for each subset the D-scores. Next, we correlated the obtained D-scores. This procedure was repeated 1,000 times. The mean correlation of the obtained correlation coefficients was calculated and corrected using the Spearman-Brown formula. As such, a reliability estimate of .83 for the autonomy desire IAT was obtained. Descriptive statistics and bivariate correlations can be found in Table 4. These interrelations, as well as the correlations between study and background variables, are discussed in Appendix S2.

3.2.2 | Frequentist analyses

To investigate whether autonomy desire (explicit and implicit) moderated the relation between autonomy satisfaction or autonomy frustration and the outcomes (i.e., vitality, quality of life, anxiety, and aggression), we performed 16 separate hierarchical regression analyses (eight for the well-

TABLE 4 Study 2: Descriptives of and correlations between the variables

	1	2	3	4	5	6	7	8
Autonomy-related measures								
1. Autonomy satisfaction								
2. Autonomy frustration	−.55***							
3. Autonomy desire, explicit	.04	.20*						
4. Autonomy desire, implicit	.05	−.01	−.06					
Outcomes								
5. Vitality	.32***	−.29***	−.02	.11				
6. Quality of life	.26**	−.29***	−.16*	.12	.61***			
7. Anxiety	−.25**	.39***	.13	−.09	−.57***	−.52***		
8. Aggression	−.13	.35***	.10	−.08	−.07	−.29***	.29***	
M	3.21	3.01	4.56	0.39	2.66	3.26	3.31	2.13
SD	0.99	0.99	0.64	0.33	1.16	0.71	0.91	0.68

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

being indicators; eight for the ill-being indicators, while controlling for all background variables).[5] In a first step, we simultaneously entered the standardized score of autonomy satisfaction or autonomy frustration and autonomy desire (explicit or implicit) as predictors, and in a second step, their respective interaction term was added. Table 5 displays these results, with explicit (left panel) and implicit autonomy desire as moderator (right panel).

With regard to Step 1, autonomy satisfaction related positively to vitality and quality of life and negatively to anxiety and aggression, but only when explicit (and not implicit) autonomy desire was also in the model. In contrast, autonomy frustration related negatively to vitality (except when implicit autonomy desire was also in the model) and quality of life and positively to anxiety and aggression. Further, neither implicit nor explicit autonomy desire yielded any relation with the outcomes, with one exception. Explicit autonomy desire related negatively to quality of life. More importantly, in Step 2, results showed that of the 16 investigated interaction terms, two were significant. Specifically, explicit autonomy desire moderated the relation between autonomy satisfaction and anxiety, whereas implicit autonomy desire moderated the relation between autonomy frustration and aggression. These interactions were further examined by means of simple slope analyses (Hayes & Matthes, 2009; see also Study 1). With respect to the first interaction, we found that autonomy satisfaction related negatively to anxiety among prisoners scoring moderately high ($\beta = –.36$; $t = –3.42$; $p < .01$) or very high ($\beta = –.50$; $t = –3.09$; $p < .01$) on explicit autonomy desire, whereas this association was not significant among those individuals scoring very low ($\beta = .06$; $t = 0.36$; $p > .05$) or moderately low ($\beta = –.08$; $t = –0.77$; $p > .05$) on explicit autonomy desire. The second interaction involving implicit autonomy desire had a very different form and showed that autonomy frustration related positively to aggression among individuals scoring very low ($\beta = .64$; $t = 3.80$; $p < .001$) or moderately low ($\beta = .45$; $t = 4.51$; $p < .001$) on implicit autonomy desire, whereas this relation was not significant for those individuals scoring moderately high ($\beta = .08$; $t = 0.83$; $p > .05$) or very high ($\beta = –.10$; $t = –0.60$; $p > .05$) on implicit autonomy desire.

