Embracing me-time: Motivation for solitude during transition to college

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Abstract

The present research examined the role of university students' motivation for spending time alone in their adjustment to college life, as well as the parenting correlates of students' healthy motivation for solitude. Two studies were conducted on first-year college students in the United States (n = 147) and Canada (n = 223). In Study 1, data was collected at three different time points, separated by two-week intervals. In Study 2, data was collected at two different time points, separated by a month. The results revealed that, for those who reported perceiving lower social belonging, approaching solitary time for autonomous reasons was linked to greater self-esteem (Study 1), and greater sense of relatedness to others and lower loneliness (Study 2). These findings suggest that endorsing a healthy motivation for solitude is not necessarily indicative of social ill-being. Additionally, students' autonomous motivation for spending time alone was associated with having parents that are autonomy supportive and that promote a sense of independence.

Keywords: well-being, autonomous motivation, solitude, loneliness, self-determination theory

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Much research has linked adolescents' and emerging adults' solitude to social isolation, social withdrawal, and peer exclusion (e.g., Boivin, Hymel, & Bukowski, 1995; Goossens et al., 2009; Vanhalst, Luyckx, & Goossens, 2014). On the one hand, adolescence and emerging adulthood are times where social connections are crucial and time spent alone can be daunting and result in loneliness (Larson, 1990, 1997). However, a few studies also suggest that having time to oneself is essential for emotional regulation and identity formation during this stage of life (Larson, 1990; Marcoen, Goossens, & Caes, 1987; Marcoen & Goossens, 1993). This presents a dilemma around adolescents' decisions on how much time they want to spend with others and the time they need for themselves. While social time and solitary time might seem antithetical to one another, it appears that both are important for healthy development. Therefore, the present paper explored the interaction between university students' social life and their motivation for spending time by themselves in the prediction of their adjustment to college. The transition to college is a particularly relevant time to examine motivation for being alone because students are charged with the delicate task of deciding on how much time they want to dedicate for themselves while also trying to navigate their new social life in college.

Indeed, much research has shown that the transition from home to college life is potentially stressful for emerging adults (Wintre & Yaffe, 2000). The way college students navigate this transition has long-term implications to their performance and persistence throughout their academic program. One important pitfall to college students' adjustment is social alienation. Loneliness and isolation are indeed quite prevalent among college freshmen (Berman & Sperling, 1991; Compas, Wagner, Slavin, & Vannatta, 1986; Cutrona, 1982), and can have serious implications for mental health, potentially leading to depression (Joiner Jr., 1997;

Russell, Peplau, & Cutrona, 1980), as well as problems with drug and alcohol abuse (see Kitzrow, 2003).

This struggle to adjust to the first year of college life can come from a combination of several factors, such as being shy or introverted, separation anxiety, lack of social support, and lack of autonomous functioning (Dyson & Renk, 2006; Halamandaris & Power, 1999; Holmbeck & Wandrai, 1993). Besides helping college freshmen to choose their courses, most first year programs and orientations focus on organizing social events that provide freshmen opportunities to make new friends. Nonetheless, heavy emphasis on building up one's social life potentially adds additional strain, leading some students to experience social isolation during their first year despite being surrounded by many peers of the same age (Berman & Sperling, 1991; Cutrona, 1982; Russell, Peplau, & Cutrona, 1980). Indeed, spending too much time socializing and having little time for oneself may also be associated with poor adjustment (Larson, 1990; Larson & Csikszentmihalyi, 1978). Thus, although there is a lot of focus on how first-year students' social life can be enhanced, existing research has paid little attention to the possibility that solitary time during adolescence and emerging adulthood is also a necessity and can even be a developmental asset (Larson, 1990; Marcoen, Goossens, & Caes, 1987).

The Significance of Solitude in Adolescence and Emerging Adulthood

Solitary time plays a potentially important role in adolescents' psychosocial adjustment, particularly during the process of identity formation. Solitary time affords young people the opportunity to explore interests and pursue goals without supervision from their parents or social pressures from their peers (Ammanity, Ecolani, & Tambelli, 1989; Buchholz, 1997; Buchholz & Chinlund, 1994; Buchholz & Catton, 1999). Thus, solitary time can be used to detach from societal pressures and get back in touch with one's own personal values and interests. In turn,

being more in touch with these values and interests allows people to regulate their behavior with a greater sense of volition, self-concordance, and self-endorsement (Assor, 2018; Kernis & Goldman, 2006; Ryan & Connell, 1989). In turn, this sense of authenticity is likely to contribute to an individual's well-being and the quality of their social interactions (Kernis & Goldman, 2006).

Nonetheless, if solitary time is beneficial to adolescent development, why does solitude often lead to negative emotions and loneliness? Several scholars indicate that the answer to this question depends on individuals' motivation for solitude (Galanaki, 2004; Long, Seburn, Averill, & More, 2003), a factor that is often overlooked in the literature (Coplan, Ooi, & Baldwin, 2018). While motivation is often acknowledged, it is typically conceptualized as a continuum, such that one's motivation for spending time alone is antithetical to their motivation for spending time with others. In this sense, the preference for being alone over being with others has been linked to a variety of negative constructs like anxiety, depression, and emotion dysregulation (Wang et al., 2013). However, we argue that the type of motivation for solitude that pertains to social avoidance ought to be distinguished from the motivation to pursue time alone for its benefits and enjoyment (Larson, 1997). Larson (1997) referred to the former motivation as reactive solitude, which is antisocial and maladaptive, and called the latter motivation a more constructive type of solitude.

Although several scholars called for an examination of constructive and high-quality motivation for being alone, empirical research on this topic is scarce (see review by Coplan, Ooi, & Baldwin, 2018). Herein, we address the notion of high-quality motivation for being alone from the perspective of self-determination theory (SDT). The theoretical framework of SDT (Ryan & Deci, 2017) fits nicely into the investigation of how individuals' motivation for spending time

alone contributes to well-being. From the SDT perspective, motivation for being alone is not simply about the extent to which one prefers being alone (relative to preferring to being with others) (akin to reactive solitude; Larson, 1997). Instead, the act of being alone can be regulated by more autonomous or more controlled reasons. A person might spend time alone due to external circumstances such as when the person is being excluded (external regulation) or due to internal pressure such as when he or she isolates himself or herself in fear of social rejection (introjected regulation). People may also want to spend time alone for more volitional reasons, including wanting to spend time alone because they consider solitude to be valuable and important (identified regulation), or simply because they enjoy it (intrinsic motivation). The more the reason for being alone has been internalized, the more autonomously motivated one is toward solitude.

In SDT, autonomous motivation for being alone is the capacity to regulate time alone in ways that are valuable and enjoyable, without internal pressures or external controls. Because solitude is an experience that can be easily avoided with easy access to social media and instant messaging, the ability to value and enjoy solitude in adolescence might be a sign of regulatory maturity and may have direct impact on adolescents' psychosocial development. To date, only two studies addressed the role of autonomous motivation for being alone in individuals' well-being. In a study conducting with a U.S. college sample, results showed that when students pursued solitude for more autonomous reasons (i.e., for the benefits and enjoyment), they derived more pleasure and psychological benefits from it (Nguyen, Ryan, & Deci, 2018). These results were consistent with previous findings by Chua and Koestner (2009) showing that when people spend time alone because they enjoy or value it, the amount of time they spend alone was not associated with increased loneliness or decreased life satisfaction.

Expanding on these previous findings, the objective of the present study was to examine the associations between autonomous motivation for being alone among first-year college students and their psychosocial adjustment as they transition to college. We considered the role of autonomous motivation in a more dynamic fashion, examining whether college students fare better (in terms of psychosocial adjustment) in periods in which they display more autonomous motivation for being alone than usual. To this end, we measured motivation and psychosocial adjustment three times across brief periods of time (with two weeks in between assessments) and observed how fluctuations on those factors co-varied over time. This selection of brief (two-week) time intervals informed by research showing that freshmen students' adjustment changes substantially and rapidly during the first year transition to college (Baker & Siryk, 1984). Another way in which we advanced previous research is by including measures of both personal and relational adjustment. Specifically, we looked into first year college students' self-esteem, depressive symptoms, sense of relatedness to their peers, and degree of loneliness experienced in the first semester of college. We predicted that autonomous motivation for spending time alone – that is, spending time alone because it is enjoyable and valuable – would relate to positive personal and social adjustment during their first semester in college.

The Interaction Between One's Social Experiences and their Motivation for Solitude

Would wanting time alone necessarily interfere with one's social life? Most would answer yes; after all, loners are often unpopular among peers so wanting time alone might inevitably hurt one's social life. Indeed, the paradox between the desire to connect with friends and the desire to have time for oneself during adolescence raises questions about the interplay between college freshmen's social life and their motivation for spending time alone. Having friends to hang out with (see meta-analysis by Chu, Saucier, & Hafner, 2010) and having

valuable time for oneself (Chua & Koestner, 2008) both contribute to adolescents' and emerging adults' well-being, but these two factors have always been studied separately. Since solitude is commonly studied as a risk factor because it seems to work against human nature as social organisms, the true test to see whether motivation for solitude would contribute to psychological well-being is to examine (1) how motivation for being alone would predict well-being independently from the benefits of social belonging, and (2) how motivation for being alone interacts with our social belonging.

Because this question has not been considered before, we could draw from several perspectives to predict the directions of the interaction between social belonging. From the perspective that seeking solitude is antithetical to human need for social belonging (Long, Averill, Seburn, & More, 2003), valuing time alone might hinder one's ability to connect and relate to others. So, one possibility is that enjoying and valuing one's solitary time might compromise the benefits of social belonging. In other words, valuing alone time might affect those with higher sense belonging more negatively compared to those with lower sense of belonging, such that the more they enjoy their solitary time, the less they benefit from social belonging. Statistically, this would mean that the association between social belonging and indicators of psychological adjustment decreases at high levels of autonomous motivation for being alone.

