Extending Self-Determination Theory: Using Longitudinal Analyses to Better Understand the Dynamic Nature of Collaborative Autonomy and Need Frustration

Shelby L. Levine

Department of Psychology

McGill University

Montreal, Quebec

January 2023

A thesis submitted to McGill University in partial fulfillment of the requirements of the degree of Doctorate of Philosophy

Table of Contents

Abstract

The overarching aim of this thesis was to extend basic principles in self-determination theory by using longitudinal analyses and research methods. The first article focuses on how autonomy flourishes in emerging adulthood over the academic year. This research is rooted in self-determination theory and aims to extend this theory by proposing that autonomous motivation and support flourish through collaboration. Article 1 provides evidence that autonomous motivation and autonomy support interact in a dynamic reciprocal manner and that this results in goal progress and improved well-being over the academic year. Article 1 has been published in Motivation Science. Article 2 uses longitudinal methods to examine the impact of collaborative personality traits on motivation, support and flourishing in goal pursuit over time. Article 2 provides more evidence for the collaborative nature of autonomy, as individuals higher in collaborative traits (agreeableness, assisted autonomy striving, and secure attachment) were more likely to experience autonomous motivation and support over the year. Additionally, a higher order latent collaborative trait exists (composed of agreeableness, assisted autonomy striving, and secure attachment), and these collaborative traits facilitate goal progress through both autonomous motivation and autonomy support. This research furthers self-determination theory by integrating personality theory to examine antecedents of flourishing over time. Article 2 has been published in the Journal of Personality. Finally, Article 3 applied the same longitudinal methods using fully cross-lagged models to examine the influence of basic psychological need frustration on depressive symptoms and negative affect over the academic year, and at the start of the COVID-19 pandemic. Again, this longitudinal analysis confirms the theoretical importance of need frustration in predicting psychological distress even when controlling for the correlations between these variables at each time point and over time. Need

frustration was found to be an antecedent and maintenance factor for psychological distress over the academic year and at the start of the global pandemic. Article 3 was published in the journal Motivation & Emotion. These studies follow large samples of individuals over time to extend our understanding of how key principles within self-determination theory predict well-being and distress. These distinct theoretical extensions to self-determination theory allow for more applications and interventions to be developed. In the future, more longitudinal research is needed in self-determination theory to replicate and further extend the applicability of this theory. Further, interventions should focus on encouraging collaboration to help autonomous individuals succeed in goal pursuit, and interventions in universities should focus on buffering against basic psychological need frustration to improve mental health on college campuses.

Résumé

L'objectif primaire de cette thèse est d'étendre les principes de base de la théorie de l'autodétermination en utilisant des analyses longitudinales et des méthodes de recherche. Le premier article se concentre sur la manière dont l'autonomie s'épanouit chez l'adulte émergent au cours de l'année universitaire. Cette recherche est ancrée dans la théorie de l'autodétermination et vise à étendre cette théorie en proposant que la motivation et le soutien autonomes s'épanouissent à travers la collaboration. L'article 1 fournit des preuves que la motivation autonome et le soutien à l'autonomie interagissent de manière dynamique et réciproque et que cela se traduit par une progression des objectifs et une amélioration du bien-être au cours de l'année scolaire. L'article 1 a été publié dans Motivation Science. L'article 2 utilise des méthodes longitudinales pour examiner l'impact des traits de personnalité collaboratifs sur la motivation, le soutien et l'épanouissement dans la poursuite d'objectifs au fil du temps. L'article 2 fournit davantage de preuves de la nature collaborative de l'autonomie, car les personnes présentant des traits de personnalité plus collaboratifs (agréabilité, recherche d'autonomie assistée et attachement sécurisant) étaient plus susceptibles d'éprouver une motivation et un soutien autonomes au cours de l'année. De plus, il existe un trait de collaboration latent d'ordre supérieur (composé de l'agréabilité, de la recherche d'autonomie assistée et de l'attachement sécurisant), et ces traits de collaboration facilitent la progression des objectifs par le biais de la motivation autonome et du soutien à l'autonomie. Cette recherche fait progresser la théorie de l'autodétermination en intégrant la théorie de la personnalité pour examiner les antécédents de l'épanouissement dans le temps. L'article 2 a été publié dans le Journal of Personality. Enfin, l'article 3 applique les mêmes méthodes longitudinales en utilisant des modèles à décalage croisé complet pour examiner l'influence de la frustration des besoins psychologiques fondamentaux sur les symptômes

dépressifs et l'affect négatif au cours de l'année universitaire et au début de la pandémie COVID-19. Une fois de plus, cette analyse longitudinale confirme l'importance théorique de la frustration des besoins dans la prédiction de la détresse psychologique, même en contrôlant les corrélations entre ces variables à chaque moment et dans le temps. La frustration des besoins s'est avérée être un facteur antécédent et de maintien de la détresse psychologique au cours de l'année universitaire et au début de la pandémie mondiale. L'article 3 a été publié dans la revue Motivation & Emotion. Ces études suivent de larges échantillons d'individus au fil du temps afin d'étendre notre compréhension de la façon dont les principes clés de la théorie de l'autodétermination prédisent le bien-être et la détresse. Ces extensions théoriques distinctes de la théorie de l'autodétermination permettent de développer d'autres applications et interventions. À l'avenir, les interventions devraient se concentrer sur l'encouragement de la collaboration pour aider les individus autonomes à réussir dans la poursuite de leurs objectifs, et les interventions dans les universités devraient se concentrer sur la protection contre la frustration des besoins psychologiques fondamentaux pour améliorer la santé mentale sur le campus.

Acknowledgements

A large part of my thesis was inspired by my own experience, that working towards goals that are important, meaningful, and enjoyable is a process that flourishes when shared with others, and that people support you with open arms when you love what you do. So, of course there is an entire village of people who I am grateful for and who have provided invaluable support and mentorship during my graduate school career.

I'd like to start by thanking my PhD supervisor Dr. Richard Koestner. It was a pleasure to get to work with you, and I am extremely grateful for the opportunity you provided me by accepting me into the McGill Human Motivation Lab. It was inspiring to learn about self-determination theory from someone who is so passionate about it, and I always loved our discussions and how you pushed me to think creatively in my work. I would also like to thank Dr. Marina Milyavskaya for her continued mentorship and collaboration. Thank you for sharing your passion and knowledge on how to do excellent research. I was also lucky to get to work with Dr. David Zuroff during my PhD, and I am thankful for the opportunity to have gotten to work with someone so brilliant and passionate. I would also like to thank the professors at McGill University who helped to shape my educational experience and helped me grow as a researcher and clinician. Thank you to the great clinical supervisors I had, who helped me to become a capable and confident clinician.

This thesis would not have been possible without the collaboration of the fellow graduate students in the McGill Human Motivation Lab, and the many research assistants and students who helped us! Additionally, thank you to my cohort for providing support while we weathered the storm together. I'd also like to thank the friends I made while in graduate school. Thank you for listening, laughing, and kvetching with me.

Finally, this thesis would be impossible without the love, support and reassurance of my family and friends. I do not know if thank you can even express the gratitude I feel towards all of you or if I could ever put into words what your love and support has meant to me. Thank you to my parents who believed in me even when I couldn't count to ten. Thank you for instilling a love of learning in me, an excellent work ethic, and for teaching me how to be a good kind person as I work towards my values. Thank you to my brothers and their families for all the love and interest they showed in my research and clinical work. I always loved our thoughtful conversations and how you made me think about my work. One of the best parts of going to graduate school in Montreal was getting to spend more time with my Bubby! Thank you, Bubby, for all the homecooked meals and love! Most of all, thank you to my amazing husband Michael! You made the transition to Montreal easy, you make everyday better, and I do not think I could have done this without you. When things were tough, you always made me feel better, when things felt impossible, you helped me to figure it out. You are the best husband, partner, and friend I could have asked for.

I just wanted to end on some simple advice. Do not place limits on yourself. Just keep trying and see what happens. Sometimes you just do not know what you are capable of or how strong you really are. Thank you to everyone who believed in me and helped me to believe in myself.

Contribution of Authors

Three published manuscripts are included in the present doctoral thesis. The first manuscript "Collaborative autonomy: The dynamic relations between personal goal autonomy and perceived autonomy support in emerging adulthood results in positive affect and goal progress" was co-authored by myself, Anne Holding, Marina Milyavskaya, Theodore Powers, and Richard Koestner (Article 1). Article 1 was published in *Motivation Science.* I was inspired to examine the dynamic reciprocal relation between motivation and support when I began reading about self-determination and saw there was a plethora of research on the influence of support on motivation, but nothing on the reverse relation. Considering recent advances in goal theory that highlighted the interpersonal nature of goal pursuit, I felt that there had yet to be research which examined how an individual's motivation can influence the goal environment to lead to greater interpersonal support, goal progress and well-being. I conducted an initial literature review that helped to integrate self-determination with other theories of flourishing. With the help of Dr. Koestner and Dr. Powers, I was able to further shape these ideas and establish hypotheses. I was able to use some archival goal study data in the lab and helped to collect an additional year of data included in this research project. Anne Holding helped to collect the data, with the help of graduate students and research assistants. I conducted the longitudinal analyses using MPlus software and consulted Dr. Milyavskaya for statistical questions. I wrote the manuscript and handled the revisions of the manuscript and received editorial assistance from all co-authors.

Article 2 "Autonomous motivation and support flourishes for individuals higher in collaborative personality factors: agreeableness, assisted autonomy striving and secure attachment" was co-authored by myself, Marina Milyavskaya, Anne Holding, Theodore Powers,

and Richard Koestner. Article 2 was published in *Journal of Personality.* Personality is a key facet of self-determination theory, and I began to wonder what role personality played in the development of motivation and support, if these factors are collaborative. Goal pursuit is often seen as an individualistic pursuit in North America, and given that motivation and support interact dynamically, perhaps collaboration is a key in successful goal pursuit. I conducted an initial literature review that helped to integrate self-determination theory with personality factors in goal pursuit to determine whether cooperative traits could be beneficial in flourishing over time. With the help of Dr. Koestner and Dr. Powers, I was able to further shape these ideas and establish hypotheses. I was able to use some archival goal study data in the lab and helped to collect an additional year of data to include new measures of collaborative traits. Anne Holding helped to organize data collection, with the help of graduate students and research assistants. I conducted the longitudinal analyses using MPlus software and consulted Dr. Milyavskaya for statistical questions. I wrote the manuscript and handled the revisions of the manuscript and received editorial assistance from all co-authors.

Article 3 “Unhappy or unsatisfied: Distinguishing the role of negative affect and need frustration in depressive symptoms over the academic year and during the COVID-19 pandemic”. This article was co-authored by myself, Claire J. Brabander, Amanda M. Moore, Anne C. Holding & Richard Koestner. Article 3 was published in *Motivation and Emotion.* Basic psychological need frustration is a key concept in self-determination, and there has yet to be extensive longitudinal research on the influence of it on distress. So, I thought the research methods applied in the last papers could be used to examine this research questions as well. I conducted an initial literature review to understand the relation between need frustration, and ill-being. With the help of Dr. Koestner, I was able to further shape these ideas and establish a

research question. I helped to collect both longitudinal data sets with the help of Anne Holding, Amanda Moore and research assistants. Amanda Moore helped to coordinate the surveys from family and friends in the second study of article 3. The first study was analyzed for the thesis submission of Claire Brabander, and she wrote her thesis based on those analyses. To submit this research to a peer-reviewed journal, I conducted the longitudinal analyses using MPlus software and added a second study examining students in the COVID-19 pandemic and used observer reports of depression. I wrote the manuscript integrating these studies and handled the revisions of the manuscript and received editorial assistance from all co-authors.

Statement of Original Contribution

Self-determination theory is a leading theory of human motivation, growth and development that is internationally researched and has been applied across multiple domains (i.e., goal pursuit, health care, parenting, education, occupational etc.) (Black & Deci, 2000; Moreau & Mageau, 2012; Patall et al., 2018; Soenens & Vansteenkiste, 2005; Su & Reeves, 2011). Two main focuses within this theory surround motivation and basic psychological needs on well-being (Deci & Ryan, 2000). However, despite the large number of articles published on this topic, there are still limits to our understanding of how these variables can change, develop, or interact over time. Additionally, there are many studies which may confirm one directional relation in this theory, without considering whether a reciprocal relation exists. For example, research suggests receiving autonomy support can be beneficial for improving autonomous motivation (Koestner et al., 2012), but the reverse relation has yet to be examined. Furthermore, the relation between need satisfaction and well-being has been examined longitudinally multiple times (Vansteenkiste et al., 2020), but although suggested theoretically, there is limited research examining the relation between need frustration and psychological distress. So, a key theoretical extension of the current thesis was utilizing longitudinal methods to explore some of the reciprocal relations that have yet to be tested in self-determination theory.

The present thesis addresses these gaps in the self-determination theory literature by examining key variables longitudinally, as well as integrating other models of goal pursuit, personality development, and psychopathology. This thesis examined over 1,500 university students across the span of multiple academic years. Additionally, one study integrated observer reports and examined students at the start of the COVID-19 pandemic (Article 3). Each article presents a unique theoretical contribution to self-determination theory and focuses on expanding

the understanding of how this theory contributes to flourishing and psychological distress over time. Additionally, each article included in this thesis has been published in a peer-reviewed and well-regarded journal for researchers who study motivation, personality, and emotions. Article 1 focuses on integrating motivation from a self-determination theory perspective with the transactive goal model (Fitzsimmons & Finkel, 2018), the broaden and build theory (Fredrickson, 2001), personality-environment Fit Theory (Roberts et al., 2008), and psychological mechanisms of how personality can influence one's environment (McAdams, 2015). Article 2 focuses on integrating motivation and support from a self-determination theory perspective with the Big-5 trait model (John & Srivastava, 1999), attachment theory (Ainsworth, 1979; Bowlby, 1988), and personality-environment Fit Theory (Roberts et al., 2008). In article 3, psychopathology development is examined from a self-determination theory perspective by integrating basic psychological needs with negative affect (Watson et al., 1988) and further exploring whether it is a transdiagnostic risk factor (Campbell et al. 2018).

The main contribution of article 1 is that it tests and provides evidence that motivation and support interact in a reciprocal dynamic manner, and that this then leads to improved goal progress and well-being over the academic year. There is extensive research that shows that autonomy support is beneficial for improving autonomous motivation and goal outcomes (Black & Deci, 2000; Moreau & Mageau, 2012; Patall et al., 2018; Soenens & Vansteenkiste, 2005; Su & Reeves, 2011). This paper was the first to show that when individuals are autonomously motivated to pursue their personal goals, they actually perceive better goal support across the year. This finding is significant because goal striving does not occur in isolation (Fitzsimmons & Finkel, 2018) and this research suggested that motivated agents have an influence over their environment that helps them to feel supported and in turn succeed during goal pursuit. This

opens an entirely new area for applied research and goal interventions. Not only can interventions focus on how to help support people, but it may also be beneficial to pursue interventions that promote personal autonomy as a method of improving personal support, goal progress and well-being. This research also used cross-lagged modelling to examine the development of motivation and support over an entire academic year, and found that the benefits of motivation on support, and of support on motivation were not limited to the start of the year, but continued to contribute to each other dynamically, and resulted in an upward spiral of motivation, support, well-being, and progress for these more autonomous students. This is a major contribution to self-determination theory which suggests that collaboration is critical for autonomy to flourish during goal pursuit.