3.2.3 | Bayesian analyses

Similar to Study 1, we investigated the relative importance of the moderating effect of autonomy strength in the associations between autonomy satisfaction or frustration and well- or ill-being by means of Bayesian analyses (Table 6). With regard to the main effects of autonomy satisfaction and frustration on the outcomes, we found that all indices yielded support in favor of the proposed model ("there is a main effect") versus the null model ("there is no main effect"), with two exceptions. That is, there was no support for the main effects of autonomy satisfaction on quality of life or anxiety. Further, we found no support for a main effect of autonomy strength, except for the model with explicit autonomy desire as a predictor of quality of life. Finally, with respect to the interaction effects, we found either no (for 14 indices) or only weak (for two indices) support in favor of the proposed model ("there are two main effects and an interaction effect") versus the alternative model ("there are only two main effects").

3.3 | Brief discussion

In line with our first hypothesis, we found that autonomy satisfaction related positively to vitality and quality of life (albeit not in the model including implicit autonomy desire) and negatively to anxiety, whereas autonomy frustration showed an opposite pattern together with a significant positive relation with aggression. Further, the pattern for autonomy desire was

TABLE 5 Study 2: Hierarchical regression analyses with autonomy satisfaction or autonomy frustration, explicit autonomy desire or implicit autonomy desire, and their interaction predicting (A) vitality or quality of life and (B) anxiety or aggression

(A) Vitality or Quality of Life								
	Explicit autonomy desire				**Implicit autonomy desire**			
	Vitality		**Quality of life**		**Vitality**		**Quality of life**	
	Step 1 β	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**
Autonomy satisfaction	.29**	.30**	.30**	.30**	.20	.20	.20	.19
Autonomy desire	.01	.00	−.17*	−.18*	.08	.08	.04	.05
Interaction		−.05		−.04		.03		.10
ΔR^2	.07	.00	.10	.00	.04	.00	.03	.01
F for ΔR^2	5.97**	0.34	8.01**	0.21	2.25	0.08	1.88	0.89
Autonomy frustration	−.24*	−.25*	−.27**	−.26**	−.21	−.20	−.28*	−.27*
Autonomy desire	.08	.09	−.09	−.10	.09	.13	.05	.08
Interaction		.03		−.03		−.18		−.16
ΔR^2	.05	.00	.07	.00	.04	.02	.06	.02
F for ΔR^2	3.51*	0.10	5.90**	0.07	2.14	2.34	3.36*	1.94
(B) Anxiety or aggression								
	Anxiety		**Aggression**		**Anxiety**		**Aggression**	
	Step 1 β	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**	**Step 1 β**	**Step 2 β**
Autonomy satisfaction	−.25**	−.24**	−.16*	−.16*	−.20	−.20	−.07	−.08
Autonomy desire	.11	.08	.14	.12	−.08	−.07	.02	.04
Interaction		−.17*		−.10		.03		.07
ΔR^2	.06	.02	.04	.01	.04	.00	.01	.00
F for ΔR^2	5.22**	4.13*	3.78*	1.60	2.30	0.07	0.34	0.60
Autonomy frustration	.38***	.36***	.29***	.30***	.35**	.35**	.37***	.39***
Autonomy desire	.01	.05	.07	.06	−.08	−.09	.03	.08
Interaction		.11		−.02		.04		−.23*
ΔR^2	.12	.01	.08	.00	.09	.00	.09	.03
F for ΔR^2	10.67***	1.52	8.42***	0.06	5.80**	0.13	8.22***	6.13*

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

much less clear-cut, with explicit autonomy desire relating negatively only to quality of life and implicit autonomy desire being unrelated to either well- or ill-being. More importantly, with regard to our second hypothesis, results showed that two interaction effects were significant. The interaction between autonomy satisfaction and explicit desire in the prediction of anxiety was consistent with Study 1 and indicated that prisoners scoring (extremely) low on autonomy desire did not report greater anxiety in relation to low autonomy satisfaction. Yet, the second interaction was very different from Study 1 and suggested that autonomy frustration only related positively to aggression among those (moderately) low in implicit desire for autonomy.