Conversely, it is also possible that those who experience a greater sense of belonging might benefit from valuing their alone time, such that the time they spend alone could provide opportunities to recharge between social interactions (Larson, 1990; 1997; Suedfeld, 1982). If that is the case, autonomous motivation for time alone might interact with social belonging in a more enhancing manner. Thus, valuing alone time would affect those people with higher levels

of belonging more positively, such that they experience even greater benefits when they spend time alone for autonomous reasons, compared to those who feel lower sense of belonging. In other words, the two variables could combine in an enhancing manner, whereby valuing and enjoying solitary time has greater benefit to adjustment outcomes for those who have a vibrant social life.

Finally, another contending pattern of findings is that the two variables could combine in a compensatory manner, such that valuing one's time alone has greater impact on well-being for those with less social belonging and fewer friends in college. This compensatory hypothesis has been largely unexplored in research on solitude. Essentially, support for this hypothesis would suggest that for those who feel isolated from their social group, cherishing the time they spend alone might buffer the negative outcomes of lacking social connections. One study that can speak to this compensatory interaction was conducted by Chua and Koestner (2008), showing that greater amount of time spent alone was associated with loneliness, but autonomous motivation for time alone cancelled out this negative effect. Besides, the idea that solitude can be embraced as a tool to cure social disconnections has been proposed in multiple outlets (Buchholz, 1997; Storr, 1989). In summary, we considered three competing hypotheses, one involving an "undermining" effect of motivation for being alone on the benefits of social belonging, the second involving an "additive" interaction, and the third hypothesis involving a "compensatory" interaction between the two variables.

Perceived Parental Autonomy-Support as a Developmental Predictor of Autonomous Motivation for Being Alone

Given the presumed role of autonomous motivation for being alone in college students' adjustment, it is also important to understand the developmental antecedents of the degree to

which students have learned to value the time they spend by themselves. Many theories suggest that the ability to enjoy one's own company is acquired through one's development rather than being innate (e.g., Winnicott, 1958). In fact, early in life, it is essential that the caregiver is always by the child's side and ready to attend to the child's needs. Therefore, learning to deal with brief separation from the caregiver is an important milestone that every child needs to go through. Research within the developmental literature suggests that how a child handles the time away from their caregiver depends at least partly on the quality and style of interaction between parent and child (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1980). Similarly, self-determination theory would propose that the way a child learns to regulate his or her alone time might depend on parenting practices.

The ability to be alone indicates independence and individuality, orientations that are highly valued in individualistic cultures such as the United States. It is a common practice in the these more Western countries to teach children to be independent by encouraging them to perform different activities alone. For example, parents will have children sleep in a separate room at an early age (Morelli, Rogloff, Oppenheim, & Goldsmith, 1992; Valentin, 2005), allow them to commute to school by themselves, encourage them to get a part-time job to generate their own income, and ultimately encourage them to move out and live on their own. This parental encouragement of independence (Silk, Morris, Kanaya, & Steinberg, 1993) is likely to be involved in adolescents' and emerging adults' capacity and health motivation for being alone. However, it is particularly likely to contribute to high-quality motivation for being alone (i.e., autonomous motivation) when parents are at the same time sensitive to their children's preferences and needs and allow them to choose how, when, and how fast they want to be independent (Soenens et al., 2007).

Conceptual Distinction between Promotion of Independence and Autonomy Support.

Parents' promotion of independence and autonomy support ought to be distinguished even though researchers and laymen often conflate the two as the same construct. According to Soenens, Vansteenkist, Lens, et al. (2017), the two concepts share some conceptual similarity such that both approaches concern with "having children make personal decisions and choices" (p. 635). However, for parents high in the promotion of independence, the emphasis is on withdrawing involvement so that the children will make decisions on their own. On the other hand, autonomy supportive parents will try to understand children's point of view and provide support as needed, so that children will be able to make decisions that are congruent with their values and interests. As such, while both approaches deal with parents' having children make personal choices, promotion of independence focuses more on bringing children to a place where children will not need parents' assistance, whereas the autonomy supportive approach aims more toward allowing children to make their own choice with the parents providing support, guidance, or whatever else a child may need.

Similarities and differences can be reflected in the items that measure each construct. For example, both the measure of promotion of independence by Fousiani et al (2014) and the measure of autonomy support by Grolnick et al. (1991) include items that concern parents' intending that children make their own decisions (e.g., "my mother/father wants me to make choices on my own" from Fousiani et al.'s (2014) measure; "my mother/father allows me to decide things for myself" from Gronick et al.'s (1991) measure). Nonetheless, while all the items in Fousiani et al.'s (2014) measure focus on parents' wanting children to make decisions independently or solve problems without the parents (e.g., "my mother/father thinks it's important that I am independent" or "my mother/father thinks it's important that I can solve

problems without him/her"), Gronick et al.'s (1991) measure included items that reflect parents' listening to children's perspectives and considering children's needs and points of view (e.g., "my mother/father listens to my opinion or perspective when I've got a problem", "is usually willing to consider things from my point of view") (see Fousiani et al. (2014) for descriptions of confirmatory factor analysis of the two measures).

Previous studies distinguished these two parenting constructs by showing that promotion of independence and autonomy support were associated with different types of psychological processes in children (Soenens, Vansteenkiste, Lens, et al., 2007; Fousiani, Petegem, Soenens, et al., 2014). When parents push children to make choices and decisions on their own, children might learn to detach from parents and feel like they have to decide without parents' help. This parents' push for independence is different from the parenting style where children are allowed to make independent decisions while parents are available to provide support and inform children's decisions (e.g., by proving meaningful rationales rather than simply telling children what to do).

It was suggested that parental promotion of independence is assumed to be most beneficial when parents also support their children's volitional functioning (i.e., by taking into account their children's perspective and by providing choices) (Fousiani et al., 2014). In contrast, the pursuit of independence can have adverse effects on the child's development when the parents push the child to become independent in a pressuring and rigid manner. This can lead the child to doing things on his or her own with a lot of anxiety, guilt, and resentment toward the parents (Lopez, Campbell, & Watkins, 1988), resulting in less autonomous motives for being alone. Therefore, it can be expected that parents who encourage adolescents to be on their own from time to time and who, at the same time, support adolescents' volition and choicefulness,

create optimal conditions for the development of an autonomous orientation towards solitude. Thus, we expected a combination of parental promotion of independence and parental autonomy support to be most strongly predictive of autonomous motivation to spend time alone.

The Present Research

The present research had two aims. First, we investigated whether solitary time played a significant role in university students' adjustment to college life. Specifically, we examined how autonomous motivation for solitude – the extent to which one pursues solitude for meaningful values and enjoyment – differentially predicts well-being based on a person's sense of belonging within their social groups. We determined that college freshmen would be an appropriate sample for this question given this sensitive transition period that is often characterized by loneliness and isolation (e.g., from moving to a new place alone, often times being a student's first time away from parents, leaving behind good friends and having to develop new relationships, etc.).

Because first-year college students are likely to vary on how much they feel like they belong to their new circle groups, we were interested in the interplay between students' sense of belonging in college and their motivation for solitary time. We investigated three competing hypotheses:

1. whether autonomous motivation for being alone would undermine the benefits of social belonging,
2. whether autonomous motivation for being alone would play a more significant role for those with higher sense of belonging and are likely to need time alone to recharge, or
3. whether autonomous motivation for being alone would be more beneficial for those with lower social belonging and thus are likely to benefit more from a "good" time alone.

Finally, we wanted to understand how parent-child relationships would relate to the quality of college students' motivation for solitude, testing the hypothesis that having more autonomy supportive parents would be related most strongly to autonomous motivation for being alone.

Statement of Transparency

Using an exploratory-confirmatory paradigm, we investigated the aforementioned questions in two studies. In the first exploratory study, we examined the relation between variables of interest in a larger survey on freshmen's adjustment in a private university in the United States. Then, in an attempt to replicate the findings found in Study 1, we conducted Study 2 with an independent sample of freshmen attending a public university in Canada. The data for this study was collected as part of a larger exploratory study on goal pursuit, with the relevant measures included for the purposes of testing the ideas discussed herein. All research questions, hypothesis, and a draft of the analytical strategy for Study 2 were posted on the Open Science Framework prior to data analysis. The pre-registration for Study 2, as well as all materials for both studies are also available. Project link: (anonymous link for peer review: https://osf.io/zy8f2/?view_only=a2251fa97cda4281851ebfaef38e89ab)

Study 1

Participants and Procedure

We recruited first-year students from a private university in the Northeast of the United States. The study was advertised in a freshmen-only Introduction to Psychology course in the Fall semesters in 2016 and 2017. Participants received course extra credit for their time. Across both semesters, we recruited 147 first-year undergraduate students (43 males, 100 females, 4 no response) around the age of 18. The sample consisted of 42% Caucasians, 47% Asians, 5%

Hispanics or Latina, and 6% Black, African American, or other races. Attrition was less than 10% over time: 146 completed survey the first survey, 138 completed the second survey, and 134 completed the third surveys.

Subjects were enrolled into the study on a rolling basis during the October of their first semester in college. After the subjects filled out the first survey, they received the link to the second survey two weeks later, and the link to the third survey one month after the initial survey. The survey included questionnaires about participants' perceptions of their parents, personality (e.g., shyness, introversion), motivation for spending time alone, perceived social belonging, and relational and personal well-being within the past two weeks.

Measures

Perceptions of parents. We measured perceived parents' promotion of independence using the 6-item revised Promotion of Independence Scale developed by Fousiani et al. (2014). This measure assesses the extent to which parents value and encourage independence in their children. A few sample items are "My mother/father thinks it's important that I am independent" and "My mother/father wants me to make choices on my own." Perceived parental autonomy support was measured with the Autonomy Support scale of the Perceptions of Parents Scale (Grolnick et al., 1991). A few examples of items are "My mother/father, whenever possible, allows me to choose what to do" or "My mother/father tries to tell me how to run my life" (reverse score). Responses for both mothers and fathers were made on a scale from 1 (*not at all*) to 5 (*very true*). All parenting variables were averaged across the three time points to obtain overall estimates of freshmen' perceptions of their parents. If either parent was absent in participants' life, they were instructed to skip the questions for that parent.