Article 2 provides substantial contributions to self-determination theory by further examining the collaborative nature of autonomy by using longitudinal methods to explore what personality and developmental dispositions contribute to successful goal pursuit. There has been some research on the influence of personality on specific types of goal pursuit (Moore et al., 2020), but not on what traits may be beneficial for motivation, support, and progress in general goal pursuit. I hypothesized that if collaboration is an important component of successful goal pursuit, then collaborative or cooperative traits and developmental factors would help an individual to succeed during goal pursuit. A higher order collaborative personality trait composed of agreeableness, assisted autonomy striving and secure attachment was found to predict improved autonomous motivation and perceived autonomy support over the academic year, and this in turn was related to flourishing and progress during goal pursuit. A highlight of this research was that a big-5 personality trait, a self-determination theory based dispositional factor, and a developmental disposition, all of which are mainly associated with cooperation,

trust, and understanding, were important for predicting successful goal pursuit. This provides further longitudinal evidence that autonomy flourishes as a collaborative process, and again provides another avenue for intervention. Further promoting cooperation may help individuals to be successful in their goal pursuit, because it helps to improve the quality of their motivation, and the support they receive.

Finally, article 3 advances our understanding of self-determination theory by examining the longitudinal relation between need frustration and depressive symptoms. There has yet to be extensive longitudinal research about this, even though need satisfaction is so central to well-being (Vansteenkiste et al., 2000). Further, using fully cross-lagged models I was able to test whether need frustration was a concomitant or antecedent of depressive symptoms and negative affect over three time points spanning an 8-month period. This is a very stringent test of whether need frustration predicts ill-being beyond, feelings of sadness or discontent. Need frustration was the only consistent predictor of negative affect and depressive symptoms over time. This is a significant finding because it confirms that it is not being sad that predicts experiencing depression, but rather feeling isolated, incompetent, or controlled that predicts which students will experience worse depressive symptoms over time. Again, this theoretical advancement provides a new area for intervention, that universities can help students to feel connected, volitional, and competent to buffer against psychological distress. Another major contribution is that this paper replicated these findings at the start of the COVID-19 pandemic, and again confirmed that it is not feeling sad that predicts ill-being over time, but feeling need frustrated (isolated, incompetent, and controlled) that predicts distress during stressful times. An additional highlight is that this replication utilized observer reports to confirm that need frustration

predicted depressive symptoms during the pandemic as observed by a close family member and friend.

List of Tables

Article 1

Article 2

Article 3

List of Figures

Article 1

Article 2

Article 3

General Introduction

Self-determination theory is a leading theory of human motivation, connection, and flourishing (Ryan & Deci, 2017). This theory is studied internationally, and there are over 172,000 articles that have been published on self-determination theory since its conception a little over three decades ago (Google Scholar Metrics, 2022). Self-determination theory's popularity can be partially explained by how easily applicable this theory is across multiple domains. This theory has been widely applied to help individuals flourish in the education, health, occupational, and relational domains (Black & Deci, 2000; Moreau & Mageau, 2012; Patall et al., 2018; Soenens & Vansteenkiste, 2005; Su & Reeves, 2011). For such an important and applicable theory, it is critical to continually evaluate and use modern research skills and tools to further test and extend the validity of this theory. The current thesis aims to further understand the dynamic nature of self-determination theory by using longitudinal research methods and analyses. These methods allow us to examine how key self-determination theory variables change or influence each other over time to further understand how self-determination theory can explain both flourishing and ill-being.

The basic principle of self-determination theory is that humans have three basic psychological needs for competence (feeling confident in one's abilities), relatedness (feeling close to others), and autonomy (feeling volitional) (Deci & Ryan, 2000). These are the basic ingredients proposed for human motivation and flourishing and the frustration of these needs is related to ill-being and psychological distress (Ryan & Deci, 2017). Further, the role of autonomy in human motivation has received significant attention. Self-determination theory does not examine the quantity of one's motivation, but instead examines the quality of one's motivation, or the reason why an individual strives for a goal or aspiration (Koestner et al., 2008;

Ryan & Deci, 2017). Individuals are thought to pursue goals for a multitude of reasons ranging from more controlled (because they feel like they have-to) to more volitional/ autonomous (because they want-to) (Ryan & Deci, 2017). Although there has been significant research within self-determination theory on basic psychological needs, and motivation, there has yet to be rigorous longitudinal research, which examines how key self-determination theory variables develop or interact over time. By further examining the relation between motivation, support and needs, a greater understanding of this theory can be established, and further applications or interventions could be utilized.

The current thesis uses longitudinal methods in student populations to further understand self-determination theory. The first two manuscripts examine whether dynamic reciprocal relations exist between autonomous motivation and support to examine whether personal and interpersonal autonomy are collaborative and an antecedent of flourishing during goal pursuit (Article 1 and 2). Then, this thesis presents a novel longitudinal examination of how basic psychological need frustration contributes to psychological distress over the academic year and the COVID-19 pandemic (Article 3). The main aim of this thesis was to present extensions of core self-determination theory concepts by applying longitudinal research methods. The current research aims to confirm the benefits and importance of self-determination theory as an antecedent and predictor of both well-being and distress over time.

Self-Determination Theory and Longitudinal Research Designs

Self-determination theory suggests that all humans have the basic psychological need for autonomy, competence, and relatedness and that these needs underlie human growth, motivation, and development (Ryan & Deci, 2017). This theory was first conceived a little over three decades ago and has emerged as one of the most popular and well-studied theories of human

motivation and development. Self-determination theory has proven to be a successful theory because it is parsimonious, testable, valid across cultures, and it promotes further scientific investigation and progress. Even though this theory has been extremely well-studied, there are still many important research questions or extensions that are possible.

The current thesis takes advantage of longitudinal research methods to further expand our understanding of how self-determination relates to flourishing, well-being, goal progress and distress over time. The benefit of prospective longitudinal research is that the relation between variables is not limited to one time point, but variance can be controlled for across time points and changes can be observed. Structural equation modelling or path modelling can help distinguish antecedents and concomitants of change and can help researchers further understand what contributes to change and development over time (Muthen & Muthen, 2015). Bettering our understanding of what might be leading to changes over time, and what just co-occurs over time. There is already a significant amount of research that utilizes a longitudinal design within self-determination theory to examine change over time (i.e, Koestner, et al., 2012, Milyavskaya et al., 2015; Werner et al., 2017). However, there has yet to be extensive research which rigorously controls for change across multiple time points to examine patterns of growth or change. Additionally, the questions inspired by the longitudinal research design in this thesis have yet to be explored within the self-determination theory literature.

Path models with cross-lagged pathways allow variance to be controlled for at each time point and over time to examine intraindividual changes in outcome variables of interest (Selig & Little, 2012). Although causal claims cannot be made with these statistical analyses, these models can utilize observational data to better understand directional changes. The current research aimed to continue applying longitudinal research methods and analyses in self-

determination theory to better understand how motivation, support and basic psychological needs interact and relate to flourishing or ill-being over time.

In article 1, longitudinal research methods are used to explore whether motivation and support contribute to each other in a dynamic reciprocal manner to predict goal progress, and well-being. This research extends self-determination theory by proposing that motivation and support are collaborative, or that it is not only support that can benefit motivation, but that the reverse is also true: motivated agents gather and perceive better support during goal pursuit. The influence of motivation on support had yet to be explored. This study utilized reports from over 1000 students on their goal pursuit over an 8-month academic year. The path model used was able to explore what predicted well-being and success in goal pursuit overtime – motivation or support. As elaborated on in the collaborative autonomy section of the introduction, although never tested, there are a number of theories congruent with self-determination theory that suggest that not only should support lead to improved motivation, but that motivated individuals should be able to elicit, perceive or gather more beneficial support. By analyzing this longitudinal data with these statistical techniques, it was possible to examine the collaborative nature of autonomy and further extend our understanding of how autonomy flourishes in emerging adulthood.

Article 2 further provides evidence for the collaborative nature of autonomy by using longitudinal cross-lagged models to examine the influence of collaborative traits over time on motivation, support, and goal progress. Again, personality has yet to be examined in relation to both motivation and support in goal pursuit, or how these variables interact over time. To further test our theoretical extension, that autonomy flourishes as a collaborative process, dispositional traits were used that are defined by cooperation, empathy, and trust. This provides evidence that autonomy is not a “me, myself and I” form of motivation, but rather one that invites support, and

open collaboration. These models controlled for the relation between motivation and support at the start and end of the academic year, and their influence on each other over time, and still examined the influence of collaborative dispositional factors for improved motivation, support and goal outcomes. Again, this longitudinal method allows for rigorous tests of variance over time to help better understand how individual differences effect change over time.

Finally, article 3 is one of the first studies to examine the influence of basic psychological need frustration on depressive symptoms over time. There is a plethora of research on need satisfaction and well-being, but little research on the reverse relation. This article was a stringent test of whether depressive symptoms, negative mood states, or psychological need frustration are antecedents or concomitants of ill-being overtime and was replicated using a pandemic sample. Again, fully cross-lagged models allow for observations of intraindividual change over time while controlling for the correlations between these variables across and over time. Additionally, some observer reports were used in article 3 to confirm these findings in a replication. The general introduction continues by further explaining these key theoretical concepts in self-determination theory and the empirical basis for why the main research questions using longitudinal methods were proposed.

Collaborative Autonomy

Article 1 examined how goal motivation develops in emerging adulthood. Many university students start the school year by setting goals for themselves. Independent of the specific goal, motivation is one factor that has been shown to consistently predict who will and who will not be successful during goal pursuit (Sheldon & Houser-Marko, 2001; Sheldon & Kasser, 1998). According to self-determination theory, motivation quality – the reasons for pursuing a goal – is especially relevant for predicting how successful an individual will be during

goal pursuit. Individuals are thought to pursue goals for a multitude of reasons ranging from more controlled (because they feel like they have-to) to more volitional/ autonomous (because they want to) (Ryan & Deci, 2017). There is a plethora of research on the benefits of autonomous goal motivation, but less research on how young adults may develop these autonomous personal goals. It is proposed that the development of autonomous personal goals is a collaborative process that is supported through the interplay of an individual's autonomy, and their perceived motivational support network.

Autonomous goal motivation is defined by pursuing one's goals for reasons that are personally meaningful and valued (identified), consistent with one's values and goals (integrated) and because pursuing this goal is enjoyable and satisfying (intrinsic) (Sheldon & Elliot, 1999). Studies have consistently found that people make more progress over time on autonomously motivated goals than non-autonomous goals (Koestner et al., 2008; Sheldon, 2014). This pattern of results was obtained for university students, working adults, and patients in treatment (Gorin et al., 2014). There is also evidence from meta-analyses that greater goal progress translates into improved well-being and greater psychological need satisfaction (Koestner et al., 2002; Sheldon & Elliot, 1999; Smith et al., 2007).

There are several mechanisms that partially explain why autonomous motivation is related to greater goal success. Autonomously motivated individuals report greater subjective ease during goal pursuit, as well as less goal conflict and distractions (Kelly et al., 2015; Milyavskaya et al., 2015; Werner et al., 2017). When individuals are autonomously motivated, they are more like to set effective implementation plans, and are better at task-oriented coping if they run into challenges (Gaudreau et al., 2012; Koestner et al., 2002, 2008). Additionally, when individuals are autonomously motivated they are less likely to have severe action crises or

experience setbacks or challenges that may entirely derail goal pursuit (Holding et al., 2017). Therefore, pursuing goals for autonomous reasons is not only beneficial for improved goal progress and well-being, but also it seems to make the goal striving process "easier". Challenges or obstacles are inevitable during goal pursuit, but when pursuing a goal that is personally meaningful, valued, and enjoyable, the research suggests that one may be able to move through this process with greater ease. With the clear benefits of autonomous motivation, more research is needed to better understand how autonomous goals develop in emerging adulthood.

Autonomous motivation is often thought of as a self-initiated process in which one pursues personally meaningful goals in a volitional manner. However, a closer examination of the literature suggests that the development of autonomous goals is likely to be a collaborative process built around interpersonal relationships and shared goals. Consistent with the transactive model of goal pursuit, the development of personal goals occurs within our interpersonal environments (Fitzsimons & Finkel, 2018). An individual's social environment can actively influence how someone pursues their goals. There is an extensive literature that provides evidence that autonomy supportive goal environments are beneficial for the growth of autonomous motivation (see Su & Reeve, 2011 or Vansteenkiste et al., 2012, for reviews).

Autonomy support is defined as support that enhances one's volition or choice (Ryan & Deci, 2000). Autonomy support for goals has recently been measured in terms of whether one feels that supporters listen to how you would like to do things and understand your perspective with respect to your goals (Koestner et al., 2012). Autonomy support has been used as a measure of how openly supportive one's motivational environment is. Autonomy support is thought to establish the context for developing autonomous motivation, which is self-directed, personally meaningful, and pleasurable (Ryan & Deci, 2017).

Across various contexts, autonomy supportive teachers, parents, managers, peers, and partners have been shown to enhance autonomous motivation in others (e.g., Black & Deci, 2000; Moreau & Mageau, 2012; Patall et al., 2018; Soenens & Vansteenkiste, 2005; Su & Reeves, 2011). Heightened autonomy has, in turn, been related to greater goal progress, achievement, well-being, and relationship satisfaction (e.g., Bao & Lam, 2008; Grolnick et al., 2014; Koestner et al., 1984). Self-determination theory acknowledges the benefits of supportive environments during goal pursuit but has yet to examine the reciprocal part of the transactive goal model (i.e., how goal striving occurs within the context of our interpersonal environments). Individuals do not pursue goals in isolation and perceptions of support may influence their goal environment and pursuit.

Although there is clear support for a causal relation from autonomy support to autonomous goal motivation, there has yet to be research which examines the reverse question, whether more autonomously motivated individuals seek out, perceive, or elicit more autonomy supportive relationships and social contexts. That autonomous goal motivation would lead individuals to seek environments which support their volition and avoid environments that are controlling is consistent with personality-environment fit theory, which posits that individuals select environments which fit their dispositional styles and exert personal influence on their environments (Caplan, 1987). Psychological mechanisms may be deployed to reinforce pre-existing traits or dispositions (McAdams, 2015). The autonomous student may select the autonomy supportive environment because they are attracted and responsive to this motivation-congruent support style (Roberts et al., 2008). By applying personality-environment fit theory to goal motivation, we can begin to understand how autonomously motivated individuals select and evoke autonomy supportive environments which suit their dispositional motivation. Over time,

motivation and environmental support may continuously contribute to each other to result in a dynamic, reciprocal autonomous goal system, which may lead to subsequent achievement and well-being. Alternatively, the reciprocal relation between autonomous motivation and autonomy support may be fueled through the positive emotions gained during this process (Fredrickson, 2001).

Article 1 aims to examine the dynamic reciprocal relation between goal motivation and support to determine how motivation can influence support and goal outcomes overtime. Goal striving does not occur in isolation (Fitzsimmons & Finkel, 2018). The dynamic reciprocal relation between autonomous motivation and support has yet to be examined with a self-determination theory perspective. It is proposed that not only will support be beneficial for improved motivation, but that the reverse relation also exists, more autonomously motivated students may be able to gather, elicit, or generate more autonomy support from their peers or family members. Article 1 aims to extend self-determination theory by examining the collaborative nature of autonomy and its influence on goal progress and well-being over time.