4 | GENERAL DISCUSSION

According to BPNT's universalistic assumption, individuals should benefit or suffer from experiences of, respectively, autonomy satisfaction or frustration even if they do not strongly value or desire getting this need met (Deci & Ryan, 2000). From an MDT perspective, however, one would

TABLE 6 Study 2: Bayes factors for the main effects of autonomy satisfaction or frustration, the main effects of explicit autonomy desire or implicit autonomy desire, and the respective interaction effects

	Explicit autonomy desire		Implicit autonomy desire	
	Vitality	**Quality of life**	**Vitality**	**Quality of life**
Autonomy satisfaction	2.84	0.83	2.84	0.83
Autonomy strength	0.21	2.61	0.35	0.39
Interaction	0.50	0.37	0.34	0.38
Autonomy frustration	4.75	14.00	4.75	14.00
Autonomy strength	0.21	2.61	0.35	0.39
Interaction	0.55	0.30	1.12	0.40
	Anxiety	**Aggression**	**Anxiety**	**Aggression**
Autonomy satisfaction	0.29	2.64	0.29	2.64
Autonomy strength	0.36	0.75	0.28	0.31
Interaction	0.42	0.67	0.39	0.33
Autonomy frustration	3,580.71	816.07	3,580.71	816.07
Autonomy strength	0.36	0.75	0.28	0.31
Interaction	0.26	0.27	1.04	0.29

Note. For the main effects of autonomy satisfaction or frustration and the main effects of explicit autonomy desire or implicit autonomy desire, Bayes factors represent the probability of the Ha model (i.e., "there is a main effect") being true as opposed to the H0 model (i.e., "there is no main effect") being true; for the respective interaction effects, Bayes factors represent the probability of the Ha model (i.e., "there are two main effects and an interaction effect") being true as opposed to the H0 model (i.e., "there are only two main effects") being true.

expect that individuals who attach greater importance to or experience a higher desire for autonomy (compared to those individuals scoring low on these constructs) are more or even only susceptible to both the beneficial and harmful effects of, respectively, need-satisfying and need-frustrating experiences (McClelland, 1965). As previous studies have provided inconsistent results and mostly focused on the needs for competence and relatedness, we examined herein the moderating role of autonomy strength across two samples, thereby making use of both explicit and implicit measures of need strength.

4.1 | The need for autonomy and psychological functioning

In line with our first hypothesis, we found that autonomy satisfaction related positively to well-being and negatively to ill-being, whereas autonomy frustration showed an opposite pattern of results. Across both studies, explicit (but not implicit) autonomy desire was found to be positively related to ill-being and unrelated to well-being. Notably, the need desire–ill-being relation may also be interpreted the other way around, with need desire being rooted in ill-being. Such an interpretation would be congruent with past work by Sheldon and Gunz (2009). Indeed, people who are currently experiencing high levels of autonomy frustration may be especially likely to long for more autonomy. Interestingly, need valuation, which was unrelated to need desire, yielded an opposite pattern of correlates with the outcomes. That is, in Study 1, autonomy valuation related positively to well-being and negatively to ill-being. Also, need valuation correlated positively with need satisfaction and negatively with need frustration, a pattern markedly different from the one observed for need desire. Presumably, due to the benefits accompanying need-satisfying experience, one may come to value the need itself more and even be more sensitive to new opportunities to derive need satisfaction (Moller et al., 2010). Overall, the nonsignificant relation between need desire and need valuation suggests that they do not reflect subcomponents of a higher-order or umbrella construct. Instead, they mark two qualitatively different interpersonal difference variables, with need desire being more deficit based and need valuation being more growth oriented. Future longitudinal studies will do well to examine the longitudinal associations between these four constructs (i.e., need desire, need valuation, need satisfaction, need frustration) to confirm the present interpretation.