Personality. We tested our hypotheses using two dimensions of personality as control variables: shyness and extraversion. Specifically, subjects rated items from the Shyness Scale (Cheek & Buss, 1981; e.g., "I feel inhibited in social situations" and "I am often uncomfortable at parties and other social functions") and from the Extraversion subscale taken from the Big-Five-Inventory (John & Srivastava, 1999; e.g., "I am someone who is talkative" and "I am someone who generates a lot of enthusiasm"). Items were rated on a scale from 1 (*definitely true*) to 5 (*definitely false*). Items were reverse coded so that higher scores indicated greater levels of extraversion and shyness.

Autonomous motivation for spending time alone. Autonomous motivation for spending time alone was measured using items from the Self-Regulation Questionnaire (Ryan & Connell, 1982). Two items asked whether participants were alone because they generally enjoy spending time alone (i.e., intrinsic motivation); two items asked whether it was because they generally value time alone as an important and valuable part of their day (i.e., identified motivation); two items asked whether it was because they generally feel that they should be like everyone else does (i.e., introjected motivation); and finally, two items asked whether it was because they generally feel forced into it due to some external circumstances (i.e., external motivation). Items were rated on scale from 1 (*not at all true*) to 7 (*very true*). A Relative Autonomy Index (RAI) was created using the following formula: Intrinsic x 2 + Identified x 1 – Introjected x 1 – External x 2 (Connell & Ryan, 1986; see Appendix B). Therefore, higher RAI scores represented greater autonomous motivation for spending time alone.

Social belonging. We used the Belonging subscale from the Social Support Questionnaire (Sarason, Levine, & Basham, 1983). This perceived belonging subscale assessed the extent to which subjects perceived that they had friends to spend time with or felt that they

belonged to the social groups around them at the time of assessment. Some sample items would be "When I feel lonely, there are several people I can talk to" or "I feel like I'm not always included by my circle of friends". Items were rated on scale from 1 (*definitely true*) to 5 (*definitely false*). Items were reverse coded so that higher scores indicated greater sense of social belonging.

Personal and relational well-being. To measure freshmen's relational and personal well-being, we used the UCLA Loneliness Scale (Russell, Peplau, & Ferguson, 1978), the Relatedness Need subscale from the Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015), the Rosenberg Self-Esteem Scale (Rosenberg, 1965), and the Center for Epidemiologic Studies Depression scale (CES-D; Hann, Winter, & Jacobsen, 1999). Participants were prompted to report their answers while thinking about how they had felt in the past two weeks. The UCLA Loneliness Scale asked participants about their experience of loneliness and included items such as "I felt left out" or "I lacked companionship." The BPNSFS consisted of items that measured both the degree to which the participants felt that their need for mutual connection with others was satisfied (e.g., "I feel that the people I care about also care about me") and the degree to which they felt that the need was undermined (e.g., "I feel excluded from the group I want to belong to"). The items that assessed this thwarted sense of relatedness were reverse-coded and combined with the items that assessed satisfied sense of relatedness to make up the composite for the relatedness need satisfaction variable (i.e., higher scores indicate a greater sense of relatedness satisfaction). The Rosenberg Self-Esteem Scale measured the extent to which the subjects regarded of themselves as worthy and valuable, including items such as "On the whole, I am satisfied with myself" or "At times I think I am no good at all" (reverse score). Finally, the CES-D measured how much participants felt that different aspects of their life

were not going as desired. Sample items include "I felt depressed" or "I could not get 'going." All items were rated on a scale from 1 (*not at all true*) to 7 (*very true*).

Statistical analyses

Because we were interested in examining whether fluctuation in motivation for spending time alone was associated with fluctuation in psychological adjustment in college, we analyzed our data in a multilevel framework using HLM 7.0 (Raudenbush, Bryk, & Congdon, 2011) with three assessments nested within person. Because we treated children's experiences with parents and their personality as stable constructs, perceptions of parents and personality traits were averaged across three time points and were be used as level-2 predictors (i.e., the level of inter-individual differences). All other variables were considered at level 1 (i.e., the level of intra-individual fluctuation). To obtained standardized coefficients, all variables were converted into z-scores prior to analysis.

Specifically, we conducted a series of two-level models to investigate 1) whether motivation for being alone modified the association between perceived social belonging and personal and relational well-being, and 2) the effect of parents' promotion of independence and their provision of autonomy support (as well as their interaction) in predicting adolescents' motivation for being alone.

To investigate the association between motivation for solitude and well-being outcomes and interaction of motivation for being alone with perceived belonging, we performed the following model:

$$Y_{ij} = ß_{0j} + ß_{1j}(RAI_{ij}) + ß_{2j}(Belonging_{ij}) + ß_{3j}(RAI \times Belonging_{ij}) + e$$

Where $ß_{1j}$ captures the extent to which changes in RAI between time of surveys covary with changes in well-being, and $ß_{2j}$ represents the extent to which changes in perceived belonging

between time of surveys covary with changes in well-being. Finally, $ß_{3j}$ captures the degree to which the associations between RAI and well-being outcomes would differ across different levels of perceived belonging. To calculate the interaction between motivation for solitude and perceived belonging, we first standardized the raw scores across all level-1 rows in SPSS, then multiplied two standardized variables of motivation for solitude and perceived belonging to calculate the interaction. Standardizing was the technique we used to center the two variables, perceived belonging and motivation for solitude, before we calculated their product for the interaction term. Motivation for solitude, perceived belonging, and the interaction term then were entered into HLMs as mean-centered variables (using the group-centered option in HLM 7.0).

Following the suggestions by (Nezlek, 2001), the intercepts, the slopes for social belonging and autonomous motivation for spending time alone were modeled as random effects. If any model took more than 100 iterations to converge, we looked for any random coefficient that yielded the lowest reliability estimate and dropped that random coefficient from the model. So, for the models predicting loneliness, depression, and self-esteem, the slope of autonomous motivation would need to be fixed for the models to converge. Likewise, for the model predicting relatedness to converge, the slope of belonging would need to be fixed.

Because HLM 7.0 only tolerated missing values at level 1, for any level-2 variables that had missing values, we replaced the missing values with the mean. There were only 2 cases when that was done. One subject did not answer questions for the father, so the missing value was replaced with 0 once the variable was converted to z-scores. Four subjects identified with a third gender besides male or female or did not report gender, so their value for the gender was replaced with .71, which is the average of all level-2 data points for gender (coded 0 for male, and 1 for female)

Additionally, in level-2 model, we also controlled for the extent to which participants exhibited personality traits that were associated with a higher likelihood of spending time alone like introversion (Leary, Herbst, & McCrary, 2003; Long, Seburn, Averill, & More, 2003) or traits that were associated with lower belonging in college, like shyness (Joiner Jr., 1997; Mounts, Valentiner, Anderson, & Boswell, 2006).

Finally, to investigate the links between parents' promotion of independence (PI) and autonomy support (AS) to subjects' motivation for being alone, we entered motivation for being alone to this level-1 model as the outcome variable:

$$ß_{0j} = \gamma_{00} + \gamma_{01}(\text{Gender}_j) + \gamma_{02}(\text{Extraversion}_j) + \gamma_{03}(\text{Shyness}_j) + \gamma_{04}(\text{PI}) + \gamma_{05}(\text{AS}) + \gamma_{06}(\text{PI} \times \text{AS}) + r_0$$

Where γ_{04} and γ_{05} capture the extent to which each parenting practice independently predicted overall motivation for being alone, and γ_{06} represents whether parents' promotion of independence would be linked to motivation for being alone differently when paired with the presence, or lack thereof, of autonomy support. Again, we standardized all level-2 variables prior to entering them into the model, and calculated the interaction term (i.e., PI × AS) using the standardized variables (i.e., PI and AS). We performed separate analyses for maternal and paternal ratings.

Results

Interaction of Social Belonging with Motivation for Time Alone

Consistent with previous literature (Dyson & Renk, 2006; Halamandaris & Power, 1999; Holmbeck & Wandrai, 1993), perceived belonging showed strong negative associations with loneliness and depression and strong positive associations with relatedness and self-esteem. While zero-correlations between autonomous motivation for spending alone and college

adjustment outcomes were significant and in the expected directions (see *Table 5a*), the main effect of motivation for time alone correlated significantly only with greater sense of relatedness.

Interactions between autonomous motivation for time alone and perceived belonging emerged in the model that predicted self-esteem (*ß* = -.12, 95% CI = [-.22, -.02]) (see *Table 1*). The interaction effect was not statistically significant for loneliness (*ß* = .01, 95% CI = [-.08, .11]), depression (*ß* = .08, 95% CI = [-.04, .20]) and relatedness (*ß* = -.07, 95% CI = [-.17, .03]).

Analyses of the simple effects indicated that autonomous motivation for being alone related to self-esteem differently for those who were high compared to those who were low in perceived belonging. The link between autonomous motivation for solitude to self-esteem was negative among those with high perceived belonging (*ß* = -.05, CI 95% = [-.19, .09]), but positive among those with low belonging (*ß* = .18, CI 95% = [.04, .32]). As seen in Figure 1, whereas autonomous motivation for spending time alone did not relate to self-esteem for those who perceived high belongingness in college, having an autonomous motivation for spending time alone was associated with greater self-esteem for those who did not belong to their peer groups.

Perceived Parenting as a Predictor of Autonomous Motivation for Being Alone

In the third set of multilevel hierarchical regressions, we examined the associations between adolescents' general perceptions of their parents with their motivation for spending time alone. Parenting variables were all entered in the models at Level 2 to predict motivation for spending time alone at level 1, again controlling for gender, extraversion, and shyness.

For both mother and father, promotion of independence significantly predicted greater autonomous motivation for spending time alone. There was no significant association between perceived parents' autonomy support with autonomous motivation for spending time alone.

However, autonomy support moderates the extent to which promotion of independence was associated with greater autonomous motivation for spending time alone both in the maternal and paternal ratings (mother: *ß* = .15, CI 95% = [.03, .27]; father: *ß* = .22, CI 95% = [.08, .36]) (*see Table 2*).