Collaborative Traits

Article 2 aimed to examine which individual difference factors support the flourishing of motivation and support in goal pursuit longitudinally. Independent of the specific goal, motivation is one factor that has been shown to consistently predict who will and who will not be successful during goal pursuit (Sheldon & Houser-Marko, 2001; Sheldon & Kasser, 1998). According to self-determination theory, individuals who pursue goals for more volitional/ autonomous reasons (because they want-to) are more likely to be successful during goal pursuit (Ryan & Deci, 2017). Additionally, individuals who perceive their supporters to be autonomy supportive (open and non-judgemental) during goal pursuit are more likely to be successful and

happier during goal pursuit (Su & Reeves, 2011). Both personal and interpersonal autonomy are crucial during goal pursuit, but who is better at engaging with their goals in this autonomous manner? Recent research suggests that the pursuit of one's goals does not occur in isolation, but rather in a dynamic goal system fueled by the interaction of personal and interpersonal factors (Fitzsimmons & Finkel, 2018). Recent research suggests that the development of autonomous goals is likely to be a collaborative process, in which both autonomous motivation and autonomy support contribute to the growth of each other over time (Levine et al., 2020). So perhaps, individuals who openly cooperate and collaborate with others are more likely to interact with their environment in a way that is beneficial to their own autonomous goal pursuit. It is proposed that individuals higher in cooperative personality and developmental dispositions – agreeableness, assisted autonomy satisfaction and secure attachment will experience a flourishing in the development of autonomous personal goals and autonomy supportive goal environments in emerging adulthood.

There is some evidence that one's disposition can influence their goals. For example, individuals are often more likely to pursue goals that either compensate for their personality (e.g., be less shy and low extraversion), or goals that compliment their personality (e.g. travel the world and high openness) (Reisz et al., 2013). The Big Five personality traits have also been found to be differentially associated with intrinsic and extrinsic achievement motivation, such that, intrinsic motivation was found to be positively related to conscientiousness, openness and extraversion, and extrinsic motivation was found to be associated with conscientiousness, and neuroticism, and negatively associated with agreeableness (Hart et al., 2007). Additionally, trait self-control, agreeableness, and conscientiousness have all been shown to be positively associated with autonomous motivation for personal goals (Holding et al., 2019). Even though

past research has examined personality and support, they did not examine whether personality factors influenced growth in both autonomous motivation and perceived autonomy support over an entire academic school year.

Agreeableness is a trait defined by empathy and cooperation (John & Srivastava, 1999). This trait has been consistently associated with an interpersonal orientation that fosters collaboration (Jensen-Campbell et al., 2010). Agreeableness encompasses descriptors having to do with interpersonal warmth, affection, empathy, cooperation, and other communal facets of personality. Past research has found that agreeableness is related to autonomous goal pursuit and higher levels of perceived support within a family system (Branje et al., 2004; Holding et al., 2019). It is possible that more agreeable individuals are better able to openly engage with their environment about their goals, and their easy disposition allows their environment to support them. For example, an agreeable student may be able to express their wishes in a friendly manner and their warmth might facilitate a more positive reaction from those in their environment. Thus, agreeable individuals may be able to engage in their environment in a way that facilitates growth in autonomous goal motivation and perceived autonomy support from others.

Additionally, our research aimed to determine how one may display or embody collaboration beyond a broad trait measure. One's dispositional style when striving for autonomy may be a stable and pervasive indicator of motivation and support over the school year. It may be that when individuals are more collaborative in striving for autonomy, they experience more growth in autonomous motivation and support over the year. Assisted autonomy striving is characterized as searching for autonomy while engaging with others and the environment around them (Legault et al., 2017). Consistent with this, the transactive goal model would suggest that if autonomy flourishes as a collaborative process, then individuals who openly seek support from

their environment will be more successful at perceiving that support, which in turn is beneficial for their motivation (Fitzsimmons & Finkel, 2018). Conversely, an individual who strives for autonomy in an asserted manner, who may alienate or isolate others in pursuit of their personal autonomy, may receive a more negative or non-supportive reaction from their social environment, and this reduction in goal support may worsen the quality of their motivation. If goals are a transactive interpersonal experience, then striving to connect with one's interpersonal environment may be more advantageous than goal striving in isolation. A common narrative of success in North America suggests that independent struggle can lead to great success, but the current research aims to challenge this and suggest that strength in goal pursuit may be fueled by being openly collaborative during goal pursuit.

Finally, if autonomy flourishes through collaboration, then dispositional differences that emerge during development might be the greatest indicator of this. Secure attachment is defined as having the ability to form strong connections with others, while also being capable of independence when appropriate (Bowlby, 1988). Specifically, secure attachment has been shown to foster growth and exploration (Ainsworth, 1979); so, the same may be true in emerging adulthood for goal development (Elliot & Reis, 2003). Secure attachment may help foster the dynamic personal and interpersonal processes involved in autonomous goal development in emerging adulthood, because this type of relationship fosters independent growth through trust and open communication. Secure attachment may thus be a precursor to the development of autonomous goals, as attachment strengthens interpersonal bonds and perceived support, while also encouraging autonomy and self-exploration. For example, a securely attached student who passionately shares their goals with a parent is likely to be openly encouraged, listened to, and supported, which further fuels autonomous motivation. Additionally, attachment theory posits

that the bond we create with our parents during development can influence how we develop relationships, perceive support, and function as adults (Brennan & Shaver, 1995; Kafetsios & Sideridis, 2006). There has been limited research on the influence of secure attachment on motivation, but most of this research is focused on adolescent goal pursuit. One study found that in adolescence, secure attachment to one's parents was positively associated with academic motivation, and that this relation was mediated by perceptions of support (Duchesne & Larose, 2007). There is additional research which suggests that secure attachment can influence perceived support. When partners genuinely encourage each other, securely attached individuals reported receiving greater levels of high-quality support then less securely attached individuals (Collins & Feeney, 2004). Secure attachment may thus be a precursor to the development of autonomous goals, as attachment strengthens interpersonal bonds and perceived support, while also encouraging autonomy and self-exploration.

Article 2 aimed to examine the collaborative nature of autonomy by combining longitudinal methods with a self-determination theory perspective. This research examined whether collaborative dispositional factors defined by cooperation and trust were antecedents to autonomous motivation and autonomy support flourishing during goal pursuit over the academic year. This research combined personality theory with self-determination theory to provide evidence for the collaborative nature of autonomy in successful goal pursuit. Again, this research utilized longitudinal methods to further self-determination theory and our understanding of how this theory explains flourishing in emerging adulthood.

Need Frustration as an Antecedent of Distress

Article 3 aimed to further self-determination theory by examining the influence of basic psychological need frustration on psychological distress over time using cross-lagged models.

Depression is one of the most common and persistent mental health problems that university students report (Song et al., 2008). Depressive symptoms can persist throughout university and can significantly affect students' academics, relationships, and daily functioning (Porter, 2018). The increased prevalence of mental health problems has spurred researchers to explore what contributes to ill-being on university campuses. Previous research has shown that both negative affect and frustration of basic psychological needs (e.g. autonomy, competence, and relatedness) can contribute to depressive symptoms (Vansteenkiste & Ryan, 2013; Watson et al., 1988). Experiencing increased negative affect is closely linked to experiencing depressive symptoms (Watson et al., 1988). Similarly, frustration of one's basic psychological needs, thwarting of a sense of competence, relatedness, or autonomy, is associated with increased likelihood of suffering from depressive symptoms (Costa et al., 2015; Ryan & Deci, 2017). However, the conceptual overlap of negative affect, need frustration, and depressive symptoms has yet to be explored, even though these constructs are often highly correlated. The present study aimed to examine how need frustration, negative affect and depressive symptoms develop over the course of an academic year and during the COVID-19 pandemic. The main goal of this research was to be able to better understand what might put students at risk of experiencing more severe depressive symptoms and ill-being over time by examining this crisis from a self-determination theory perspective.

Depressive symptoms commonly present as heightened negative affect, anhedonia (loss of positive affect), weight loss or gain, psychomotor retardation, impaired concentration, insomnia, restlessness, agitation, and feelings of worthlessness (Trivedi, 2004). On average, students report increased depressive symptoms over an academic year (Levine et al., 2020). Further, affect is a critical component of psychopathology, and often a core symptom of mood

and anxiety disorders. Affect is a general measure of a person's emotional experience over time (Emmons, 1992). Affect integrates one's physiological and cognitive appraisals, as well as the valence and intensity of an experience (Munezero, et al., 2014). To determine an individual's well and ill-being, researchers will often measure general affect (Emmons, 1992; Watson & Clark, 1995). The current research aimed to distinguish whether negative affect and need frustration are distinct antecedents of depressive symptoms across the academic year.

Basic psychological needs theory, a mini-theory within self-determination theory (Ryan & Deci, 2017), posits that need frustration contributes to ill-being (Vansteenkiste et al., 2020). A person's three basic psychological needs are competence (feeling able and confident in one's abilities), relatedness (feeling close to others), and autonomy (feeling free and volitional) (Ryan & Deci, 2017). These needs must be satisfied in order to promote one's growth, vitality, and general psychological well-being, while active need thwarting leads to frustration, dissatisfaction, and ill-being (Diener & Oishi, 2000). There are many aspects of university life that may be need frustrating for an individual, for example receiving grades below one's expectations (competence frustration), feeling isolated from one's peers (relatedness frustration), or perhaps feeling compelled to follow a certain career path (autonomy frustration). The current research aims to explore whether need frustration serves as a predictor of depressive symptoms over the academic year.

Need frustration is the active thwarting of one's needs, and need dissatisfaction is the lack of fulfillment of one's basic needs (Ryan & Deci, 2017). For example, a plant will not fair well if it does not have sunlight (low need satisfaction) but will wither and die quickly if you use salt water on it (need frustration). When controlling for need frustration, need dissatisfaction does not predict ill-being, meaning need frustration is a unique contributor to negative outcomes

(Cordeiro et al., 2016). For example, an environment where one does not get along with colleagues will result in low feelings of relatedness and low well-being, but a workplace where one is rejected and socially isolated by others effectively thwarts relatedness and leads to ill-being (Schultz et al., 2015; Vansteenkiste & Ryan, 2013). The impact of rejection or isolation, feelings of incompetence or being controlled can have a large impact on an individual's mental health but has yet to be extensively examined using longitudinal methods (Vansteenkiste et al., 2020).

Need frustration often mediates the relationship between negative environments and depressive symptoms, suggesting that psychological needs may play a role in explaining why psychopathology occurs (Campbell et al., 2018). However, there have been only two studies that examined the relation between need frustration and ill-being in multi-wave longitudinal studies (Cordeiro et al., 2016; Vermote et al., 2021). Self-determination theory suggests that need frustration is a unique predictor of ill-being, but without rigorous longitudinal research, how can we determine whether need frustration precedes ill-being, or whether it is just a natural correlate of ill-being over time. Article 3 aims to distinguish whether negative affect and need frustration are distinct antecedents or concomitants of depressive symptoms across the academic year and during the COVID-19 pandemic using longitudinal methods to further expand our understanding of self-determination theory.

The Present Research

The present set of studies aimed to further extend self-determination theory using longitudinal methods and analyses. In this set of studies, I examined university student populations over the course of the academic year to better understand motivation, support, and basic psychological needs in relation to well-being and psychological distress. There is a plethora

of research in self-determination theory on these topics, but the current research aimed to extend self-determination theory by examining the dynamic reciprocal relations between these variables over time to establish patterns of change, and determine antecedents related to flourishing (well-being and goal attainment) and psychological distress.

Article 1 consists of a multi-wave, longitudinal study of 1544 university students during goal pursuit, in which autonomous motivation and autonomy support were repeatedly assessed over the span of a school year (about 9,000 data points). The aim of this study was to examine whether the development of autonomous personal goals is a dynamic, collaborative process fueled by the interaction of personal autonomy, and perceived interpersonal support. The multi-wave, temporal nature of our data was used to establish whether there were dynamic and reciprocal relations between the personal and interpersonal forms of autonomy. Previous studies have shown that autonomy support enhances autonomous goal motivation, but no study has shown the reciprocal relation, nor has any study shown that the pattern would persist beyond one cycle of measurement. This research is a preliminary examination of whether autonomy flourishes in a dynamic manner. Specifically, it was hypothesized that autonomy support was related to increased autonomous motivation, and conversely that autonomous motivation was related to increased autonomy support over time. Additionally, I sought to examine whether the growth of autonomy was associated with positive affect and goal progress over time. It was hypothesized that gains in both autonomous motivation and autonomy support would be associated with gains in goal progress and positive affect over the year.

Article 2 consisted of a set of longitudinal studies of university students' goal pursuits in which personality, autonomous motivation, and autonomy support were assessed over the span of a school year. My aim was to examine whether individuals higher in cooperative personality

traits (agreeableness, assisted autonomy satisfaction, and secure attachment) experienced growth in autonomous motivation for personal goals, and autonomy supportive goal environments. Goal striving does not occur in isolation, and recent developments in goal theory would suggest that individuals who engage openly with their environment are more likely to experience the benefits of autonomous motivation and support during goal striving (Finkel & Fitzimons, 2018). First, it was hypothesized that agreeableness would be related to both increases in autonomous motivation and perceived autonomy support over the year. There were no specific hypotheses for the other Big Five traits. Second, it was expected that assisted autonomy would relate to the development of autonomous motivation and greater perceived autonomy support over the year; there were no hypotheses for assertive autonomy. Finally, it was hypothesized that secure attachment to parents would predict increased autonomous motivation for goals supported by the parent and perceived autonomy support from parents over the school year. Finally, a model was created to examine whether a higher order latent collaborative trait existed, and whether it was beneficial for autonomous motivation, support, and goal progress. The overarching goal of this research was to use longitudinal research methods to provide evidence that collaborative individuals can foster goal environments that enhance their motivation and adequately support their ambitions.

Article 3 used fully cross-lagged path modelling to examine the associations between need frustration, negative affect, and depressive symptoms over the academic year and the first 6 weeks of the COVID-19 pandemic. Conceptually, there is a lot of overlap between these constructs, and the current methodology allowed us to observe how these constructs influence each other over time while controlling for that shared variance. I hypothesized that both negative affect and need frustration would be unique predictors of depressive symptoms over the

academic year, and that these variables would have reciprocal accumulation. In order to test these hypotheses, a 3-wave longitudinal survey on 379 students was conducted over the course of a full 8-month academic year, and focused on students' reports of affect, basic psychological needs and depressive symptoms at beginning (September), middle (December) and end of the academic year (April). This study aimed to highlight how self-determination theory can help our understanding of how depressive symptoms develop in university students, by highlighting the incremental validity of basic psychological need frustration relative to negative affect. The goal of this second study in Article 3 was to replicate previous finding in a pandemic sample. Again, cross-lagged relations were examined between negative affect, need frustration and depressive symptoms across 6 weeks at the beginning of the global pandemic (early April 2020 to late May 2020). It was hypothesized, that need frustration would be an antecedent and concomitant of depressive symptoms and negative affect during the COVID-19 pandemic. A secondary goal of this second study was to examine whether these results could be replicated using the reports of close family members and friends to confirm changes in depressive symptoms associated with need frustration. The reports were intended to corroborate the participant self-reports and help us to further understand depressive presentation in these individuals. Article 3 aimed to apply the importance of longitudinal research methods and analyses in self-determination theory to further suggest that these analyses are critical for understanding the impact of this theory on psychological distress over time.

Across these three articles, over a thousand individuals were examined over time to extend our understanding of how key variables in self-determination theory can influence well-being and distress. Article 1 and 2, focused on the dynamic reciprocal relation between motivation and support to suggest that autonomy flourishes when collaborative individuals are

autonomously motivated and surrounded by supporters that enhance their volition. This dynamic relation is believed to lead to an upward spiral that result in improved goal pursuit and positive affect over the academic year. Article 3 focused on distinguishing whether basic psychological need frustration was an antecedent, correlate or consequence of negative affect and depressive symptoms over time. Again, using longitudinal path modelling, basic psychological need frustration was hypothesized to emerge as an antecedent and predictor of ill-being over the academic year, and the COVID-19 pandemic.