Further, in Study 2, we found that explicit and implicit autonomy desire were unrelated. This finding is congruent with previous studies finding no or weak relations between

explicit and implicit measures of need strength (McClelland et al., 1989; Schüler et al., 2016). Based on a meta-analysis by Hoffmann, Gawronski, Gschwender, Le, and Schmitt (2005), the strength of the correlation between the IAT and an explicit measure of the same concept is dependent upon the spontaneity of self-reports and the conceptual correspondence between measures. Previous theorizing indeed pointed to conceptual differences between explicit and implicit need strength, with the former reflecting conscious reflections and the latter reflecting ingrained preferences developed from early affective experiences (McClelland et al., 1989).

4.2 | The moderating role of autonomy desire and valuation

In line with our second hypothesis, we found in general only modest evidence for the moderating role of autonomy strength in the relations between autonomy satisfaction and frustration, on the one hand, and well- and ill-being, on the other. A number of factual findings deserve to be highlighted. For instance, across both studies, 18.75% of the interaction effects turned out to be significant, and these interactions explained between 1% and 4% incremental variance in the outcomes above and beyond the main effects, which already explained between 3% and 33% variance. For some outcomes, such as life satisfaction (Study 1) and quality of life (Study 2), no interaction effects emerged, regardless of the predictor (i.e., need satisfaction or need frustration) and moderator (i.e., need desire or need valuation) being used. Furthermore, because merely counting the number of significant interactions that surpassed the rather arbitrary critical threshold of $p < .05$ sheds insufficient light on the probability of such interactions to emerge, we additionally performed a series of Bayesian analyses. The probability of finding main effects was much larger than that of obtaining interactions, yet some of these interactions were found to be fairly probable to occur. The obtained interactions can be interpreted in various ways.

First, all simple slope analyses indicated that the associations between either satisfaction or frustration and an outcome were more pronounced among those higher in autonomy strength and were sometimes even not significant among those very low in autonomy strength. Such findings indicate that individuals with a very low preference for autonomy might not be affected by these experiences. That is, all significant interaction terms in Study 1 and one of both significant interactions in Study 2 indicated that individuals with a stronger preference for autonomy benefited or suffered more from, respectively, need-satisfying or need-frustrating experiences, a finding congruent with MDT (Schultheiss, 2008). There was one notable exception to this pattern in Study 2, which is hard to account for without the risk of becoming speculative.

Second, the question can be raised whether these findings contradict the BPNT perspective. The answer to this question seems largely dependent upon the perspective one adopts vis-à-vis BPNT. As far as it is said to reflect a strong and radical universalistic framework, there is no room for any moderation at all. Consequently, the current interaction findings disconfirm such a strong interpretation. Yet, most recently, more moderate interpretations of the universalistic assumption have been forwarded (Soenens et al., 2015), which leave room for interindividual differences in the gradation and manifestation of the benefits and costs associated with, respectively, need satisfaction and need frustration. Central to this discussion is the (de)sensitization hypothesis (Moller et al., 2010), which holds that, depending on individuals' history of need-based experiences, one may be more (in)sensitive to the benefits of need satisfaction and the detrimental effects of need frustration. Because the notions of need valuation and need desire reflect different histories of, respectively, accumulated need satisfaction and frustration (Sheldon & Gunz, 2009), they are ideal candidate moderators. The interactions obtained in Study 1 seem largely congruent with such an interpretation, as those high in autonomy strength benefited the most from autonomy satisfaction (Figure 1d) and suffered the most from low need satisfaction (Figure 1a) or high need frustration (Figure 1c). Such findings indicate that some individuals may be more sensitive to need-based experiences.

Overall, then, we can conclude that the more moderate interpretation of SDT and the MDT are both of added value if one wants to make sense of the present findings. Indeed, where SDT's universality claims are largely confirmed in the significant effects of autonomy satisfaction and frustration at moderately low, moderately high, and very high levels of need strength, MDT's "interactionist" claims may apply to individuals very low in need strength. Clearly, more work is needed in this area to replicate the present pattern of findings. The following additional observations regarding the obtained interactions may be useful in this regard as well as in future work. First, most of the significant interactions were observed in Study 1 rather than in Study 2. This could be due to the high mean level of explicit autonomy desire and the rather low observed variance in this construct in the prisoner sample in Study 2, which makes it more difficult to find significant interactions. Also, Study 2 may be slightly underpowered to obtain interactions. Hence, future research may rely on sufficiently large samples to maximize the chance of obtaining significant interactions.