Analyses of the simple effects showed stronger link between mother's promotion of independence and autonomous motivation for solitude at higher level of mother's autonomy support (*ß* = .58, CI 95% = [.33, .83]). The association was weaker at lower level of mother's autonomy support (*ß* = .27, CI 95% = [.09, .45]) (see Figure 2). Likewise, there was a stronger association between father's promotion of independence and autonomous motivation for solitude at higher level of father's autonomy support (*ß* = .71, CI 95% = [.42, 1.00]). The association was weaker at lower level of father's autonomy support (*ß* = .27, CI 95% = [.09, .44]) (see *Figure 3*). Overall, the findings suggested that the combination of parental encouragement of independence and support for volitional functional function was most strongly predictive of the extent to which college students regulate their time alone more autonomously.

Brief Discussion

Findings of this first study suggested that the way in which first-year college students regulate their solitary time plays a meaningful role for their adjustment to college. Controlling for extraversion and shyness, the results showed that having an autonomous motivation for solitude – a motivation to spend time alone for its own sake or its intrinsic values – was associated with higher self-esteem for those who perceived lower sense of belonging in college. This finding is consistent with findings from a few previous cross-sectional studies (Chua & Koestner, 2014; Nguyen et al., 2018) and extends these studies by demonstrating the importance of autonomous motivation for being alone at the level of college students' adjustment.

Study 2

The purpose of this second study was to replicate the findings in Study 1 in a new sample. Based on some of the limitations in the previous study, we made the following adjustments. In Study 1, the sample size was relatively small despite recruiting participants across two semesters, and so in the present study we aimed to recruit a higher number of participants.

Additionally, items that assess mother's and father's promotion of independence (Fousiana et al., 2014) overlap with items that assess mother's and father's autonomy support (Grolnick et al., 1991) (i.e., "my mother/father tries to tell me how to run my life", "my mother/father allows me to decide things for myself"), resulting in high correlation between the two variables (r = .64). Therefore, in Study 2 we re-examined the interaction of parents' promotion of independence and parents' autonomy support and reported the interaction when we used the original scale as well as when we had those overlapping items removed[1].

Finally, in Study 1, there was high correlations between well-being measures across three time points[2] (see *Table 5b*), so we opted not to perform lagged regression analyses using prior measures of social belonging to predict later measures of well-being. Therefore, in Study 2, we administered surveys at times that are further apart; that is, one month instead of two weeks, and

[1] We performed exploratory factor analyses on all the items assessing perceptions of parents in Study 1. For both set of items about mother and father, we identified two items from the autonomy support measures that loaded onto the factor of the promotion of independence measures. Those two were: "my mother/father, whenever possible, allows me to choose what to do" and "my mother/father allows me to decide things for myself". We also identified three other items that loaded onto a separate factor, including "my mother/father tries to tell me how to run my life", "my mother/father insists upon my doing things his/her way", and "my mother/father isn't very sensitive to many of my needs". As such, to be the most conservative with our revised measure for autonomy support, we removed all those five items and used only the four items that pertain to parents' willingness to listen to children's point of view and helping children make informed decisions (see *Appendix A*). Those four items yielded satisfactory internal consistency for both scales for mother (α = .78) and father (α = .77) (see *table 6*).

[2] As seen in *Table 5b,* the correlations between Time 1 and Time 2 measures of loneliness, depression, self-esteem, relatedness ranged between .50 and .70, and the correlations between Time 2 and Time 3 measures of those outcomes ranged between .60 and .75. These high correlations suggested that there is little change over time, which would make it difficult for the lagged models to converge.

we aimed to conduct regression analyses to examine whether Time 1 (T1) variables would predict changes in well-being from Time 1 to Time 2 (T2).

Participants and Procedure

Two hundred and twenty three first-year students from a public university in the South East of Canada signed up to participate in an online survey. Three students were excluded from the data because they were not first-year students, and so the final sample was comprised of 220 participants (43 males, 176 females, 1 other), most of whom were 18 years old (n = 119). The mean age was 18.54, and participants were predominately White or Caucasian (58%), followed by Asian (19%), Black or African American (9%), Hispanic or Latino/a (5%), Aboriginal (2%), and other (14%).

Toward the beginning of the Fall 2017 semester, students in their first year of college and who were enrolled in an introductory psychology course were invited to participate in a larger longitudinal study on personality and goal pursuit. Participants received course extra credit for their time. Between mid-October and the first week of November, participants completed an initial survey, including the same measures that were used in Study 1. Those are the measures for perceptions of parents (i.e., promotion of independence, autonomy support), personality controls (i.e., extraversion, shyness), social belonging, autonomous motivation for spending time alone, and college adjustment (i.e., loneliness, depression, self-esteem, relatedness).

Then, one month later (between the end of November and beginning of December), participants completed a brief follow-up survey, including *only* the measures of college adjustment (i.e., loneliness, depression, self-esteem, relatedness). The measures of perceptions of parents, personality controls, social belonging, and autonomous motivation for spending time alone were not included in the follow-up surveys.

The only deviation from the measures included in Study 2 was that all items were rated on a scale from 1 (*not at all*) to 7 (*very true*). Therefore, there were some differences in the means reported in *table 5a* of Study 1 and *table 6a* of Study 2. Because of this difference, all variables in the current study are standardized. Interaction terms were the products calculated using the standardized scores.

Results

Interaction of Social Belonging with Motivation for Time Alone

In Study 2, perceiving a greater sense of social belonging to their college and having autonomous motivation for spending time alone simultaneously predicted lower levels of loneliness and depression, and greater levels of relatedness to other and self-esteem (see *Table 3* and *Table 6a*). Perceived social belonging and motivation for time alone also significantly interacted when predicting loneliness and relatedness. The results remained unchanged after we controlled for subject's extraversion and shyness (see *Table 3*), and also after we added age and gender into the regression models.

Analyses of the simple slopes showed that having autonomous motivation for time alone cancelled out the association between perceiving low social belonging with loneliness. In other words, among those who do not feel like they belong to their college environment, students with higher autonomous motivation for spending time alone reported feeling less lonely than those who reported low autonomous motivation for solitude (*ß* = -.32, CI 95% = [-.44, -.20]). The slope of autonomous motivation for solitude on perceived loneliness was not significant for those who perceived high belonging in college (*ß* = -.04, CI 95% = [-.21, .13]). In other words, for first-year students who felt a low sense of belonging to their college environment, when they endorsed high autonomous reasons for spending time alone - spending time alone because they

enjoy solitude and see it as beneficial and valuable – they felt less lonely compared to those who did not see solitude as enjoyable or valuable (see *Figure 4*).

The interaction between perceived social belonging and autonomous motivation for time alone was also significant for students' perceived relatedness to others. Analyses of the simple slopes showed that having autonomous motivation for time alone was positive associated with feeling greater relatedness to others for those who perceive low levels of social belonging in college (*ß* = .28, CI 95% = [.14, .42]). The association was not significant for those who perceive high levels of social belonging (*ß* = .06, CI 95% = [-.08, 20]). In other words, for first-year students who felt a low sense of belonging to their college environment, when they endorsed high autonomous reasons for spending time alone, they reported a greater sense of relatedness to others compared to those who did not see solitude as enjoyable or valuable (see *Figure 4*).

Overall, the results are consistent with Study 1 in suggesting that autonomous motivation for solitude might have some beneficial effects on well-being for those who don't feel like they belong to their college environment.

Exploratory Analyses. Another question we planned to explore was whether this interaction effect would predict change in first-year students' well-being one month later. Per our preregistered plan, we performed the regression analyses using the well-being scores obtained one month after as outcome variables, with perceived belonging, autonomous motivation for time alone, and their interaction term as predictors. We also controlled for extraversion, shyness, and well-being scores from T1. The sample size with available data for this set of analyses is 131, due to large attrition[3] (59% of original sample size). None of the analyses yielded meaningful results with $p < .05$.

[3] While we acknowledge that such a large attrition rate is normally of concern, in the present study we experienced this issue due to a recruitment error, not necessarily because of the quality of the data or participants. Specifically,

Interaction of Parents' Promotion of Independence and Autonomy Support

We performed two separate set of analyses; one using the same scale calculation of parents' autonomy support as Study 1 (9 items) and another using the revised scale calculation after removing the overlapping items with promotion of independence (4 items). For the analyses that used the original autonomy support scale (9 items), the interaction of promotion of independence and autonomy support emerged for father but not for mother. The effect got slightly smaller when we used the revised autonomy support measure with 4 items (*see Table 4*).

Analyses of the simple slopes for the interaction using the 9-item scale showed that there was a stronger association between father's promotion of independence and autonomous motivation for solitude at higher level of father's autonomy support (*ß* = .35, CI 95% = [.10, .60]). The association was weaker and not statistically significant at lower level of father's autonomy support (*ß* = .10, CI 95% = [-.06, .26]) (see *Figure 5*). That means, father's promotion of independence in children only yields positive association with children's autonomous motivation for spending time alone when independence promotion is coupled with high autonomy support – when parents allow children to make personal choices while listening to children's views and continuing to provide guidance and support to help children's decisions.

General Discussion

The present research examined the link between first-year students' autonomous motivation for their alone time and revealed interactions between first-year college students' perceived belonging in college and their motivation for spending time alone. The findings showed that autonomous motivation for spending time alone correlated yielded stronger

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participants were supposed to receive a set amount of extra credit once they completed T1 and the remaining credit after they completed T2. However, due to an administrative error, participants mistakenly received the full compensation after completing T1. Following recommendations of the department's SONA administrator and university ethics board, we were unable to take away the credit that was supposed to be reserved for T2, and so the incentive to actually complete T2 was relatively low.

associations with well-being outcomes particularly for those who perceived low sense of belonging. For first-year students who didn't feel like they belong in their college environment, those who displayed more autonomous motivation for time alone than average experienced more personal well-being in Study 1 (e.g., higher self-esteem) and greater social well-being in Study 2 (i.e., lower loneliness, higher relatedness) compared to those who did not have the same motivation for time alone.