This series of research studies uses longitudinal methods and analyses to test critical questions in self-determination theory. Do the basic tenets or principles in self-determination theory hold when examining these relations longitudinally in novel ways or when compared with different theories (e.g., transactive goal model, Big-5 trait theory, attachment theory, etc.). Self-determination theory is a theory of human motivation, development, and flourishing. The goal of this thesis was to extend our understanding of self-determination theory and how this theory predicts the development of well-being and distress over time.

Article 1

Collaborative autonomy: The dynamic relations between personal goal autonomy and perceived autonomy support in emerging adulthood results in positive affect and goal progress[*]

S. L. Levine[1*], A. C. Holding[1], M. Milyavskaya[2],

T. A. Powers[3] & R. Koestner[1]

[1]McGill University, Montreal, Canada

[2]Carleton University, Ottawa, Canada

[3]University of Massachusetts Dartmouth, New Bedford, USA

*Publication Citation

Levine, S. L., Holding, A. C., Milyavskaya, M., Powers, T. A., & Koestner, R. (2021). Collaborative autonomy: The dynamic relations between personal goal autonomy and perceived autonomy support in emerging adulthood results in positive affect and goal progress. *Motivation Science, 7*(2), 145.

Abstract

Individuals are more successful when they pursue autonomous goals, but how do such goals develop in young adults? The current investigation suggests that the development of autonomous personal goals is a collaborative process. To test this, we examined whether autonomous motivation and autonomy support would interact in a dynamic reciprocal manner over the school year. A 5-wave longitudinal study was conducted with university students (N = 1544), who completed surveys on motivation, support, goal progress and affect. A dynamic reciprocal relation emerged between autonomous motivation and autonomy support. At each subsequent time-point, autonomy support led to increased autonomous motivation, and autonomous motivation led to increased autonomy support. This upward spiral of autonomous goal motivation and autonomy support also resulted in increased positive affect and goal progress over the academic year. These results suggest that the development of autonomous personal goals is a collaborative process fueled by an individual's personal autonomy and the interpersonal autonomy support they perceive from others, and this upward cycle is also beneficial for well-being and success. Future research is needed to determine how autonomously motivated individuals seek or elicit more autonomy support from others.

Keywords: Autonomous motivation, autonomy support, goals, positive affect, goal progress

Collaborative autonomy: The dynamic relations between personal goal autonomy and perceived autonomy support in emerging adulthood results in positive affect and goal progress

Many university students start the school year by setting goals for themselves. Some students strive to get A's in all their classes, while others hope to make new friends or eat healthier. Independent of the specific goal, motivation is one factor that has been shown to consistently predict who will and who will not be successful during goal pursuit (Sheldon & Houser-Marko, 2001; Sheldon & Kasser, 1998). According to self-determination theory, motivation quality – the reasons for pursuing a goal – is especially relevant for predicting how successful an individual will be during goal pursuit. Individuals are thought to pursue goals for a multitude of reasons ranging from more controlled (because they feel like they have to) to more volitional/ autonomous (because they want to) (Ryan & Deci, 2017). Autonomous goals are defined as reflecting personal interest, meaning, values, and enjoyment. For example, a student could be motivated to get good grades because they feel pressure from their parents (controlled) or because they take joy in learning, and education is a valued part of their identity (autonomous). There is a plethora of research on the benefits of autonomous goal motivation, but less research on how young adults may develop these autonomous personal goals. We propose that the development of autonomous personal goals is a collaborative process that is supported through the interplay of an individual's autonomy, and their perceived motivational support network.

Autonomous Goals

Pursuing goals for autonomous reasons appears to be highly adaptive. Autonomous goal motivation is defined pursuing one's goals for reasons that are personally meaningful and valued (identified), consistent with one's values and goals (integrated) and because pursuing this goal is

enjoyable and satisfying (intrinsic) (Sheldon & Elliot, 1999). Studies have consistently found that people make more progress over time on autonomously motivated goals than non-autonomous goals (Koestner, Otis, Powers, Pelletier & Gagnon, 2008; Sheldon, 2014). This pattern of results was obtained for university students, working adults, and patients in treatment (Gorin, Powers, Koestner, Wing & Raynor, 2014). There is also evidence from meta-analyses that greater goal progress translates into improved well-being (Koestner, Lekes, Powers & Chicoine, 2002).

There are several mechanisms that appear to mediate the relation of autonomous motivation to greater goal success. Autonomy appears to optimize goal pursuit because it is associated with adaptive goal processes including subjective ease of pursuing the goal (Werner, Milyavskaya, Foxen-Craft & Koestner, 2017), less goal conflict (Kelly, Mansell & Wood, 2015), automatic shielding of goals from temptations and distractions (Milyavskaya, Inzlicht, Hope & Koestner, 2015), fewer and less severe action crises (Holding, Hope, Harvey, Marion Jetten & Koestner, 2017), malleable beliefs about one's self-control capacities (Sieber, Fluckiger, Mata, Bernecker & Job, 2019), task-oriented coping (Gaudreau, Carraro & Miranda, 2012), and more frequent and effective use of implementation plans (Koestner et al., 2002, 2008). Finally, when individuals pursue autonomous goals, they experience greater need satisfaction which promotes well-being (e.g. Kelly et al., 2015; Sheldon & Elliot, 1999; Smith, Ntoumanis & Duda, 2007).

The Development of Autonomous Goals

Given the benefits of autonomous goal motivation, it is important to examine how it develops. Autonomous motivation is often thought of as a self-initiated process in which one pursues personally meaningful goals in a volitional manner. However, a closer examination of the literature suggests that the development of autonomous goals is likely to be a collaborative

process built around interpersonal relationships and shared goals. Consistent with the transactive model of goal pursuit, the development of personal goals occurs within our interpersonal environments (Fitzsimons & Finkel, 2018). An individual's social environment can actively influence how they pursue their goals. For example, individuals are more likely to pursue autonomous goals in those environments that afford the satisfaction of the psychological needs of autonomy, competence, and relatedness, compared to environments where those needs are not satisfied (Milyaskaya, Nadolny & Koestner, 2014). Additionally, there is an extensive literature which provides evidence that autonomy supportive goal environments are beneficial for the growth of autonomous motivation (see Su & Reeve, 2011 or Vansteenkiste et al., 2012, for reviews). Autonomy support is defined as support which enhances one's volition or choice (Ryan & Deci, 2000). Autonomy support for goals has recently been measured in terms of whether one feels that supporters listen to how you would like to do things and understand your perspective with respect to your goals (Koestner, Powers, Carbonneau, Milyavskaya & Chua, 2012). Autonomy support has been used as a measure of how openly supportive one's motivational environment is.

Autonomy support is thought to establish the context for developing autonomous motivation, which is self-directed, personally meaningful, and pleasurable (Ryan & Deci, 2017). Across various contexts, autonomy supportive teachers, parents, managers, peers, and partners have been shown to enhance autonomous motivation in others (e.g. Black & Deci, 2000; Moreau & Mageau, 2012; Patall et al., 2018; Soenens & Vansteenkiste, 2005; Su & Reeves, 2011). Heightened autonomy has, in turn, been related to greater goal progress, achievement, well-being, and relationship satisfaction (e.g. Bao & Lam, 2008; Grolnick et al., 2014; Koestner, Ryan, Bernieri & Holt, 1984). Self-determination theory acknowledges the benefits of supportive

environments during goal pursuit, but to the best of our knowledge has yet to examine the reciprocal part of the transactive goal model. Individuals do not pursue goals in isolation and perceptions of support may influence their goal environment and pursuit.

Reciprocal dynamic relations between autonomous goals and autonomy support.

Although there is clear support for a causal relation from autonomy support to autonomous goal motivation, there has yet to be research which examines the reverse question, whether more autonomously motivated individuals seek out, perceive, or elicit more autonomy supportive relationships and social contexts. That autonomous goal motivation would lead individuals to seek environments which support their volition and avoid environments that are controlling is consistent with personality-environment fit theory, which posits that individuals select environments which fit their dispositional styles and also exert personal influence on their environments (Caplan, 1987). Psychological mechanisms may be deployed to reinforce pre-existing traits or dispositions (McAdams, 2015). The autonomous student may select the autonomy supportive environment because they are attracted and responsive to this motivation-congruent support style (Roberts, Woods & Caspi, 2008). By applying personality-environment fit theory to goal motivation, we can begin to understand how autonomously motivated individuals select and evoke autonomy supportive environments which suit their dispositional motivation. Over time, motivation and environmental support may continuously contribute to each other to result in a dynamic, reciprocal autonomous goal system, which may lead to subsequent achievement and well-being.

Both autonomous goal motivation and autonomy support are related to positive affectivity and well-being (e.g. Kelly et al., 2015; Gagne, 2003; Sheldon & Elliot, 1999). This dynamic relationship between autonomous motivation and autonomy support may develop

reciprocally through a positive reinforcement system. In line with the broaden and build theory, positive emotions experienced while acting autonomously or receiving autonomy support may lead one to continue to pursue autonomous action or autonomy support from others, which further fuels gains in positive emotions (Fredrickson, 2001). Thus, the reciprocal relation between autonomous motivation and autonomy support may be fueled through the positive emotions gained during this process. Positive and negative affect are separate constructs that can be examined independently (Diener & Emmons, 1984). There is little evidence that autonomous goal motivation or support would contribute to negative affectivity, so this research focused on positive affect. Intrinsic motivation (i.e. goals pursued for personal enjoyment or pleasure) and autonomy supportive environments have indeed been found to interact synergistically to result in better performance outcomes (Vansteenkiste, Simons, Lens, Sheldon & Deci, 2004). However, the synergistic nature of personal and interpersonal autonomy has yet to be explored longitudinally to determine whether this occurs in a dynamic cyclical manner over time. The reinforcing function of positive affect may partially explain why such a reciprocal relation would flourish in emerging adulthood.

Present Investigation

The current investigation consists of a multi-wave, longitudinal study of university students' goal pursuits in which autonomous motivation and autonomy support were repeatedly assessed over the span of a school year. Our aim was to examine whether the development of autonomous personal goals is a dynamic, collaborative process fueled by the interaction of personal autonomy, and perceived interpersonal support. We made use of the multi-wave, temporal nature of our data to establish whether there were dynamic and reciprocal relations between the personal and interpersonal forms of autonomy. Previous studies have shown that

autonomy support enhances autonomous goal motivation, but no study has shown the reciprocal relation, nor has any study shown that the pattern would persist beyond one cycle of measurement. This research is a preliminary examination of whether autonomy flourishes in a dynamic manner. Specifically, we hypothesized that autonomy support is related to increased autonomous motivation (H1), and conversely that autonomous motivation is related to increased autonomy support over time (H2). We also sought to determine whether the growth of autonomy is associated with positive affect and goal progress. We hypothesized that gains in both autonomous motivation and autonomy support would be associated with gains in goal progress (H3) and positive affect over the year (H4)[1]. The hypotheses and analytical plan were posted on OSF before any analyses were conducted (but after data collection had occurred)[2]; they can be found along with all measures, data, and full outputs from analyses here: https://osf.io/ufhwz/?view_only=dc0df60a8bbd491e953935f2e7086939.

Methods

Participants and Procedures

Participants were 1544 students at a large Canadian University (M_{age} = 20.63, SD_{age} = 3.08, 71.5% female) collected over four years from 2015 to 2019. Participants were recruited through advertisements in classes and around campus to participate in a year-long study on goals. At the initial time point, participants were excluded if they did not complete ideographic information on their goals. The time points of the study were September, November, December,

[1] This hypothesis varied slightly from the preregistration as the researchers realized that the data could not actually address the initial question posed.
[2] Note initially this analysis was preregistered for a subset of the sample, but a final decision was made to go with the entire sample for a most robust finding after subsequent years were collected. Please see Appendix B on OSF for the original results with the subset of the original data. Additional analyses including goal progress were also added after preregistration in response to suggestions of the reviewers.

February, and April. If participants completed each time-point they were compensated with $50, if they completed a portion of the time points, they received partial compensation. Prior to taking part in the study, each participant was asked to read over and agree to the informed consent. In the initial assessment, all participants completed a series of demographic questions, as well as questions on mood and their motivation for personal goals. Participants were asked to set three goals for themselves for the academic year during the initial time point. Each year, at the second- and fourth-time points participants completed a measure on how supported they felt by others for their goals. In every year, at the third and fifth time points, participants completed the motivation measure again. At the final time point participants completed a survey on their mood and goal progress. The overall retention across the entire school year for all the subsamples was 84%. Missing data was handled using FIML for structural equation models in MPlus. This research was approved by the university research and ethics board. A full list of our measures can be found on OSF under Appendix A.

Measures

Positive Affect. Positive affect at the first and final time points was assessed using 4-items from Emmons (1992). Participants were asked to report how much they felt each emotion on a scale of 1 (*Not at all*) to 7 (*Very*). Emotional prompts included “Joyful”, “Happy”, “Pleased”, and “Enjoyment/Fun”. A mean of all items was taken to compute a positive affect score. $\alpha_{T1} = .85$, $\alpha_{T2} = .88$.

Goal Progress. Goal progress was assessed at the end-of-year. Participants rated how much they agreed with the following three statements: “I have made a lot of progress toward this goal”, “I feel like I am on track with my goal plan” and “I feel like I am achieving this goal” (Koestner et al., 2012). Participants’ responses were made on a

7-point scale with 1 corresponding to strongly disagree and 7 corresponding to strongly agree. Total goal progress was calculated as the mean of the end-of-year assessment items for all goals. $\alpha > .90$.

Autonomous Motivation. At time 1, 3 and 5 participants were asked about their motivation to pursue their goals using 3 items. For each goal, participants were asked to rate their motivation on a 7-point Likert-type scale, from 1 (*not at all for this reason*) to 7 (*completely for this reason*), on items that assessed identified, integrated and intrinsic reasons for goal pursuit (Sheldon & Elliot, 1999). The prompt used to assess identified motives was "Because you really believe that it is an important goal to have – you endorse it freely and value it whole heartedly". The prompt used to assess integrated motives was "Because it represents who you are and reflects what you value most in life". The prompt used to assess intrinsic motives was "Because of the fun and enjoyment which the goal will provide you—the primary reason is simply your interest in the experience itself". A summary measure of autonomous goal motivation was calculated as the mean of all identified, integrated, and intrinsic items for each of the individual's goals (Koestner et al., 2008). $\alpha_{T1} = .66$, $\alpha_{T3} = .72$, $\alpha_{T5} = .74$.

Autonomy Support. Perceived autonomy support was assessed for two supporters at Time 2 and 4 using three items which have been used to measure goal support in previous research (Koestner et al., 2002). First participants were asked to think of two people who have helped them while pursuing all their goals, and then they were asked a series of questions on how supportive each of these individuals have been. Examples of items include "I feel this person understands how I see things with respect to my goal" and "I am able to be open with this person about my goals". All ratings were made on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). A mean of all items for each supporter was taken and then averaged to

compute a perceived autonomy support score as a measure of how generally supportive their environment was. $\alpha_{T2} = .79$, $\alpha_{T4} = .78$.

Analytical Plan

First descriptive statistics were run. To determine change in affect over the year, residualized change scores were calculated using SPSS. To do this Time 5 positive affect was regressed on Time 1 positive affect and the unstandardized residual values were saved (Zumbo, 1999). Then, a fully unconstrained path model was built using MPlus Software (Muthen & Muthen, 2015), as illustrated in Figure 1 below. To determine the best model fit with the greatest DFs, predictive pathways were constrained to the same value. First, the path between autonomous motivation and subsequent time points was constrained. Then, the path between received autonomy support and the subsequent time point was constrained. Following that the time-lagged paths were constrained. The purpose of constraining various pathways over time was to simplify and create the most parsimonious model. The best model was selected based on BIC, CFI, SRMR, RMSEA and χ^2 values. The best model was used to determine indirect effects for the bidirectional mediation model. Using indirect effects, both bidirectional mediation models were tested (i.e. autonomous motivation → autonomy support → change in PA or goal progress and autonomy support → autonomous motivation → change in PA or goal progress).