Second, five out of the seven significant interactions across both studies involved explicit autonomy desire. This indicates that individual differences in explicitly assessed autonomy desire are more likely to moderate the effects of need-related experiences than such differences in autonomy valuation. It should be noted that our measures of need desire

are face valid and yield a strong one-to-one relation to the assessed need satisfaction, which may increase the chance of finding an interaction, as the moderator is more closely aligned with the assessed need satisfaction (see also Chen, Van Assche, et al., 2015).

Alternatively, the present findings may suggest that more deficit-based interpersonal differences in need strength, as captured by individuals' desire for autonomy, may yield stronger moderating potential than growth-oriented differences in need strength, as captured by the valuation of autonomy. That is, individuals strongly craving new need-satisfying experiences appeared especially vulnerable to the downsides of low autonomy satisfaction and high autonomy frustration (Figure 1a–1c).

Third, in contrast with previous studies reporting a significant moderating role for implicit (but not for explicit) need strength (e.g., Schüler et al., 2016), we found the moderating role of implicit autonomy desire (Study 2) to be limited and to deviate from the kind of interactions obtained for explicit autonomy strength. Such differential findings may be accounted for by the different operationalization of the implicit measure in the current work. That is, whereas previous work (e.g., Schüler et al., 2016) mainly used picture-based tests, we employed a reaction time–based test. This was done (a) to increase the comparability between our explicit and implicit measures of autonomy desire (i.e., the stimuli used in the IAT were based on the questionnaire assessing autonomy desire), (b) to have a more straightforward and concise measure of autonomy desire, and (c) because of practical reasons (i.e., the coding of story tasks is often rather time-consuming and requires a high level of expertise). Hence, it is important to note that this difference in assessment might result in qualitatively different conceptualizations of need strength. Indeed, it has been argued that picture-based tests are especially valuable in assessing implicit need strength, as these first elicit previous experiences related to the need by exposing individuals to need-related pictures. This arousal of needs (by external pictorial cues) is regarded to be necessary to activate this need strength to come into effect (Heckhausen & Heckhausen, 2008). Subsequently, these picture-based tests assess individuals' operant behavior by letting them indicate their interpretation of the scene depicted in the picture. In this way, individuals are not asked to indicate how they feel with regard to a certain need but are asked to indicate how other people would think, feel, or act with regard to the scene displayed in the picture. As the IAT does not involve the interpretation of pictorial cues but is based on response latencies, it is possible that picture-based tests of implicit need strength are not comparable to an assessment of implicit need strength with the IAT. Future research including both picture-based tests and the IAT is needed to further empirically document the difference in the assessment of need strength (see Schüler et al., 2015).