This research conceptualized motivation for being alone in line with the self-determination theory's perspective (SDT; Ryan & Deci, 2017), which is different from how motivation for being alone was conceptualized by Larson and colleagues (see review by Larson, 1990). In previous research, participants reported on their choice for solitude by responding whether they wished to be doing something else when they were alone and whether they wished to be with people at that moment (Larson, 1997; Larson & Csikszentmihalyi, 1978). While this is a rather limited, one-sided, and quite negative view on motivation for solitude, the SDT perspective recognizes that an individual could choose to be alone for different reasons other than simply not wishing to be with people. That is, individuals' motivations for time alone can vary quite a lot and can be situated on a continuum ranging from intrinsic reasons, to identified, and internally pressuring reasons, to the most external ones. According to Ryan and Deci (2004), being able to assimilate a range of behaviors "to the self" and becoming more autonomously motivated to perform those behaviors is indicative of "ego development" (see also Loevinger & Blasi, 1991). As such, our findings showing that those with more autonomous motivation for the time they spend alone showed higher levels of the positive well-being indices (i.e., self-esteem, relatedness) and lower levels of the negative well-being indices (i.e., depression, loneliness) in

college, which are in line with the notion that autonomous motivation reflects higher levels of ego development and personality integration.

Considering that not having friends and support available in college is one of the most consistent variables linked to college maladjustment (Dyson & Renk, 2006; Halamandaris & Power, 1999; Holmbeck & Wandrai, 1993), these results suggest that a shift in focus toward how students regulate the time they spend alone might be worth considering. This seemed to be especially relevant for those who do not have many friends to hang out with and talk to, perhaps because they have fewer opportunities for social contacts or less social skills, and so valuing solitary time and finding it enjoyable was beneficial to their adjustment. On the other hand, first-year students who do not have as many friends to hang out with and also do not enjoy and value their solitary time reported feeling most lonely, most depressed, and displayed the lowest levels of self-esteem and relatedness to others. These negative outcomes are not only a matter of not having available networks, but also a matter of lacking the ability to regulate one's time alone in a more autonomous manner. Prevention and intervention efforts could primarily target these students, who spend much time alone and do so against their will, because they are most at risk for maladjustment. Instead of only coaching these students in seeking social contact, these efforts would do well to also assist students in enjoying and valuing the importance of time spent alone.

In addition to the role of autonomous motivation for solitude on college freshmen's psychosocial adjustment, we also investigated what developmental factors contributed to students' ability to enjoy themselves during solitude and value this time. The results showed that autonomous motivation for being alone was predicted primarily by the perception that parents promote independence. We found the interaction of promotion of independence and autonomy support in predicting greater autonomous motivation in Study 1 for both parents, and for fathers

in Study 2. We replicated the finding for fathers using the original measure for autonomy support as we used in Study 1. However, when we removed the items from autonomy support measure that overlap with items in the promotion of independence measure, the interaction for fathers became smaller. This warrants further investigations with a larger sample size to determine whether with the revised measure the effect would still hold up.

There are meaningful implications that can be drawn from the findings around the link between parenting and children's having a healthy motivation for solitude. When parents convey the importance of self-reliance and provide many opportunities for independent decision-making, emerging adults themselves appear to appreciate more the value of time spent alone. This is consistent with Winnicott's (1958) assertion by showing that parents' promotion of independence was indeed related positively to autonomous motivation for being alone. However, this association was most pronounced when parents at the same time promote volitional functioning, that is, when parents take their child's frame of reference and provide choices that are attuned to the child's preferences and needs (e.g., regarding the degree, timing, and pace of independent development). Although this possibility was not directly addressed in the current study (but could be examined in future research), when the parent pushes the child to be independent (e.g., through guilt-inducing language), the child may actually feel less autonomous when he or she spends time alone. Thus, our findings should not be interpreted as meaning that parents should completely distance themselves from the children. Instead, parents need to continue offering support when needed. The combined presence of promotion of independence and autonomy support allows the child to feel safe when he or she spends time alone, and this develops into a healthy capacity to spend time with oneself autonomously.

Limitations

While the present research explored a novel topic that has not been studied previously, it is important to address several limitations. The first limitation was the modest sample size in Study 1 (n = 147), which was due to a limited subject pool. For that reason, we attempted to collect additional data from a new subject pool with larger sample size in Study 2 (n = 223) to confirm our findings.

Another limitation was that, with a correlational design, we could not draw causal inference from the current findings. One way to get at directional relationship from these data sets could be to perform lagged regression analyses. We tried to address this in Study 2. The results did not reach the conventional significance level of $p < .05$ when we looked at the association between autonomous motivation for time alone, perceived belonging, and the interaction term with well-being outcomes measured one month after, controlling to prior well-being measures. However, the sample available for lagged regression analyses was smaller than anticipated (n = 131 with 4 participants removed for not completing survey at Time 1). This suggested that more stringent tests with larger sample size at Time 2 would need to be conducted. Further, an intervention that promotes autonomous motivation for solitude could be implemented during the first semester in college for freshmen, and researchers could observe changes in well-being among those who have less friends and support in college.

Finally, the findings around the associations between parents' promotion of independence and autonomy support with children's autonomous motivation for spending time alone relied mainly on children's retrospective self-reports of their parents' behaviors. While errors due to retrospective bias might be lower for first-year college students for whom parents' influences are still very salient, this limitation can be addressed in future research by collecting data from both parents and children. Further, other researchers can also collect data on adolescents who are still

living with their parents and examine parents' behaviors as well as children's motivation for spending time alone on a day-to-day basis.

Conclusion

Overall, our findings open a new perspective to look at the time college students spend by themselves. Previous research has focused on how time alone affects adolescents' affective experiences and adjustment (cf., Larson, 1990), but our findings suggest that it is also important to consider how students regulate their alone time. The benefits of spending time alone emerge only when college students deliberately choose to be alone and personally value the importance of solitude. This is particularly the case for those who feel less social belonging to their college environment. It might be worthwhile for future research to explore further the solitary experiences of these studies and what they do during this time when they value time alone and enjoy it. Further, this beneficial motivational orientation towards time spent alone appears to be fostered by parents who encourage children to be independent while continuing to support children's sense of choice and volition. By doing so, parents can equip their emerging adult children with the capacity to regulate solitude effectively to maintain a healthy balance between the children's motivation for socializing and motivation for solitude.

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Table 1. Effect of Autonomous Motivation for Spending Time Alone on Outcomes while Interacting with Levels of Belonging in College in Study 1

	Loneliness			Relatedness			Depression			Self-esteem		
	ß	*df*	*t*	*ß*	*df*	*t*	*ß*	*df*	*t*	*ß*	*df*	*t*
LEVEL-2												
Intercept, B00	.04 [-.20, .28]	143	.36	-.23† [-.47, .01]	143	-1.85	-.19 [-.43, .05]	143	-1.68	.07 [-.17, .31]	143	.54
Gender, B01	-.04 [-.31, .23]	143	-.25	.32* [.03, .61]	143	2.13	.31* [.04, .58]	143	2.20	-.12 [-.41, .17]	143	-.85
Extraversion, B02	-.05 [-.23, .13]	143	-.61	-.03 [-.20, .15]	143	-.31	.03 [-.13, .19]	143	.40	.05 [-.13, .23]	143	.59
Shyness, B03	.39*** [.21, .57]	143	4.48	-.34*** [.52, -.16]	143	-3.73	.35*** [.19, .51]	143	4.17	-.45*** [-.63, -.27]	143	-5.01
LEVEL-1												
RAI, *P10*	-.06 [-.18, .06]	146	-.96	.14* [.00, .28]	121	1.94	-.00 [-.14, .13]	146	-.07	.07 [-.03, .17]	146	1.20
Belonging, P20	-.37*** [-.55, -.19]	121	-3.99	.39*** [.25, .53]	146	5.29	-.22* [-.42, -.02]	121	-2.23	.32*** [.16, .48]	121	4.23
RAI x Belonging, P30	.01 [-.08, .11]	121	.21	-.07 [-.17, .03]	121	-1.35	.08 [-.04, .20]	121	1.40	-.12* [-.22, -.02]	121	-2.49

Notes. †p < .10, *p < .05, **p < .01, ***p < .001; RAI = Autonomous motivation for time alone
Level-1 variables were entered as group-centered variables in HLMs

Table 2. Effect of Parenting on Autonomous Motivation for Spending Time Alone in Study 1

	MOTHER		FATHER	
	ß	*t*	*ß*	*t*
Intercept, B00	-.11	-.88	-.19	-1.46
	[-.36, .15]		[-.44, .06]	
Gender, B01	.01	.06	.07	.50
	[-.28, .30]		[-.22, .36]	
Extraversion, B02	.01	.11	.09	.98
	[-.17, .19]		[-.08, .27]	
Shyness, B03	.03	.27	.10	1.07
	[-.15, .21]		[-.08, .28]	
Promotion of independence (PI), B04	.42***	4.29	.49***	4.94
	[.22, .62]		[.29, .69]	
Autonomy support (AS), B05	-.02	-.25	-.06	-.68
	[-.19, .16]		[-.24, .12]	
PI x AS, B06	.15**	2.64	.22**	2.96
	[.03, .27]		[.08, .36]	

*Notes. *p < .05, **p < .01, ***p < .001*
Level-2 d.f. = 140.

Table 3. Effect of Autonomous Motivation for Spending Time Alone on Outcomes while Interacting with Levels of Belonging in College in Study 2

	Loneliness		Relatedness		Depression		Self-esteem	
	ß	*t*	*ß*	*t*	*ß*	*t*	*ß*	*t*
Extraversion	.17** [.05, .28]	2.74	-.17* [-.29, -.04]	-2.68	.14† [-.00, .29]	1.92	-.05 [-.19, .11]	-.70
Shyness	.15** [.04, .27]	2.60	-.07 [-.20, .05]	-1.21	.18* [.03, .32]	2.42	-.29*** [-.42, -.12]	-3.79
Belonging	-.61*** [-.72, -.50]	-11.13	.64*** [.53, .75]	11.35	-.42*** [-.56, -.29]	-6.21	.30*** [.18, .45]	4.40
RAI	-.18** [-.28, -.08]	-3.63	.17*** [.07, .27]	3.36	-.13* [-.25, -.01]	-2.05	.09† [-.02, .23]	1.36
Belonging x RAI	.14** [.05, .22]	3.14	-.11* [-.20, -.02]	-2.46	.09 [-.02, .20]	1.61	-.07 [-.19, .03]	-1.29

Notes. †p < .10, *p < .05, **p < .01, ***p < .001*;* RAI = Autonomous motivation for time alone
Coefficients did not change while gender was added to the regression models; however, because we did not preregister the plan of including gender in the models, we opted to not include it here.