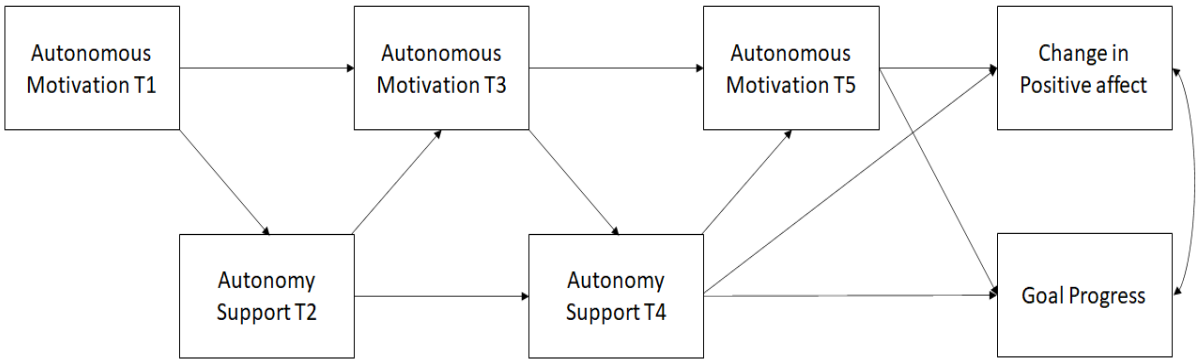

Figure 1. Theoretical path model of the path SEM to determine the reciprocal relation between autonomous support and autonomous motivation and the influence on goal progress and change in positive affect over the year.

Results

Descriptive Statistics. Below, Table 1 summarizes descriptive statistics for the variables of interest for the entire sample (N = 1544) collected from 2015-2019, as well as the correlation between these variables. The data set is included under Appendix C on OSF.

Table 1

Means, standards deviation and correlations with 95%CI between all variables of interest

	M(SD)	T3AM	T5AM	T2AS	T4AS	T1PA	T5PA	T5GP
T1AM	5.27(.86)	.52 [.28, .56]	.42 [.37, .46]	.18 [.13, .23]	.15 [.10, .20]	.21 [.16, .25]	.13 [.07, .18]	.04 [-.01, .09]
T3AM	5.29(.87)	1	.55 [.51, .58]	.22 [.17, .27]	.18 [.12, .23]	.16 [.11, .21]	.14 [.08, .19]	.11 [.06, .17]
T5AM	5.37(.99)	-	1	.22 [.17, .28]	.19 [.14, .25]	.17 [.11, .22]	.17 [.11, .22]	.29 [.23, .33]
T2AS	5.83(.87)	-	-	1	.59 [.55, .62]	.17 [.12, .22]	.22 [.17, .27]	.18 [.12, .23]
T4AS	5.66(.97)	-	-	-	1	.13 [.08, .18]	.20 [.14, .25]	.20 [.15, .25]
T1PA	4.83(1.08)	-	-	-	-	1	.35 [.30, .40]	.11 [.06, .17]
T5PA	4.70(1.21)	-	-	-	-	-	1	.28 [.23, .33]
T5GP		-	-	-	-	-	-	1

Note: AM =autonomous motivation, AS = autonomy support, PA = positive affect and GP = goal progress.

Upward Spiral Model. We used path analyses to test an upward spiral mechanism of autonomous motivation, autonomy support, goal progress and positive affect (as described in the analytical plan above). Appendix C on OSF reports how the model fit changed while constraining different pathways and how the final model was decided upon. The model with the best fit was fully unconstrained (Figure 2). This model had adequate fit: BIC = 21525.76, χ^2 (9) = 71.24, p <.001, CFI = .967, RMSEA = .068[.054; .083], SRMR = .029. Syntax and output are available in Appendix C on OSF. Please see Figure 2 for a representation of this model with statistics. Autonomous goal motivation predicted increased perceived autonomy support across the year. Additionally, autonomy goal support predicted increases in autonomous motivation throughout the school year. Both autonomous goal motivation and support predicted increased goal progress and positive affect over the year. Next, indirect effects were tested to determine whether a bi-directional mediation model with autonomous motivation, autonomy support predicting positive affect and goal progress occurred[3]. Both indirect pathways were significant providing evidence for both mediational pathways. Using the model indirect function in MPlus, mediation pathways were determined. Autonomous motivation mediated the relation between autonomy support and increased positive affect over the year (b = .008, 95%CI = [.002, .013], *p* = .007). Autonomy support mediated the relation between autonomous motivation and increased positive affect over the year (b = .021, 95%CI = [.011, .031], *p* < .001). Autonomous motivation mediated the relation between autonomy support and increased goal progress over the year (b = .027, 95%CI = [.015, .038], *p* < .001). Autonomy support mediated the relation between autonomous motivation and increased goal progress over the year (b = .026, 95%CI = [.015,

[3] Multiple mediation pathways were significant, and these can be seen in Appendix C on OSF under the output for these analyses.

.038], $p < .001$). Evidence for this model suggests that the relation between personal and interpersonal autonomy can create an upward spiral or cascade of autonomy, goal progress, and positive affect[4]. As post-hoc analysis, this model was run while controlling for variability in motivation across goals, by using the standard deviation of goal motivation as a control variable. The model still held, and variability significantly predicted autonomy support at T2 and positive affect over the year. To see this output please see Appendix D on OSF.

[4] Additionally, a full SEM model with latent variable was run, but had poor fit. A more detailed explanation of this model, as well as the syntax and output can be found in Appendix D on OSF.

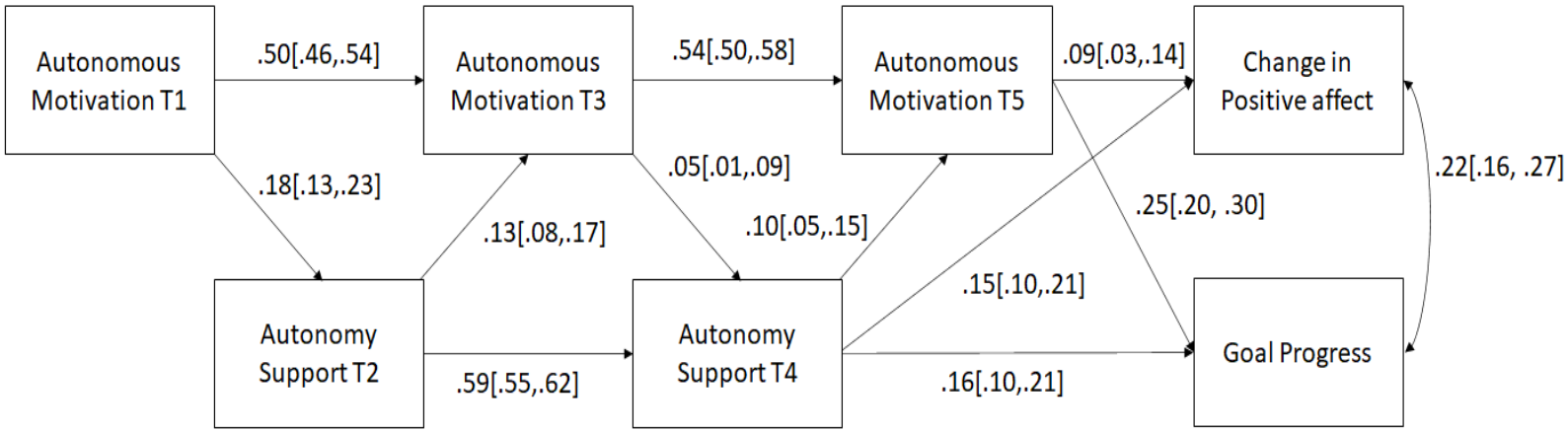

Figure 2. The path model for the reciprocal relation between autonomous support and autonomous motivation and the influence on change in positive affect and goal progress over the year. STDYX standardized values are reported.

Discussion

Setting personal goals in emerging adulthood is a normative experience that can facilitate growth and personal success (Koestner et al., 2008, 2020). Although goal setting in emerging adulthood is often considered a claiming of one's independence, the current research suggests that setting autonomous goals is a process that flourishes through collaboration with environments where one perceives their autonomy to be supported. The current research used multiple assessments over the course of a year in a large sample to provide evidence that not only does autonomy support relate to increases in autonomous goal motivation over time, but that the reciprocal relation also exists. Individuals who pursue their goals for autonomous reasons are more likely to report perceiving greater autonomy support over the course of the school year than those who pursue their goals for less autonomous reasons. Additionally, this reciprocal relation builds over time, such that autonomous motivation and perceived autonomy support contribute to one another in an upward spiral. This circular relation results in better goal progress, as well as, gains in positive affect that one experiences while acting and experiencing autonomous goal pursuit. Many students set goals at the beginning of the school year; the current research suggests that students who whole-heartedly endorse their goals, while surrounding themselves with individuals who support their volition, will flourish through gains in motivation, support, progress, and positive affect.

Although autonomy is not a synonym for independence, it is often considered a highly personal form of motivation. The current research finds evidence for the opposite assertion. The development of autonomous motivation flourishes within openly cooperative and satisfying interpersonal environments. Additionally, autonomy supportive environments are fueled by individuals who pursue their goals with whole-hearted volition. The influence of autonomy

support on autonomous motivation has been well-documented within the literature (see Su & Reeves, 2011 or Vansteenkiste et al., 2012, for reviews). However, to our knowledge there is limited empirical evidence which finds that autonomous individuals can influence the type of support they receive. The current research suggests that autonomous individuals elicit, or perhaps pursue more autonomy supportive environments.

Although this has not yet been tested within a self-determination theory framework, personality theories often suggest that individuals will either select or manipulate their environments to suit their disposition (Caplan, 1987; McAdams, 2015). The current research broadens the implications of personality-environment fit, by suggesting that perhaps motivation-environment fit may also be important for an individual's flourishing. Selecting the proper environment to pursue one's goals may facilitate growth in motivation, support, and progress (Roberts et al., 2008). It is easy to imagine that an autonomous student in a controlling environment may have their volition quashed, and this may lead them to change environments. Or, an autonomously motivated student within a controlling environment may work harder to exercise their volition, then the student may be able to manipulate the environment to be more autonomy supportive. When an individual volitionally and wholeheartedly pursues a goal, they may increase their likelihood of eliciting open understanding and support. If someone shares their goals with enthusiasm, interest, and volition, a controlling response would be incongruent. Autonomously motivated individuals may act as the agent of change in their own lives to gain these more autonomy supportive environments. More research is needed to determine the mechanism through which autonomous individuals gain autonomy support from others.

The upward spiral of autonomy suggests that both autonomous motivation and autonomy support continuously contribute to the growth of each other over time, and that this autonomy

spiral is fueled by gains in positive emotions. The upward spiral of autonomy might be consistent with the broaden and build theory, which suggests that positive emotions lead to a broadening of one's thought-action repertoires, which over time leads to a building of one's skills and resources (Fredrickson, 2001). Positive emotions experienced while acting autonomously or receiving autonomy support may be reinforcing and lead one to continue to pursue autonomous action or autonomy support from others which further fuels gain in positive emotions. Both autonomous motivation and autonomy support are related to need satisfaction and well-being (e.g. Kelly et al., 2015; Gagne, 2003; Sheldon & Elliot, 1999). Additionally, our findings suggest that those lower in autonomous motivation may receive lower quality support and this may result in less positive affect over time. Further research is needed to explore how someone can break this downward spiral and engage in more personally and interpersonally satisfying goal pursuit. Our current model may suggest that either pathway, an individual identifying with their goals more autonomously or a more enriching support environment, would lead to growth in personal and interpersonal autonomy. Additionally, each incremental increase in either personal or interpersonal autonomy is predicted to lead to this reciprocal upward spiral and well-being over time. Future research is needed to see how a two-pronged approach promoting autonomous motivation and autonomy support could be implemented to help facilitate successful goal pursuit.

Limitations & Future Directions

There are a number of limitations to consider within the current research. First, this research was conducted with a university sample, and more research is needed to determine whether this phenomenon extends beyond young adulthood. However, this may also be a strength of this research, as young adulthood is a time when many people make career decisions,

search for their identity, and achieve independence from parents (Salmela-Aro, 2010). It is a relevant period to test the collaborative nature of autonomy, as young adulthood is one of the most volitional life stages, and when many people set crucial life goals (Shulman & Nurmi, 2010). Young adulthood is a time when many individuals proclaim their independence, so it is perhaps especially convincing that during young adulthood cooperation and collaboration with others is especially relevant for growth in autonomous motivation, support, and well-being. Further research is needed to determine whether autonomy flourishes as a collaborative process throughout the life span.

Second, the current research aggregated across all types of goals rather than searching for distinct patterns for, say, social versus achievement goals. This allows these findings to be more generalizable, but it also limits the specificity of what we can claim about the development of collaborative autonomy. Further research is needed to determine how broadly applicable this process might be for a variety of goals, or beyond goals for an individual's general autonomous motivation and daily perceived support across different situations. Additionally, we only examined autonomous goal motivation, and not controlled goal motivation. Self-determination theory posits that individuals pursue goals for reasons ranging from more controlled (to avoid punishment or gain approval from others) to more autonomous (for personal enjoyment and fulfillment). More research is needed to see how controlled motivation may influence the type of support an individual receives and if that can influence their motivation.

Third, this research only examined self-reported motivation, support, and affect. Self-report may not be completely accurate but is commonly used in social science research and has been found to be relatively accurate (e.g. Chan, 2009; Koestner et al., 2002). Moving forward, this research would be strengthened by adding either peer reports, or other more objective

measures of support, like video taping dyad interactions. Additionally, the current research used a path model, which is not as precise or can have more measurement error than SEM models. We tried to run an SEM, but it had poor fit due to the unequal weighting of the response in the latent variables, which we felt was not an accurate test of our current hypothesis. This supplemental analysis is included in Appendix D on OSF. Finally, the majority of this sample was female, Caucasian and of a relatively high socio-economic status. Future research is needed to determine whether this phenomenon generalizes across more diverse populations. Not every individual may have the luxury of pursuing their passions or goals solely for autonomous reasons due to economic or circumstantial reasons. It would be interesting to see whether these findings would generalize in a sample of emerging adults who decided to not attend university.

Autonomous motivation is associated with perceiving more autonomy support from others. We expect that this might occur because people are seeking out situations that provide them more autonomy. Our research provides preliminary evidence that autonomous goal motivation and perceived autonomy goal support influence each other in a cyclical manner, but how does this cycle start, and is it possible to jump start this upward spiral of autonomy? First, this research would need to be replicated across different samples, and then more research is needed to see whether this cycle could be intervened upon. Of course, this research requires replication across diverse samples, and experimental designs are required to test whether this cycle is subject to intervention. Prior research suggests that when someone is in crisis, they may need more directive or active support from others to help them (Feeney & Collins, 2015). When an individual is looking for growth related support, a more autonomy supportive form of support may be more appropriate. For example, if an individual is in trouble, giving them positive guidance or solving their problems might be necessary. When an individual whole-heartedly

endorses a volitional goal, just listening and being open to them may be the more apt response. Additionally, when one is volitional, they might be prouder of their goals, or more likely to tell more family, and friends, or to enlist more supporters. Maybe more autonomous individuals are better at choosing autonomy supportive facilitators, or autonomy supportive situations. Conversely, perhaps over time our regular supporters learn the most effective style of support across similar situations. For example, an autonomously motivated student in class might consistently need fewer controlling instructions over time and receive more autonomy support from this source. Perhaps, autonomous motivation elicits more autonomy support from others, as autonomy support is the most congruent response when working with an autonomous individual. Alternatively, it may also be that more autonomous individuals are just more open to this form of support, or that they perceive support differently. When you volitionally and wholeheartedly pursue a goal, all support, however passive, might be perceived in a positive manner, or as support for your ambitions. Further research is needed to determine how others respond to more autonomously motivated individuals and how individuals higher in autonomous motivation elicit this rich source of support.