5 | LIMITATIONS AND DIRECTIONS FOR FUTURE STUDIES

This study had several limitations. First, we employed a cross-sectional nonexperimental design, which precludes the possibility of making causal statements. Future longitudinal and experimental studies are needed to shed more light on the temporal interplay between our study variables. Such studies could, for example, manipulate the degree of autonomy strength and then expose individuals to either an autonomy-satisfying or -frustrating event and, subsequently, assess individuals' current psychological functioning. Second, Study 2 was slightly underpowered with regard to finding interaction effects, and the results regarding interaction effects should therefore be interpreted with caution. Third, although the inclusion of an implicit measure of autonomy desire in Study 2 was a strength and this measure was found to be reliable, we found that implicit autonomy desire was not related to any study variables. These weak relations are perhaps due to the explicit and cognitive nature of all other variables. Indeed, because implicit measures are especially valuable when predicting behavior occurring under reduced cognitive capacity (Gawronski, 2009), it would be interesting to investigate whether implicit autonomy desire predicts spontaneous behaviors or behaviors conducted under pressure. Additionally, future studies on the moderating role of competence and relatedness strength are needed, as studies with respect to these needs have also provided inconsistent results (e.g., Chen, Vansteenkiste, et al., 2015; Schüler & Kuster, 2011). Finally, previous studies on need strength have examined well-being at three distinct levels, that is, in relation to a specific activity at a specific moment (i.e., situational level), in relation to a life domain (e.g., school; contextual level), or toward life in general (i.e., global level; see Vallerand, 2000). Although implicit need strength measures have been found to moderate the relation between need satisfaction and situational and contextual well-being (e.g., Schüler et al., 2010, 2016), such effects have not been observed at the global level (Chen, Vansteenkiste, et al., 2015; Schüler et al., 2013; Sheldon & Schüler, 2011), suggesting a need for more research including outcomes at each of these three levels simultaneously.

6 | CONCLUSION

Across two studies, we found that, overall, experiences of autonomy satisfaction and autonomy frustration contribute to individuals' well-being and ill-being, an effect that was in some cases more pronounced for those scoring high on need strength. The observed moderating role of autonomy strength and especially autonomy desire in these relations was in line

with a dispositional motivational approach, but it also matched with a more moderate interpretation of SDT's universalistic claims. We call for future research that addresses potential complementarity between MDT and SDT so as to gain precise insight regarding the question of which experiences of need satisfaction yield the most optimal outcomes for which persons.

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CONFLICT OF INTERESTS

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ENDNOTES

[1] The data used in Studies 1 and 2 are part of larger data collections. Part of the data of Study 1 was also reported in Chen, Van Assche, Vansteenkiste, Soenens, and Beyers (2015), which focused on the moderating role of environmental safety in the association between all three needs (autonomy, competence, and relatedness) and well-being. A recent article (Van der Kaap-Deeder, Audenaert, et al., 2017) employed the same sample as Study 2 and focused on the role of choice and autonomy satisfaction in prisoners' quality of life.

[2] To examine the unique effects of need satisfaction and need frustration in the prediction of either well- or ill-being, we ran several additional regression analyses examining autonomy satisfaction and frustration *simultaneously*, focusing on either autonomy desire or valuation as a moderator, and the indices of well- or ill-being as an outcome. The results revealed two interesting patterns. First, while only autonomy satisfaction significantly predicted well-being, both autonomy satisfaction and frustration predicted ill-being. Second, none of the interactions reached significance when examining autonomy satisfaction and frustration simultaneously.

[3] Under Belgian law, mentally ill offenders, who are considered not to be accountable for their crime due to their psychiatric disorder, can be interned. Rather than being a punishment, internment is a safety measure that excludes mentally ill offenders from society (to prevent further harm) while also providing treatment (see also Vandevelde et al., 2011, for an overview of internment in Belgium).

[4] We conducted multilevel analyses to investigate whether there was significant variation in the study variables at the between-prison level. This was, however, not the case (with the between-prison variance concerning all study variables ranging between 0% to 11%).

[5] Similar to Study 1, we examined the unique effects of autonomy satisfaction and autonomy frustration in the prediction of all outcomes. We ran eight additional regression analyses examining autonomy satisfaction and frustration *simultaneously*, focusing on either explicit or implicit autonomy desire as a moderator, and the indices of well- or ill-being as an outcome. The results revealed two interesting patterns. First, there was a differentiation between a bright and dark path. That is, only autonomy satisfaction, but not autonomy frustration, was related to vitality (but only in the model with explicit autonomy desire). Both autonomy satisfaction and autonomy frustration did not relate to quality of life. With respect to ill-being, only autonomy frustration, but not autonomy satisfaction, was related to anxiety and aggression. Second, none of the interactions reached significance.

ORCID

Jasper Van Assche http://orcid.org/0000-0002-2570-2928

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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

Appendix S1

Appendix S2

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