Table 4. Effect of Parenting on Autonomous Motivation for aloneness

	4-item revised Autonomy Support scale			
	MOTHER		FATHER	
	ß	*t*	*ß*	*t*
Intercept	-.01	-.07	-.06	-.77
	[-.14, .13]		[-.20, .09]	
Extraversion	-.15	-1.81	-.11	-1.22
	[-.31, .01]		[-.27, .06]	
Shyness	-.11	-1.35	-.09	-1.03
	[-.28, .05]		[-.26, .08]	
Promotion of independence (PI)	.20**	2.64	.19*	2.19
	[.05, .36]		[.02, .36]	
Autonomy support (AS)	-.08	-1.16	-.04	-.52
	[-.23, .06]		[-.19, .11]	
PI x AS	-.02	-.33	.11	1.68
	[-.13, .09]		[-.02, .23]	
	9-item Autonomy Support scale			
	MOTHER		FATHER	
	ß	*t*	*ß*	*t*
Intercept	-.01	-.14	-.07	-.93
	[-.15, .13]		[-.22, .07]	
Extraversion	-.15	-1.82	-.10	-1.12
	[-.31, .01]		[-.26, .07]	
Shyness	-.12	-1.41	-.09	-1.05
	[-.28, .05]		[-.26, .08]	
Promotion of independence (PI)	.22**	2.71	.23*	2.57
	[.06, .37]		[.05, .40]	
Autonomy support (AS)	-.07	-.94	-.06	-.78
	[-.23, .08]		[-.22, .09]	
PI x AS	-.00	-.03	.13*	2.16
	[-.11, .11]		[.01, .24]	

*Notes. *p < .05, **p < .01, ***p < .001*

Table 5a. Correlation table of main variables in Study 1

	Variables	ICC	Level-1 variance proportion	Scale Relia.	N	M (SD)	1	2	3	4	5	6	7	8	9	10	11
1	Mother's promotion of independence	.87	.29	.76	415	3.91 (.88)											
2	Mother's autonomy support	.94	.14	.49	415	3.70 (.86)	.64**										
3	Father's promotion of independence	.83	.37	.79	412	4.04 (.88)	.47**	.33**									
4	Father's autonomy support	.92	.18	.47	412	3.58 (.78)	.43**	.69**	.60**								
5	Extraversion	.93	.16	.42	418	2.90 (.74)	.18**	.18**	.04	.13*							
6	Shyness	.91	.21	.58	417	2.97 (.75)	-.13**	-.13**	-.24**	-.21**	-.61**						
7	Social belonging	.87	**.27**	.53	418	3.82 (.66)	.30**	.33**	.36**	.35**	.45**	-.47**					
8	RAI	.83	**.36**		418	8.17 (6.01)	.32**	.20**	.33**	.21**	.09	-.07	.34**				
9	Loneliness	.80	**.40**	.91	417	2.43 (1.14)	-.15**	-.22**	-.19**	-.25**	-.34**	.39**	-.65**	-.32**			
10	Depression	.74	**.49**	.77	417	3.23 (.77)	-.04	-.11*	-.03	-.09	-.24**	.32**	-.35**	-.18**	.75**		
11	Self-esteem	.86	**.30**	.77	417	5.09 (1.16)	.25**	.34**	.28**	.33**	.36**	-.46**	.52**	.21**	-.56**	-.54**	
12	Relatedness	.81	**.39**	.72	417	5.49 (1.09)	.27**	.32**	.37**	.39**	.23**	-.31**	.63**	.36**	-.78**	-.46**	.51**

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

ICC was estimated using HLM 7.0

Scale reliability was calculated using the formula by Bolger & Laurenceau (2013)

Correlations were calculated for all data rows at level 1.

Table 5b. Correlations between measures at three time points in Study 1

		Time 1						Time 2						Time 3				
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Time 1																		
1.	Social belonging																	
2.	RAI	.21*																
3.	Loneliness	-.67**	-.20*															
4.	Depression	-.38**	-.14	.75**														
5.	Self-esteem	.56**	.12	-.56**	-.52**													
6.	Relatedness	.60**	.24**	-.78**	-.52**	.52**												
Time 2																		
7.	Social belonging	**.77****	.07	-.55**	-.26**	.45**	.49**											
8.	RAI	.41**	**.59****	-.29**	-.12	.21*	.36**	.38**										
9.	Loneliness	-.49**	-.15	**.58****	.37**	-.37**	-.50**	-.63**	-.38**									
10.	Depression	-.28**	-.18*	.42**	**.49****	-.32**	-.31**	-.37**	-.22**	.77**								
11.	Self-esteem	.44**	.16	-.45**	-.43**	**.70****	.42**	.49**	.30**	-.53**	-.56**							
12.	Relatedness	.47**	.14	-.46**	-.22*	.35**	**.56****	.59**	.40**	-.80**	-.50**	.45**						
Time 3																		
13.	Social belonging	**.64****	.09	-.46**	-.17*	.33**	.49**	**.77****	.38**	-.62**	-.36**	.37**	.64**					
14.	RAI	.31**	**.60****	-.24**	-.12	.16	.27**	.29**	**.75****	-.37**	-.32**	.23**	.30**	.42**				
15.	Loneliness	-.44**	-.16	**.53****	.34**	-.32**	-.52**	-.58**	-.37**	**.68****	.51**	-.46**	-.60**	-.64**	-.39**			
16.	Depression	-.25**	-.07	.39**	**.44****	-.38**	-.34**	-.36**	-.19*	.47**	**.60****	-.54**	-.35**	-.29**	-.20*	.72**		
17.	Self-esteem	.36**	.05	-.37**	-.30**	**.62****	.34**	.49**	.23**	-.51**	-.48**	**.74****	.46**	.49**	.24**	-.57**	-.54**	
18.	Relatedness	.42**	.17	-.50**	-.23**	.27**	**.56****	.54**	.42**	-.65**	-.41**	.38**	**.69****	.70**	.45**	-.78**	-.36**	.55**

Notes. Highlighted cells are correlations between T1, T2, and T3 measures of each variable

Table 6a. Correlation table of main variables in Study 2

	Variables	N	M (SD)	1	2		3	4		5	6	7	8	9	10	11	12
1	Mother's promotion of independence	215	5.68 (1.20)	**.92**													
2	Mother's autonomy support (4 items)	215	5.06 (1.45)	.35**	**.78**												
	Mother's autonomy support (9 items)	215	4.76 (.99)	.45**	.89**	.72											
3	Father's promotion of independence	200	5.84 (1.18)	.56**	.40**	.44**	**.93**										
4	Father's autonomy support (4 items)	200	4.66 (1.51)	.26**	.37**	.35**	.40**	**.77**									
	Father's autonomy support (9 items)	200	4.62 (.93)	.29**	.40**	.42**	.46**	.87**	**.67**								
5	Extraversion	217	4.18 (1.17)	.09	.04	.04	-.08	.06	.00	**.86**							
6	Shyness	217	3.81 (1.25)	-.12	-.07	-.10	-.04	-.08	-.07	-.57**	**.87**						
7	Social belonging	218	4.91 (1.18)	.17*	.19**	.18**	.08	.33**	.30**	.39**	-.38**	**.81**					
8	RAI	217	8.32 (5.34)	.18*	-.01	.03	.12	.01	-.00	-.07	-.04	.25**					
9	Loneliness	215	2.56 (1.53)	-.11	-.15*	-.17*	-.16*	-.36**	-.31**	-.17*	.32**	-.67**	-.37**	**.98**			
10	Depression	215	3.06 (1.30)	-.11	-.16*	-.15*	-.14	-.31**	-.30**	-.13	.28**	-.48**	-.26**	.76**	**.94**		
11	Self-esteem	214	4.71 (1.30)	.25**	.20**	.23**	.21**	.27**	.29**	.23**	-.39**	.43**	.19**	-.51**	-.75**	**.89**	
12	Relatedness	213	5.42 (1.29)	.10	.20**	.20**	.16*	.37**	.35**	.13	-.25**	.67**	.36**	-.71**	-.66**	.60**	**.90**

*$p < .05$; **$p < .01$
Scale reliability was bolded;
All variables were measured using 7-point scales
Correlations were calculated using only T1 data

Table 6b. Correlations between measures at two time points at Study 2

	1	2	3	4	5	6	7	8	9
Time 1									
1. Social belonging									
2. RAI	.20*								
3. Loneliness	-.75**	-.33**							
4. Depression	-.54**	-.23**	.73**						
5. Self-esteem	.46**	.20*	-.55**	-.76**					
6. Relatedness	.72**	.38**	-.72**	-.67**	.62**				
Time 2									
7. Loneliness	-.45**	-.15	**.57****	.47**	-.41**	-.41**			
8. Depression	-.44**	-.15	.53**	**.67****	-.59**	-.41**	.79**		
9. Self-esteem	.36**	.26**	-.45**	-.53**	**.65****	.42**	-.61**	-.76**	
10. Relatedness	.41**	.23**	-.46**	-.42**	.38**	**.52****	-.73**	-.65**	.66**

Notes. Highlighted cells are correlations between T1 and T2 measures for each variable

Figure 1. Interaction of perceived belonging and autonomous motivation for being alone on levels of self-esteem in the past 2 weeks (Study 1)