In the future, research is needed to determine how to facilitate this dynamic growth between personal goal autonomy and interpersonally autonomy supportive environments. The current research suggests that interventions which promote need satisfaction (especially autonomy and relatedness satisfaction) in individuals during goal pursuit may help promote successful goal pursuit. Basic psychological need satisfaction has been shown to be related to many well-being and productivity outcomes, as well as to setting more autonomous goals (e.g. Milyavskaya & Koestner, 2011; Milyavskaya et al., 2014; Ryan and Deci, 2017; Vansteenkiste, Ryan & Soenens, 2020). There are many interventions that have been shown to be effective at

facilitating need supportive behaviour (Teixeira et al., 2019). An intervention focused on teaching goal supporters to act in a need satisfying way might be most effective for facilitating goal pursuit. For example, teaching supporters how to encourage open sharing of goals, or how to use non-controlling language while helping support someone's goal pursuit would likely facilitate the goal pursuers autonomy (Teixeira et al., 2019). Many individuals in emerging adulthood rely on their parents during goal pursuit (Koestner, Powers, Holding, Hope & Milyavskaya, 2020), so targeting this intervention to parents might be especially effective for encouraging autonomy during emerging adulthood.

Conclusion

The development of autonomous personal goals in young adulthood appears to be a collaborative process fueled by the synergy of autonomous goal motivation and autonomy supportive interpersonal goal environments. Not only does autonomy support lead to increases in autonomous motivation, but autonomous motivation leads to increases in perceived autonomy support. The latter relation has yet to be tested within the self-determination theory literature or within the broader goal and support literature. Pursing personal goals in an autonomous manner can set someone up to experience an upward spiral of autonomous goal motivation, autonomy support, goal progress, and positive emotions. Future research is needed to determine how more autonomously motivated individuals elicit or select more autonomy supportive environments and whether the collaborative personal and interpersonal autonomy spiral can be applied across contexts.

References

Bao, X. H., & Lam, S. F. (2008). Who makes the choice? Rethinking the role of autonomy and relatedness in Chinese children's motivation. *Child development*, *79*, 269-283.

Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science education*, *84*, 740-756.

Caplan, R. D. (1987). Person-environment fit theory and organizations: Commensurate dimensions, time perspectives, and mechanisms. *Journal of Vocational behavior*, *31*, 248-267.

Chan, D. (2009). So why ask me? Are self-report data really that bad. *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences*, 309-336.

Emmons, R. A. (1992). Abstract versus concrete goals: personal striving level, physical illness, and psychological well-being. *Journal of personality and social psychology*, *62*, 292.

Feeney, B. C., & Collins, N. L. (2015). A new look at social support: A theoretical perspective on thriving through relationships. *Personality and Social Psychology Review*, *19*, 113-147.

Fitzsimons, G. M., & Finkel, E. J. (2018). Transactive-Goal-Dynamics Theory: A Discipline-Wide Perspective. *Current Directions in Psychological Science*, *27*, 332-338.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American psychologist*, *56*, 218

Gagne, M. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of applied sport psychology, 15*, 372-390.

Gaudreau, P., Carraro, N., & Miranda, D. (2012). From goal motivation to goal progress: the mediating role of coping in the Self-Concordance Model. *Anxiety, Stress & Coping, 25*, 507-528.

Gorin, A. A., Powers, T. A., Koestner, R., Wing, R. R., & Raynor, H. A. (2014). Autonomy support, self-regulation, and weight loss. *Health Psychology, 33*, 332.

Grolnick, W. S., Raftery-Helmer, J. N., Marbell, K. N., Flamm, E. S., Cardemil, E. V., & Sanchez, M. (2014). Parental provision of structure: Implementation and correlates in three domains. *Merrill-Palmer Quarterly (1982-), 60*, 355-384.

Hart, J. W., Stasson, M. F., Mahoney, J. M., & Story, P. (2007). The Big Five and Achievement Motivation: Exploring the Relationship Between Personality and a Two-Factor Model of Motivation. *Individual Differences Research, 5*.

Holding, A. C., Hope, N. H., Harvey, B., Marion Jetten, A. S., & Koestner, R. (2017). Stuck in limbo: Motivational antecedents and consequences of experiencing action crises in personal goal pursuit. *Journal of Personality, 85*, 893-905.

Kelly, R. E., Mansell, W., & Wood, A. M. (2015). Goal conflict and well-being: A review and hierarchical model of goal conflict, ambivalence, self-discrepancy and self-concordance. *Personality and Individual Differences*, *85*, 212-229.

Koestner, R., Powers, T. A., Holding, A., Hope, N., & Milyavskaya, M. (2020). The relation of parental support of emerging adults' goals to well-being over time: The mediating roles of goal progress and autonomy need satisfaction. *Motivation Science.*

Koestner, R., Lekes, N., Powers, T. A., & Chicoine, E. (2002). Attaining personal goals: self-concordance plus implementation intentions equals success. *Journal of personality and social psychology*, *83*, 231.

Koestner, R., Otis, N., Powers, T. A., Pelletier, L., & Gagnon, H. (2008). Autonomous motivation, controlled motivation, and goal progress. *Journal of personality*, *76*, 1201-1230.

Koestner, R., Powers, T. A., Carbonneau, N., Milyavskaya, M., & Chua, S. N. (2012). Distinguishing autonomous and directive forms of goal support: Their effects on goal progress, relationship quality, and subjective well-being. *Personality and Social Psychology Bulletin*, *38*, 1609-1620.

Koestner, R., Ryan, R. M., Bernieri, F., & Holt, K. (1984). Setting limits on children's behavior: The differential effects of controlling vs. informational styles on intrinsic motivation and creativity. *Journal of personality*, *52*, 233-248.

McAdams, D. P. (2015). *The art and science of personality development*. Guilford Publications.

Milyavskaya, M., Inzlicht, M., Hope, N., & Koestner, R. (2015). Saying "no" to temptation: Want-to motivation improves self-regulation by reducing temptation rather than by increasing self-control. *Journal of Personality and Social Psychology*, *109*, 677.

Milyavskaya, M., Nadolny, D., & Koestner, R. (2014). Where do self-concordant goals come from? The role of domain-specific psychological need satisfaction. *Personality and Social Psychology Bulletin, 40*, 700-711.

Milyavskaya, M., & Koestner, R. (2011). Psychological needs, motivation, and well-being: A test of self-determination theory across multiple domains. *Personality and individual differences, 50*, 387-391.

Moreau, E., & Mageau, G. A. (2012). The importance of perceived autonomy support for the psychological health and work satisfaction of health professionals: Not only supervisors count, colleagues too! *Motivation and Emotion*, *36*, 268-286.

Muthén, L. K., & Muthén, B. O. (2015). Mplus user's guide (1998–2015). *Muthén & Muthén: Los Angeles, CA*.

Patall, E. A., Steingut, R. R., Vasquez, A. C., Trimble, S. S., Pituch, K. A., & Freeman, J. L. (2018). Daily autonomy supporting or thwarting and students' motivation and engagement in the high school science classroom. *Journal of Educational Psychology*, *110*, 269.

Roberts, B. W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. *Handbook of personality: Theory and research*, *3*, 375-398.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55*, 68.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.

Salmela-Aro, K. (2010). Personal goals and well-being: How do young people navigate their lives? *New directions for child and adolescent development, 2010*, 13-26.

Shulman, S., & Nurmi, J. E. (2010). Understanding emerging adulthood from a goal-setting perspective. *New directions for child and adolescent development, 2010*, 1-11.

Sheldon, K. M. (2014). Becoming oneself: The central role of self-concordant goal selection. *Personality and Social Psychology Review*, *18*, 349-365.

Sheldon, K. M., & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: the self-concordance model. *Journal of personality and social psychology*, *76*, 482.

Sheldon, K. M., & Houser-Marko, L. (2001). Self-concordance, goal attainment, and the pursuit of happiness: Can there be an upward spiral? *Journal of personality and social psychology*, *80*, 152.

Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress, but not all progress is beneficial. *Personality and social psychology bulletin*, *24*, 1319-1331.

Sieber, V., Flückiger, L., Mata, J., Bernecker, K., & Job, V. (2019). Autonomous goal striving promotes a nonlimited theory about willpower. *Personality and Social Psychology Bulletin*, 0146167218820921.

Smith, A., Ntoumanis, N., & Duda, J. (2007). Goal striving, goal attainment, and well-being: Adapting and testing the self-concordance model in sport. *Journal of Sport and Exercise Psychology*, *29*, 763-782.

Soenens, B., & Vansteenkiste, M. (2005). Antecedents and outcomes of self-determination in 3 life domains: The role of parents' and teachers' autonomy support. *Journal of Youth and Adolescence*, *34*, 589-604.

Su, Y. L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review*, *23*, 159-188.

Teixeira, P. J., Marques, M. M., Silva, M. N., Brunet, J., Duda, J., Haerens, L., & Hagger, M. S. (2019). Classification of techniques used in self-determination theory-based interventions in health contexts: An expert consensus study. *PsyArXiv, doi: https://doi. org/10.31234/osf. io/z9wqu*.

Vansteenkiste, M., Sierens, E., Goossens, L., Soenens, B., Dochy, F., Mouratidis, A., ... & Beyers, W. (2012). Identifying configurations of perceived teacher autonomy support and structure: Associations with self-regulated learning, motivation and problem behavior. *Learning and instruction*, *22*, 431-439.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: the synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of personality and social psychology*, *87*, 246.

Werner, K. M., Milyavskaya, M., Foxen-Craft, E., & Koestner, R. (2016). Some goals just feel easier: Self-concordance leads to goal progress through subjective ease, not effort. *Personality and Individual Differences*, *96*, 237-242.

Zumbo, B. D. (1999). The simple difference score as an inherently poor measure of change: Some reality, much mythology. *Advances in social science methodology*, *5*, 269-304.

Bridge to Article 2

In Article 1 a dynamic reciprocal relation was found between autonomous motivation and support. Meaning, not only do autonomy supportive environments help to improve an individual's autonomous motivation during goal pursuit, but that there is evidence for the reverse relation as well. When individuals are more autonomously motivated to pursue their personal goals, they perceive more autonomy support from their closest goal supporters. Additionally, this research utilized prospective longitudinal data over multiple time points, so this reciprocal relation was not limited to the start or end of the year, but at each time point there was incremental growth indicating an upward spiral of motivation, support, positive affect, and goal progress. This finding is congruent with self-determination theory and the broaden and build theory of positive emotions (Fredrickson, 2001; Ryan & Deci, 2017). When someone pursues goals that are in line with their values, meaningful and enjoyable, they are more likely to receive open and understanding support, and this ultimately helps them to achieve their goals and flourish!

The dynamic relation between motivation and support was a novel proposition in self-determination theory. To further confirm the idea that collaboration is key in goal pursuit, it was hypothesized that individual differences factors that favoured cooperation, and trust would be antecedents for growth in autonomous motivation, and perceived autonomy support, and that this would result in flourishing during goal pursuit. So, article 2 again utilizes longitudinal methods to examine whether dispositional collaboration predicts improved goal pursuit, through increased personal and interpersonal autonomy over the academic year.

Please note both Article 1, 2 and 3, were part of a larger study on goal pursuit across the academic year. Articles 1 and 2 utilize the same studies and participants.

Article 2

Autonomous motivation and support flourishes for individuals higher in collaborative personality factors: agreeableness, assisted autonomy striving and secure attachment*

S. L. Levine[1*], M. Milyavskaya[2],

T. A. Powers[3], A. C. Holding[1] & R. Koestner[1]

[1]McGill University, Montreal, Canada

[2]Carleton University, Ottawa, Canada

[3]University of Massachusetts Dartmouth, New Bedford, USA

*Publication Citation

Levine, S. L., Milyavskaya, M., Powers, T. A., Holding, A. C., & Koestner, R. (2021). Autonomous motivation and support flourishes for individuals higher in collaborative personality factors: Agreeableness, assisted autonomy striving, and secure attachment. *Journal of Personality*, *89*(5), 899-914.

Abstract

Introduction: Individuals who strive autonomously for their goals, and who perceive autonomy supportive environments are more successful during goal pursuit. What dispositional factors predict autonomy flourishing during goal pursuit?

Methods: Four longitudinal studies were conducted over an 8-month academic year, and university students (N_{total} = 1544) completed surveys on motivation, support, and personality. Structural equation models were created using MPlus software to test whether collaborative personality factors were related to growth in autonomous motivation and autonomy support.

Results: All three distinct collaborative personality factors, trait agreeableness, assisted autonomy striving, and secure parental attachment, were related to increases in autonomous motivation over the academic year. Conscientiousness, assisted autonomy, and secure attachment were related to increases in perceived autonomy support. A higher order latent collaborative traits factor, composed of agreeableness, assisted autonomy, and secure attachment was found to be related to increased autonomous motivation and support over the academic year and resulted in increased goal progress.

Conclusion: These results suggest that individuals higher in collaborative personality factors experience growth in personal autonomy during goal pursuit. Future research is needed to determine how to promote collaboration in goal pursuit to further help individuals successfully strive for their goals.

keywords: Autonomous motivation, autonomy support, goals, agreeableness, secure attachment

Autonomous motivation and support flourishes for individuals higher in collaborative personality factors – agreeableness, assisted autonomy striving and secure attachment

Many university students set goals, but what distinguishes who will be more successful during goal pursuit. Independent of the specific goal, motivation is one factor that has been shown to consistently predict who will and who will not be successful during goal pursuit (Sheldon & Houser-Marko, 2001; Sheldon & Kasser, 1998). According to self-determination theory, individuals who pursue goals for more volitional/ autonomous reasons (because they want-to) are more likely to be successful during goal pursuit (Ryan & Deci, 2017). Additionally, individuals who perceive their supporters to be autonomy supportive (open and non-judgemental) during goal pursuit are more likely to be successful and happier during goal pursuit (Su & Reeves, 2011). Both personal and interpersonal autonomy are crucial during goal pursuit, but who is better at engaging with their goals in this autonomous manner? Recent research suggests that the pursuit of one's goals does not occur in isolation, but rather in a dynamic goal system fueled by the interaction of personal and interpersonal factors (Fitzsimmons & Finkel, 2018). So perhaps, individuals who openly cooperate and collaborate with others are more likely to interact with their environment in a way that is beneficial to their own autonomous goal pursuit. We propose that individuals higher in cooperative personality and developmental dispositions – agreeableness, assisted autonomy and secure attachment will experience a flourishing in the development of autonomous personal goals and autonomy supportive goal environments in emerging adulthood.