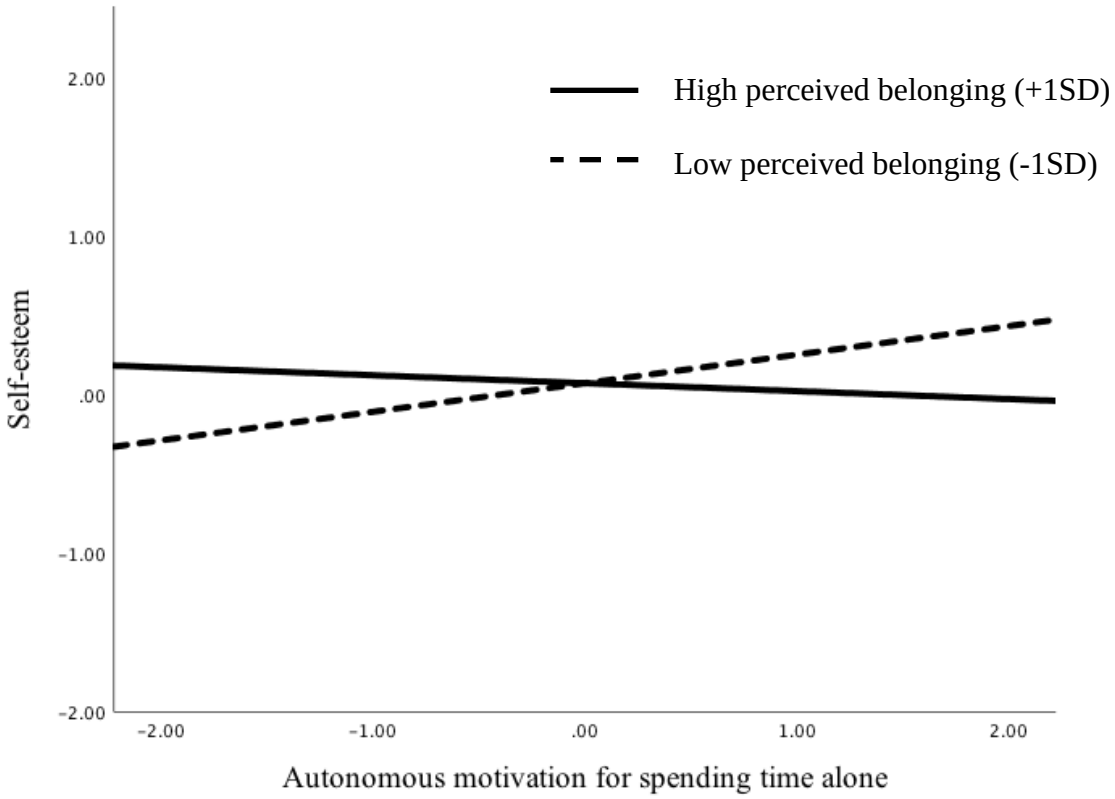
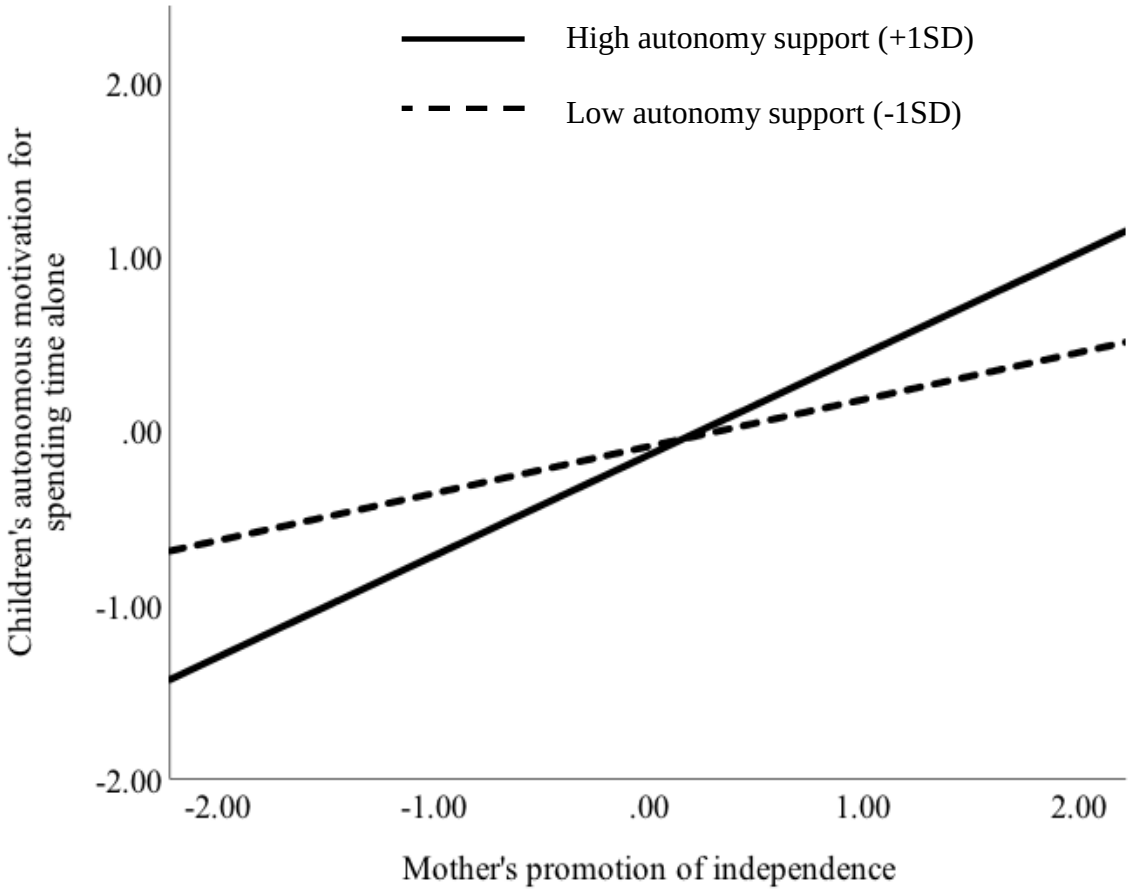


Figure 2. Interaction of mother's promotion of independence and autonomy support on autonomous motivation for being alone (Study 1)



Figures 3. Interaction of father's promotion of independence and autonomy support on autonomous motivation for being alone (Study 1)