Autonomous Goal Pursuit

Pursuing goals for autonomous reasons appears to be highly adaptive. Independent of the specific goal content, pursuing a goal for autonomous reasons because it is personally relevant, meaningful, and interesting has been found to be associated with greater goal progress and well-being over time (Koestner, Lekes, Powers & Chicoine, 2002; Koestner, Otis, Powers, Pelletier & Gagnon, 2008; Sheldon, 2014). This pattern of results has been found for university students, working adults, and patients in treatment (Gorin, Powers, Koestner, Wing & Raynor, 2014). There are several mechanisms that partially explain why autonomous motivation is related to greater goal success. Autonomously motivated individuals report greater subjective ease during goal pursuit, as well as less goal conflict and fewer distractions (Kelly, Mansell & Wood, 2015; Milyavskaya, Inzlicht, Hope & Koestner, 2015; Werner, Milyavskaya, Foxen-Craft & Koestner, 2017). When individuals are autonomously motivated, they are more likely to set effective implementation plans, and are better at task-oriented coping if they run into challenges (Gaudreau, Carraro & Miranda, 2012; Koestner et al., 2002, 2008). Additionally, when someone is pursuing autonomous goals, they are more likely to experience frequent and recurring psychological need satisfaction which further fuels effort and success in goal pursuit (Kelly et al., 2015; Sheldon & Elliot, 1999). Pursuing goals for autonomous reasons is beneficial for a multitude of reasons, but more research is now needed to better understand how to help individuals strive for their goals autonomously.

Given the benefits of autonomous goal motivation, it is important to examine how it develops. Autonomous motivation is often thought of as a self-initiated process in which one pursues personally meaningful goals in a volitional manner. However, recent research suggests that the development of autonomous goals is likely to be a collaborative process, in which both

autonomous motivation and autonomy support contribute to the growth of each other over time (Levine et al., 2020). There is an extensive literature which provides evidence that autonomy supportive environments are beneficial for the growth of autonomous motivation (see Su & Reeves, 2011 or Vansteenkiste et al., 2012, for reviews). Autonomy support is defined as support which enhances one's choice or feeling of volition (Ryan & Deci, 2000). Further, autonomy support for goals has recently been measured in terms of whether one feels that supporters listen to how you would like to do things and understand your perspective with respect to your goals (Koestner, Powers, Carbonneau, Milyavskaya & Chua, 2012). Autonomy support is contrasted with directive support wherein the supporter is perceived as actively giving guidance and helping to problem-solve. Additionally, autonomy support has been found to relate to other forms of support within the literature. Both nurturing and invisible support have been found to be like autonomy support and to facilitate partner autonomy (Girme, Overall & Hammond, 2019; Overall, Fletcher & Simpson, 2010). There is mounting evidence that both autonomous motivation and autonomy support are crucial for successful goal pursuit in emerging adulthood, but less research on which traits or dispositions may be beneficial to help individuals pursue goals autonomously.

Individual Differences that Facilitate Autonomous Goal Pursuit

Striving for goals while feeling autonomous and being supported in an autonomous manner is beneficial during goal pursuit, but what factors help facilitate growth in autonomy during emerging adulthood. The development of autonomous personal goals is likely to be a collaborative process facilitated by individual difference factors that favor cooperation with others. The development of personal goals occurs within our interpersonal environments (Fitzsimons & Finkel, 2018). An individual can influence their interpersonal environment, and in

turn, an individual's interpersonal environment can influence them. It may therefore not be ecologically valid to consider an individual's goals in isolation, independent of the support they perceive, or their own influence on the supporters. The current research examines how perceived support from others and motivation for one's goals may be driven by dispositional characteristics. Individual differences have been shown to influence our interpersonal environment (e.g. Dunkley, Sanislow, Grilo & McGlashan, 2006; Roohafza et al., 2016; Swickert, Hittner & Foster, 2010). For example, those higher in perfectionism are more likely to gain support through their negative self-doubt, or more extraverted individuals perceive greater social support because they engage with their environment more fully (Dunkley et al., 2006; Swickert et al., 2010). The current research aims to further this line of research by suggesting that collaborative individual difference factors are associated with growth in personal autonomy and perceived autonomy support over the academic year, such that collaborative individual difference factors can positively influence one's motivation and interpersonal environment.

There is some evidence that one's disposition can influence their goals. For example, Reisz, Bourdeaux & Ozer, (2013) found that individuals are often more likely to pursue goals that either compensate for their personality (e.g., be less shy and low extraversion), or goals that compliment their personality (e.g. travel the world and high openness). The Big Five personality traits have also been found to be differentially associated with intrinsic and extrinsic achievement motivation, such that, intrinsic motivation was found to be positively related to conscientiousness, openness and extraversion, and extrinsic motivation was found to be associated with conscientiousness, and neuroticism, and negatively associated with agreeableness (Hart, Stasson, Mahoney & Story, 2007). Additionally, trait self-control, agreeableness, and conscientiousness have all been shown to be positively associated with

autonomous motivation for personal goals (Holding, Hope, Verner-Filion & Koestner, 2019). Even though past research has examined personality and support, they did not examine whether personality factors influenced growth in both autonomous motivation and perceived autonomy support over an entire academic school year. One's personality can also exert influence on the type of support one receives (Branje, van Lieshout & van Aken, 2004; Swickert et al., 2010). One study found that agreeable individuals are more likely to perceive greater levels of support from family members (Branje et al., 2004). Conversely, in a study with undergraduate students, extraversion, neuroticism, and openness were found that interact to predict perceived support (Swickert et al., 2010). Individuals interact within their environments in a dynamic manner and their personality may be one factor that partially explains how they strive and perceive support for their goals, but research has yet to examine a transactive goal model with personality.

Agreeableness is a trait defined by empathy and cooperation (John & Srivastava, 1999). This trait has been consistently associated with an interpersonal orientation that fosters collaboration (Jensen-Campbell, Knack & Gomez, 2010). Agreeableness encompasses descriptors having to do with interpersonal warmth, affection, empathy, cooperation, and other communal facets of personality. Past research has found that agreeableness is related to autonomous goal pursuit and higher levels of perceived support within a family system (Branje et al., 2004; Holding et al., 2019). It is possible that more agreeable individuals are better able to openly engage with their environment about their goals, and their easy disposition allows their environment to support them. For example, an agreeable student may be able to express their wishes in a friendly manner and their warmth might facilitate a more positive reaction from those in their environment. Thus, agreeable individuals may be able to engage in their environment in

a way that facilitates growth in autonomous goal motivation and perceived autonomy support from others.

Additionally, our research aims to determine how one may display or embody collaboration beyond a broad trait measure. One's dispositional style when striving for autonomy may be a stable and pervasive indicator of motivation and support over the school year. It may be that when individuals are more collaborative in striving for autonomy, they experience more growth in autonomous motivation and support over the year. There are two different dispositional styles of striving to experience autonomy in one's life (Legault, Ray, Hudgins, Pelosi & Shannon, 2017). Asserted autonomy striving is defined as the personal claiming of autonomy through one's independence and force (Legault et al. 2017). Conversely, assisted autonomy striving is more cooperative and characterized as searching for autonomy while engaging with others and the environment around them (Legault et al., 2017). Consistent with this, the transactive goal model would suggest that if autonomy flourishes as a collaborative process, then individuals who openly seek support from their environment will be more successful at perceiving that support, which in turn is beneficial for their motivation (Fitzsimmons & Finkel, 2018). Conversely, an individual who strives for autonomy in an asserted manner, who may alienate or isolate others in pursuit of their personal autonomy, may receive a more negative or non-supportive reaction from their social environment, and this reduction in goal support may worsen the quality of their motivation. If goals are a transactive interpersonal experience, then striving to connect with one's interpersonal environment may be more advantageous than goal striving in isolation. A common narrative of success in North America suggests that independent struggle can lead to great success, but the current research

aims to challenge this and suggest that strength in goal pursuit may be fueled by being openly collaborative during goal pursuit.

Finally, if autonomy flourishes through collaboration, then dispositional differences that emerge during development might be the greatest indicator of this. Secure attachment is defined as having the ability to form strong connections with others, while also being capable of independence when appropriate (Bowlby, 1988). Specifically, secure attachment has been shown to foster growth and exploration (Ainsworth, 1979); so, the same may be true in emerging adulthood for goal development (Elliot & Reis, 2003). Secure attachment may help foster the dynamic personal and interpersonal processes involved in autonomous goal development in emerging adulthood, because this type of relationship fosters independent growth through trust and open communication. For example, a securely attached student who passionately shares their goals with a parent is likely to be openly encouraged, listened to, and supported, which further fuels autonomous motivation. Additionally, attachment theory posits that the bond we create with our parents during development can influence how we develop relationships, perceive support, and function as adults (Brennan & Shaver, 1995; Kafetsios & Sideridis, 2006). There has been limited research on the influence of secure attachment on motivation, but most of this research is focused on adolescent goal pursuit. One study found that in adolescence, secure attachment to one's parents was positively associated with academic motivation, and that this relation was mediated by perceptions of support (Duchesne & Larose, 2007). There is additional research which suggests that secure attachment can influence perceived support. When partners genuinely encourage each other, securely attached individuals reported receiving greater levels of high-quality support then less securely attached individuals (Collins & Feeney, 2004). Secure attachment may thus be a precursor to the development of autonomous goals, as attachment

strengthens interpersonal bonds and perceived support, while also encouraging autonomy and self-exploration.

Present Investigation

The current investigation consists of a set of longitudinal studies of university students' goal pursuits in which personality, autonomous motivation and autonomy support were assessed over the span of a school year. Our aim was to examine whether individuals higher in cooperative personality traits (agreeableness, assisted autonomy, and secure attachment) experienced growth in autonomous motivation for personal goals, and autonomy supportive goal environments. Goal striving does not occur in isolation, and recent developments in goal theory would suggest that individuals who engage openly with their environment are more likely to experience the benefits of autonomous motivation and support during goal striving (Finkel & Fitzimons, 2018). First, we hypothesized that agreeableness would be related to both increases in autonomous motivation (H1a) and perceived autonomy support (H1b) over the year. We did not have any specific hypotheses for the other Big Five traits. Second, we expected that assisted autonomy would relate to the development of autonomous motivation (H2a) and greater perceived autonomy support (H2b) over the year; we did not have any hypotheses for assertive autonomy. Finally, we hypothesized that secure attachment to parents would predict increased autonomous motivation for goals supported by the parent (H3a) and perceived autonomy support from parents (H3b) over the school year. Finally, a model was created to examine whether a higher order latent collaborative trait exists, and whether it is beneficial for autonomous motivation, support, and goal progress (H4). The overarching goal of this research was to provide evidence that collaborative individuals can foster goal environments which enhance their motivation and adequately support their ambitions.

Methods

Participants and Procedures

Participants were 1544 students at a large Canadian University (M_{age} = 20.63, SD_{age} = 3.08, 71.5% female) collected over four years from 2015 to 2019. Participants were recruited through advertisements in classes and around campus to participate in a year-long study on goals. At the initial time point, participants were excluded if they did not complete ideographic information on their goals. The time points of the study were September, November, December, February, and April. If participants completed each time-point they were compensated with $50, if they completed a portion of the time points, they received partial compensation. Prior to taking part in the study, each participant was asked to read over and agree to the informed consent. In the initial assessment, all participants completed a series of demographic questions, as well as questions on personality, their motivation for personal goals and goal support. Participants were asked to set three goals for themselves for the academic year during the initial time point. Participants reported a variety of goals related to academics (i.e. “I want to maintain an A average this term”), growth (i.e. “I want to learn to speak French”), social (i.e. “I want to make more friends”), and health (i.e. “I want to exercise weekly). At the end of the academic year, participants were reminded of their goals and nominated supporters, and completed a survey on their motivation and goal support. In 2017-2018 and 2018-2019, a survey on autonomy satisfaction was added at the initial time-point. In 2018-2019, a survey on security of attachment to one’s parents was added at the initial time point, and participants indicated which goals their parents supported them on. The overall retention across the entire school year for all the subsamples was 84%. Missing data was handled using FIML for structural equation models. To answer our first research question, the entire multi-year, multi-wave data was utilized (N =

1544). To answer our second research question of whether autonomy satisfaction was related to motivation and support, a subset of the sample from 2017-2019 was used (N = 610, M_{age} = 20.12, SD_{age} = 3.10, 84% female). To answer our third research question of whether security of parental attachment influenced motivation and support, a subset of the sample collected from 2018-2019 was used (N = 333, M_{age} = 19.81, SD_{age} = 2.36, 82% female). To answer our final research question the entire sample was used, like for research question one. A full list of our measures, data, syntax and output can be found on OSF at https://osf.io/gf2a3/?view_only=a64796701c314d0882cd2a587662003f

Measures

Autonomous Motivation. At the beginning and at end of the year, participants were asked about their motivation to pursue their goals. For each goal, participants were asked to rate their motivation on a 7-point Likert-type scale, from 1 (*not at all for this reason*) to 7 (*completely for this reason*), on items that assessed identified, integrated and intrinsic reasons for goal pursuit (Sheldon & Elliot, 1999). An example of a prompt used is "Because you really believe that it is an important goal to have – you endorse it freely and value it whole heartedly". A summary measure of autonomous goal motivation was calculated as the mean of all identified, integrated, and intrinsic items for each of the individual's goals (Koestner et al., 2008). α_{TB} = .64, α_{TF} = .74.

Autonomy Support. Perceived autonomy support was assessed at beginning and end of the academic year using three items which have been used to measure goal support in previous research (Koestner et al., 2002). First participants were asked to think of people who have helped them while pursuing all their goals, and then they were asked a series of questions on how supportive these individuals have been. The scale items were "I feel this person understands how I see things with respect to my goal," "This person listens to how I would like to do things

regarding my goals," and "I am able to be open with this person about my goals". All ratings were made on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). A mean of all items was taken to compute a perceived autonomy support score. Everyone rated this measure for two supporters who they felt provided support for all their goals, and an average was taken across supporters. $\alpha_{TB} = .79$, $\alpha_{TF} = .78$.

Big Five Personality Traits. To measure the personality constructs of conscientiousness, agreeableness, openness, extraversion, and neuroticism, the 44- item Big Five Inventory was administered (BFI; John & Srivastava, 1999). The BFI is a widely used, reliable, and valid measure of these personality constructs. The BFI utilizes 44 short phrases based on the trait adjectives known to be prototypical of these traits to capture individual differences (Extraversion 8 items, Agreeableness 9 items, Conscientiousness 9 items, Neuroticism 8 items, Openness 10 items). Participants rated phrases on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). An example of the phrases used include "I am someone who worries a lot" (Neuroticism), "I am someone who tends to be disorganized" (Conscientiousness, reversed), "I am someone who is helpful and unselfish with others" (Agreeableness), " I am someone who is original, or comes up with new ideas" (Openness), and " I am someone who is sometimes shy, inhibited" (Extraversion, reversed). $\alpha_{conscientiousness} = .80$, $\alpha_{agreeableness} = .77$, $\alpha_{extraversion} = .87$, $\alpha_{neuroticism} = .84$, $\alpha_{openness} = .78$.

Dispositional Autonomy Striving. At the beginning of the school year, participants were asked about their dispositional style when striving for autonomy. Participants were asked to rate their agreement with 6 prompts on a 7-point Likert-type scale, from 1 (*strongly disagree*) to 7 (*strongly agree*), on items that assessed how individuals strove to achieve autonomy (Legault et al., 2017). This scale is divided in two subscales, one assessing asserted autonomy striving,

which is classified as a claiming of one's personal autonomy (3-items). The other 3-item subscale assessed assisted autonomy striving which focuses on collaboration with one's environment. An example of a prompt used for asserted autonomy striving would be "I fight for opportunities to be who I really am.". An example of a prompt used for assisted autonomy striving would be "I feel like my family and friends allow me the chance to express myself and my feelings." A summary measure of assisted and asserted autonomy was calculated by taking the mean of each subscale. $\alpha_{assisted} = .81$, $\alpha_{asserted} = .74$.