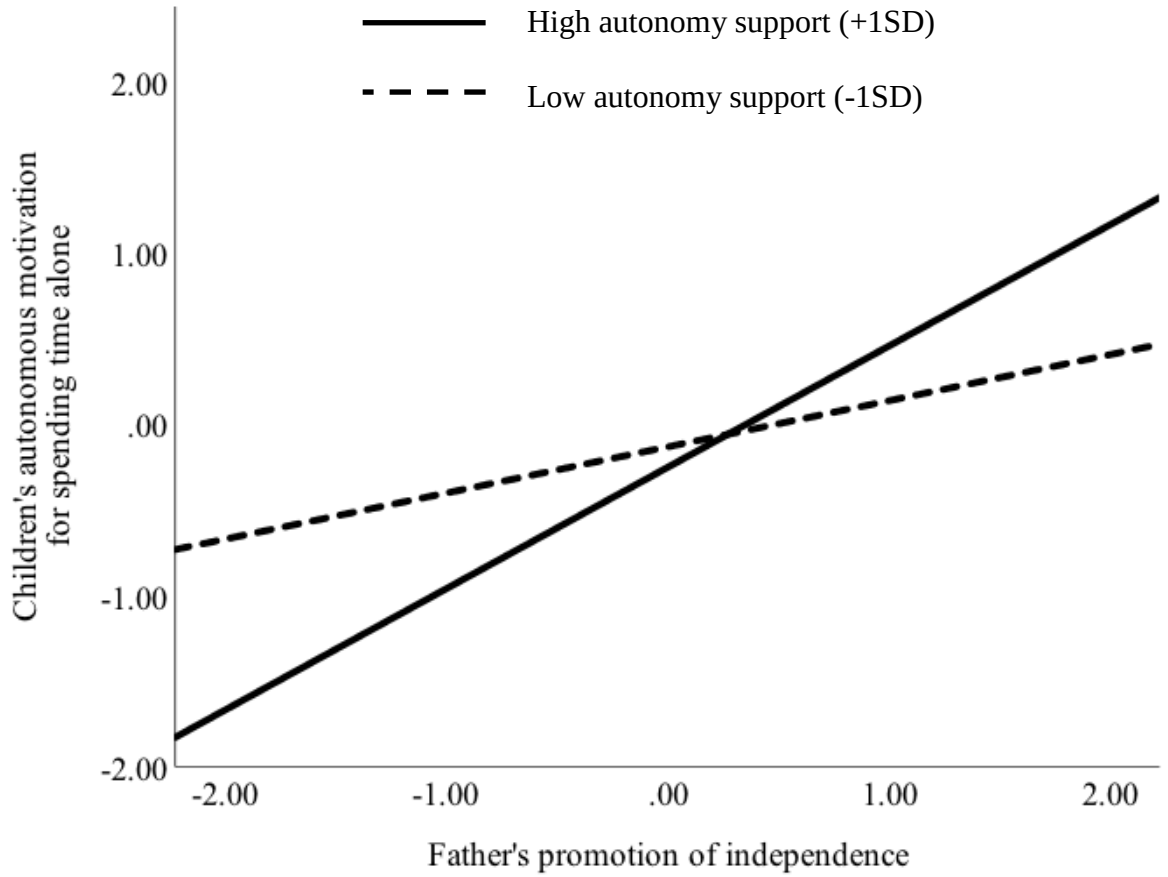
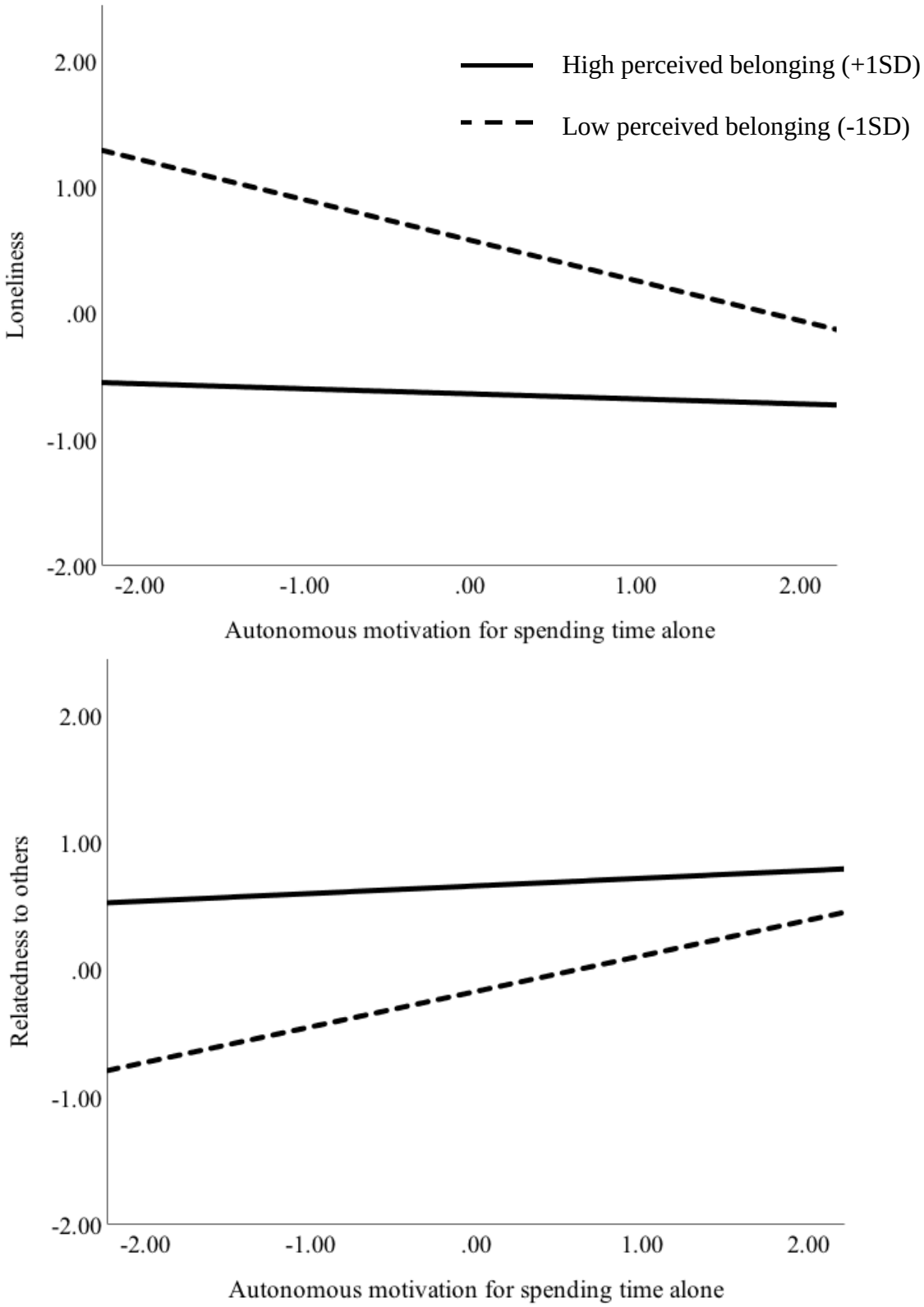
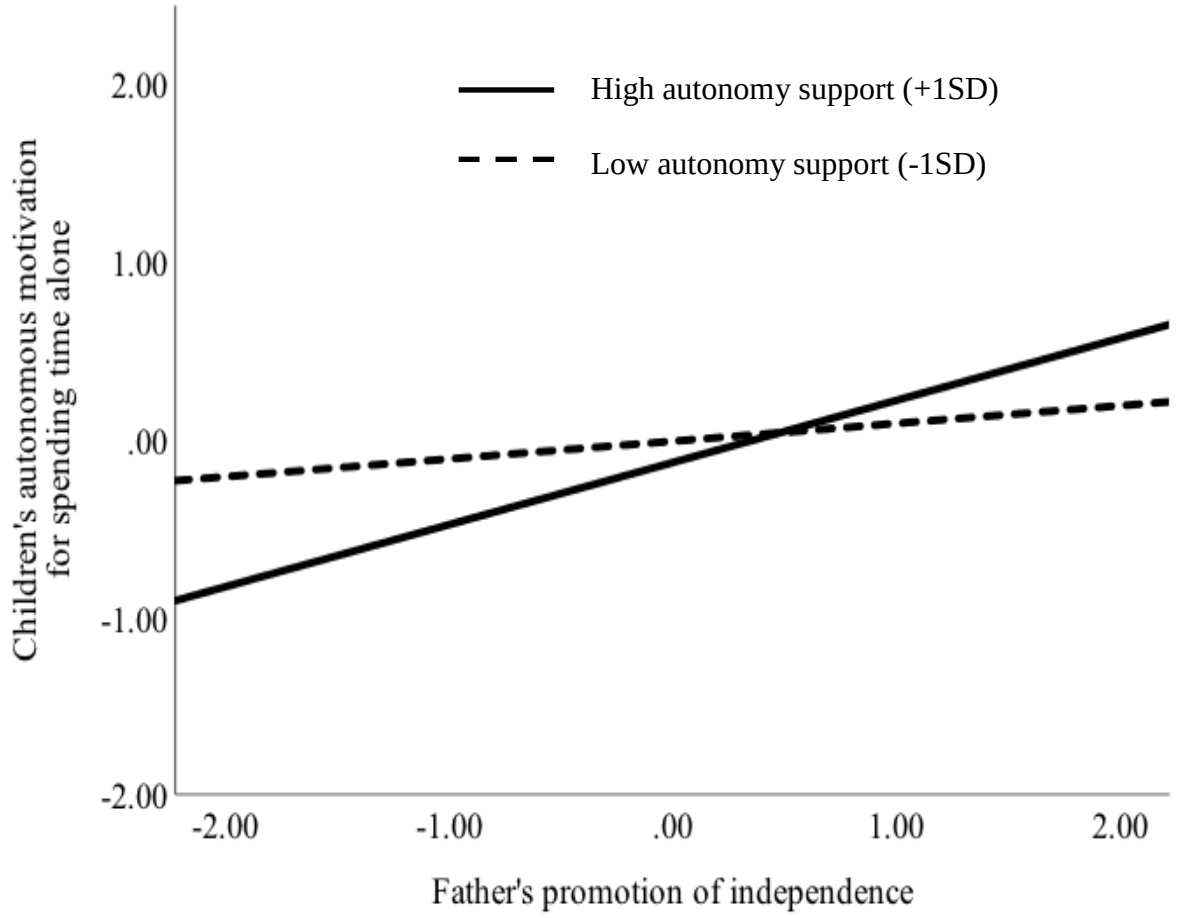


Figure 4. Interaction of perceived belonging and autonomous motivation for being alone on levels of depressive symptoms in the past 2 weeks (Study 2)



Figures 5. Interaction of father's promotion of independence and promotion of volitional functioning on autonomous motivation for being alone (Study 2)



APPENDIX A

Please answer the following questions about your mother and your father. If you do not have any contact with one of your parents (for example, your father), but there is another adult of the same gender living with your house (for example, a stepfather) then please answer the questions about that other adult.

If you have no contact with one of your parents, and there is not another adult of that same gender with whom you live, then leave the questions about that parent blank.

Response scale:
1 = not at all true; -; 7 – VERY TRUE

Promotion of independence (Fousiani et al., 2014)
My mother/my father

1. thinks it's important that I can solve problems without him/her
2. thinks it's important for me to learn to stand on my own legs
3. wants me to make decisions on my own
4. thinks it's important that I am independent
5. wants me to make choices on my own
6. thinks I should take care of my own business

Autonomy support (Grolnick et al., 1991)
My mother/my father

1. seems to know how I feel about things*
2. tries to tell me how to run my life
3. whenever possible, allows me to choose what to do
4. listens to my opinion or perspective when I've got a problem*
5. allows me to decide things for myself
6. insists upon my doing things her way
7. is usually willing to consider things from my point of view*
8. helps me to choose my own direction*
9. isn't very sensitive to many of my needs

References:

Fousiani, K., Van Petegem, S., Soenens, B., Vansteenkiste, M., & Chen, B. (2014). Does parental autonomy support relate to adolescent autonomy? An in-depth examination of a seemingly simple question. *Journal of Adolescent Research, 29*(3), 299-330.

Grolnick, W. S., Ryan, R. M., & Deci, E. L. (1991). Inner resources for school achievement: Motivational mediators of children's perceptions of their parents. Journal of Educational Psychology, 83(4), 508.

APPENDIX B

Autonomous motivation for spending time alone

Think of times when you are by yourself. Those are times when you do not interact with anyone in person or virtually. You might be by yourself either because you want or choose to be by yourself, or because you just happen to be by yourself without intending to, or because you have to or feel like you should stay by yourself. Different people spend time by themselves for different reasons. Please indicate the extent to which each of the following reasons applies to you and all the instances when you are by yourself **in general**. Please choose 1 if the reason does *not* apply to you *at all* and 7 if the reason applies to you *very much.*

Response scale: 1 = this does not apply to me at all; 4 = this somewhat applies to me; 7 = this applies to me very much

1. Because I simply enjoy being with myself (SRQ1)
2. For the pleasure of being with myself (SRQ2)
3. Because having time to myself is important and beneficial to me (SRQ3)
4. Because I really value having time to myself (SRQ4)
5. Because I would feel bad if I didn't do it (SRQ5)
6. Because I feel that is what everyone else does so I should too (SRQ6)
7. Because of some external circumstances that make me (SRQ7)
8. I would get in trouble with others if I didn't (SRQ8)

INTRINSIC MOTIVATION: SRQ1, SRQ2
IDENTIFIED REGULATION: SRQ3, SRQ4
INTROJECTED REGULATION: SRQ5, SRQ6
EXTERNAL REGULATION: SRQ7, SQR8

Relative autonomy index =
INTRINSIC*2 + IDENTIFIED*1 - INTROJECTED*1 - EXTERNAL*2

Check scale correlation to see if simplex pattern of correlations shows up (Deci & Ryan, 1985; Otis, Grouzet, & Pelletier, 2005).

- Intrinsic motivation correlates positively and more strongly with identified regulation, less with introjected and external regulations
- External regulation correlates positively and more strongly with introjected regulation, less with identified regulation and intrinsic motivation
- External regulation shows the strongest negative correlation with intrinsic motivation and identified regulation
- Introjected regulation shows moderate negative correlation or no correlation with intrinsic motivation and identified regulation

References:

Deci, E., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* New York, NY: Plenum Press.

Otis, N., Grouzet, F. M., & Pelletier, L. G. (2005). Latent motivational change in an academic Setting: A 3-Year longitudinal study. Journal of Educational Psychology, 97(2), 170.