Secure Parental Attachment. To assess secure attachment to parental figures, participants completed an adapted brief secure attachment subscale from the Adult Attachment Scale (Collins & Read, 1990). Other forms of attachment were not measured in this survey. Participants were asked to rate their agreement with 6 prompts on a 5-point likert-type scale, from 1 (*not at all characteristic of me*) to 5 (*very characteristic of me*), on items that assessed how close an individual feels to their parents and how much they trust them (Collins & Read, 1990). An example of a prompt used for this subscale would be "I know that my parents will be there when I need them". To calculate a secure attachment score, an average of all the items were completed. $\alpha = .81$

Goal Progress. Goal progress was assessed at the end-of-year. Participants rated how much they agreed with the following three statements: "I have made a lot of progress toward this goal", "I feel like I am on track with my goal plan" and "I feel like I am achieving this goal" (Koestner et al., 2012). Participants' responses were made on a 7-point scale with 1 corresponding to strongly disagree and 7 corresponding to strongly agree. Total goal progress was calculated as the mean of the end-of-year assessment items for all goals. $\alpha > .90$.

Result

Research Question 1: Which traits are associated with growth in autonomous goal motivation and perceived autonomy support during goal striving?

Descriptive Statistics. Below, Table 1 summarizes descriptive statistics for the variables of interest, as well as the correlation between these variables. Again, the entire sample (N = 1544) collected from 2015-2019 was used. All personality traits, except for neuroticism were positively related to autonomy support and autonomous motivation.

Table 1

Means, standards deviation and correlations with 95%CI between all variables of interest

	M(SD)	T2AM	T1AS	T2AS	E	A	C	N	O
T1AM	5.28(.88)	.42 [.37, .46]	.18 [.23, .13]	.15 [.10, .20]	.17 [.12, .22]	.08 [.03, .13]	.15 [.10,.20]	-.10 [-.15, -.05]	.20 [.15, .25]
T2AM	5.38(1.02)	1	.22 [.17, .28]	.19 [.14, .25]	.10 [.05, .15]	.13 [.08, .19]	.13 [.08, .19]	-.09 [-.15, -.04]	.09 [.04, .15]
T1AS	5.89(.86)	-	1	.59 [.55, .62]	.18 [.13, .23]	.19 [.14, .24]	.22 [.17, .27]	-.08 [-.13, -.03]	.08 [.03, .13]
T2AS	5.74(.94)	-	-	1	.12 [.07, .17]	.16 [.11, .21]	.25 [.20, .30]	-.11 [-.16, -.05]	.06 [.01, .12]
E	3.19(.88)	-	-	-	1	.12 [.07, .17]	.12 [.07, .17]	-.23 [-.27, -.18]	.16 [.11, .21]
A	3.77(.64)	-	-	-	-	1	.19 [.14, .24]	-.25 [-.30, -.20]	.08 [.03, .13]
C	3.53(.69)	-	-	-	-	-	1	-.22 [-.27, -.17]	.00 [-.05, .05]
N	3.22(.83)	-	-	-	-	-	-	1	-.03 [-.08, .02]
O	3.66(.64)	-	-	-	-	-	-	-	1

Note: AM means autonomous motivation, AS means autonomy support, E means extraversion, A means agreeableness, C means conscientiousness, N means neuroticism and O means openness.

Structural Equation Model. To test a parsimonious model which explored the relation between the big-five personality traits, motivation and support over the school year, a structural equation model was created using MPlus Software (Muthen & Muthen, 2015). The model had poor fit (Figure 1, Table 2): BIC = 14280.23, χ^2 (10) = 250.51, p = .001, CFI = .73, RMSEA = .12[.11; .14], SRMR = .08. Syntax and output are available on OSF. All associations and confidence intervals are included in Table 2. Autonomous motivation at baseline was highly associated with autonomous motivation at the end of the year. Autonomy support at baseline was highly associated with autonomy support at the end of the year. Agreeableness was the only trait to predict increases in autonomous motivation over the school year, when controlling for baseline levels of these variables. Conscientiousness was the only trait to predict increases in autonomy support over the school year, when controlling for baseline levels of these variables. Extraversion, openness, and neuroticism were not related to changes in autonomous motivation or autonomy support over the school year[5].

[5] These analyses were rerun including a measure of end of year personality reports (which was included in 3 of 4 samples). The initial results replicated, but there were also significant associations from T1 autonomy support to increased agreeableness, and conscientiousness over the year. These supplemental analyses are included on OSF.

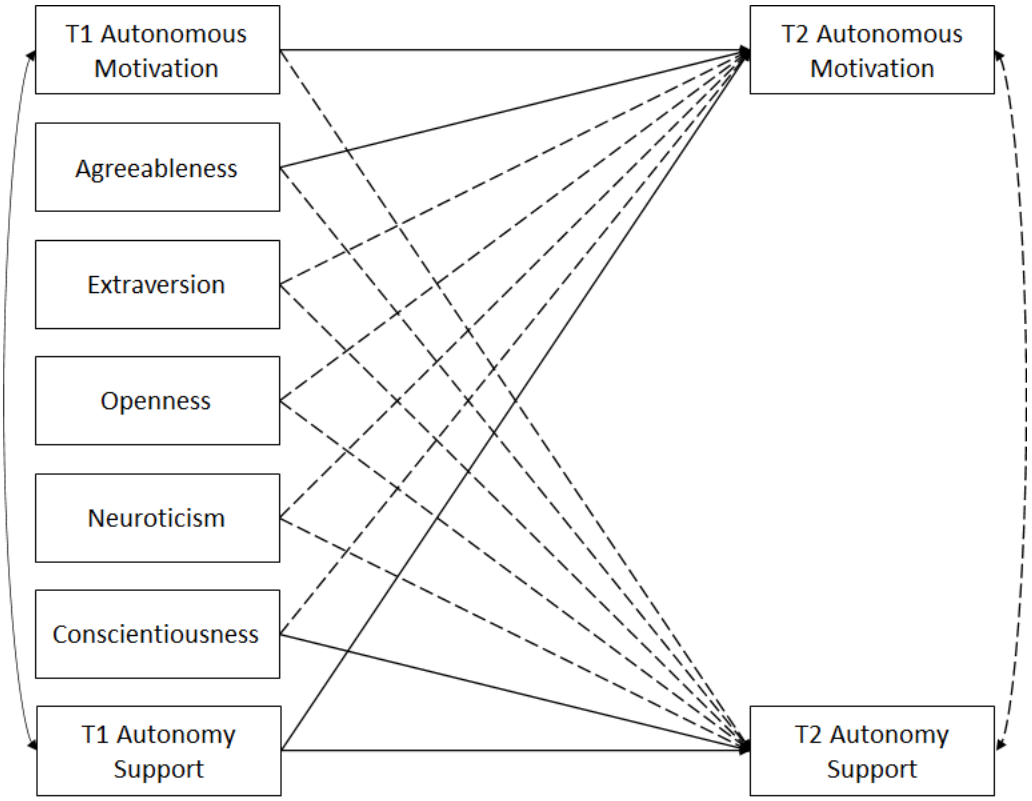

Figure 1. The model representing the influence of the big five personality traits on changes in autonomous motivation and perceived autonomy support when controlling for baseline motivation and support. Solid lines indicate $p < .05$.

Table 2

The coefficients for the path model with the big-5, baseline autonomous motivation, and support predicting end of year autonomy support and autonomous motivation

Path	*B*[95%CI]	B	*t*	*p*
T1AM w T1AS	**.18[.13, .24]**	.14	**6.35**	**<.001**
T2AM w T2AS	.06[-.01, .12]	.04	1.94	.052
T1AM → T2AM	**.39[.34, .44]**	**.44**	**14.53**	**<.001**
T1AS → T2AS	**.57[.52, .63]**	**.63**	**17.66**	**<.001**
T1AM → T2AS	.01[-.03, .06]	.02	.59	.553
T1AS → T2AM	**.14[.07, .44]**	**.15**	**4.19**	**<.001**
Neuro → T2AM	-.02[-.07, .03]	-.03	-.83	.404
Cons → T2AM	.02[-.03, .07]	.03	.93	.351
Agree → T2AM	**.07[.02, .13]**	**.11**	**2.84**	**.005**
Extra → T2AM	-.01[-.06, .05]	-.01	-.23	.820
Open → T2AM	-.01[-.05, .04]	-.01	-.30	.760
Neuro → T2AS	-.04[-.09, .01]	-.04	-1.62	.105
Cons → T2AS	**.12[.07, .17]**	**.17**	**4.84**	**<.001**
Agree → T2AS	.02[-.03, .07]	.03	.79	.429
Extra → T2AS	-.00[-.05, .04]	-.00	-.10	.923
Open → T2AS	.01[-.04, .06]	.01	.43	.670

Note: STDYX standardized values are reported

Research Question 2: Do individuals higher in assisted autonomy experience growth in goal motivation and support when compared to those higher in asserted autonomy?

Descriptive Statistics. Below, Table 3 summarizes descriptive statistics for the variables of interest, as well as the correlation between these variables. A subset of the sample (N = 610) was used for these analyses, as the measures of asserted and assisted autonomy were only collected over the years of 2017-2019.

Table 3

Means, standards deviation and correlations with 95%CI between all variables of interest

	M(SD)	T2AM	T2AS	T2AS	Assisted A	Asserted A
T1AM	5.28(.88)	.42 [.37, .46]	.18 [.23, .13]	.15 [.10, .20]	.13 [.04, .21]	.22 [.14, .29]
T2AM	5.38(1.02)	1	.22 [.17, .28]	.19 [.14, .25]	.20 [.11, .28]	.15 [.06, .23]
T1AS	5.89(.86)	-	1	.59 [.55, .62]	.36 [.28, .43]	.15 [.07, .23]
T2AS	5.74(.94)	-		1	.43 [.36, .50]	.16 [.08, .25]
Assisted A	5.43(1.16)	-	-	-	1	.35 [.27, .42]
Asserted A	4.73(1.24)	-	-	-	-	1

Note: AM = autonomous motivation, AS = autonomy support, and A = autonomy striving.

Structural Equation Model. To test a parsimonious model which explored the relation between dispositional autonomy striving, motivation and support over the school year, a structural equation model (Figure 2) was created using MPlus Software (Muthen & Muthen, 2015). The model was identified, so fit statistics are not reported. Syntax and output are available on OSF. All associations and confidence intervals are included in Table 4. Autonomous motivation at baseline was highly associated with autonomous motivation at the end of the year. Autonomy support at baseline was highly associated with autonomy support at the end of the year. Assisted autonomy predicted increases in autonomous motivation and autonomy support over the school year, when controlling for baseline levels of these variables. Asserted autonomy was not related in changes in autonomous motivation or autonomy support over the school year. It is likely that assisted autonomy partially explains how these two variables are related over time, as both reciprocal relations between autonomous motivation and support were not significant.

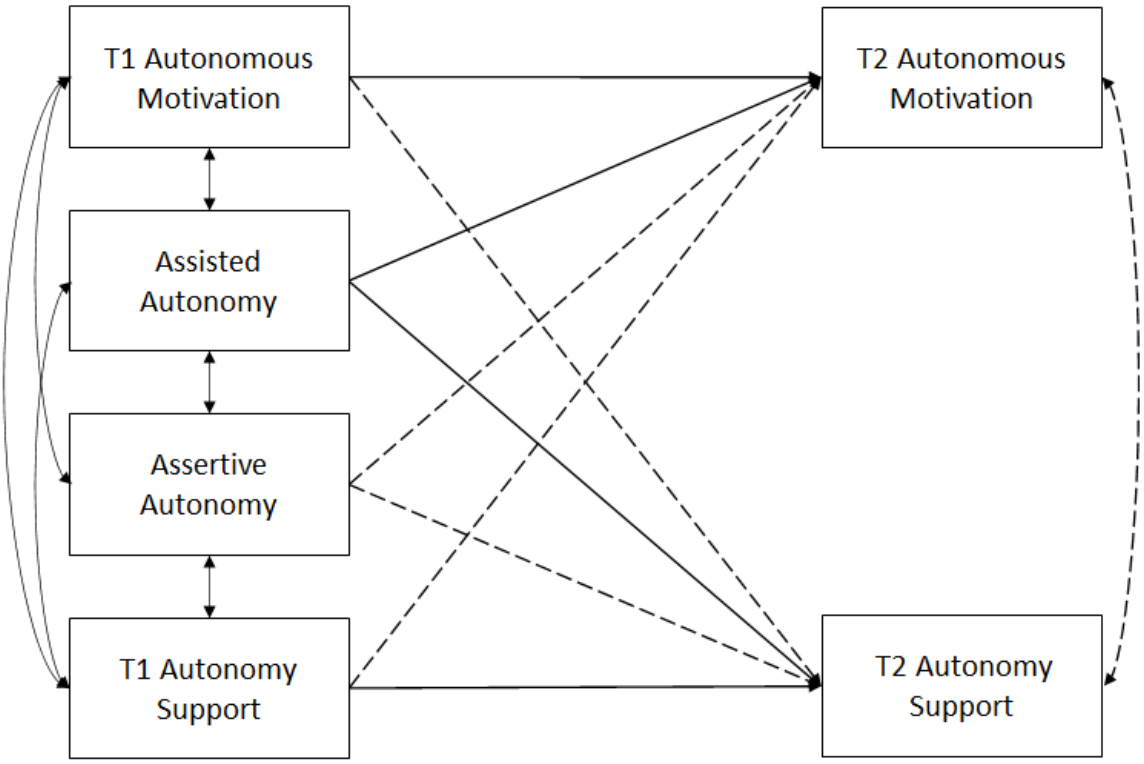

Figure 2. The model representing the influence of both assisted and asserted autonomy on changes in autonomous motivation and received autonomy support when controlling for baseline autonomous motivation and support. Solid lines indicate $p < .05$.

Table 4

The coefficients for the path model of both assisted and asserted autonomy on changes in autonomous motivation and received autonomy support when controlling for baseline autonomous motivation and support.

Path	*B*[95%CI]	B	*t*	*p*
T1AM w T1AS	**.19[.12, .27]**	.14	**4.63**	**<.001**
T2AM w T2AS	.07[-.02, .16]	.05	1.43	.152
Assist w T1AM	**.12[.04, .21]**	**.13**	**2.98**	**.003**
Assist w T1AS	**.37[.30, .45]**	**.37**	**7.98**	**<.001**
Assert w T1AM	**.21[.13, .29]**	**.23**	**4.63**	**<.001**
Assert w T1AS	**.15[.07, .24]**	**.16**	**3.47**	**<.001**
Assist w Assert	**.35[.28, .42]**	**.51**	**7.77**	**<.001**
T1AM → T2AM	**.36[.29, .44]**	**.42**	**8.88**	**<.001**
T1AS → T2AS	**.49[.42, .55]**	**.54**	**12.74**	**<.001**
T1AM → T2AS	.02[-.05, .09]	.02	.58	.560
T1AS → T2AM	.09[.00, .17]	.10	1.90	.057
Assist → T2AM	**.13[.04, .22]**	**.11**	**2.87**	**.004**
Assist → T2AS	**.26[.18, .33]**	**.21**	**6.70**	**<.001**
Assert → T2AM	.02[-.07, .11]	.02	.45	.650
Assert → T2AS	-.01[-.08, .06]	-.00	-.29	.768

Note: STDYX standardized values are reported

Research Question 3: Do securely attached individuals experience greater autonomous motivation and support on parent supported goals during goal pursuit?

Descriptive Statistics. Below, Table 5 summarizes descriptive statistics for the variables of interest, as well as the correlation between these variables. For this research question a subset of the sample was used (N = 355), because the secure attachment measure was only collected in 2018-2019. Using a one-way ANOVA, students with more secure attachment to their parents

listed either one or both parents as the person who supported them during goal pursuit ($F(330, 2) = 12.82$, $p < .001$; $M_{diff:0-1} = -.46$, $p = .001$, 95%CI = [-.70, -.22]; $M_{diff:0-2} = -.64$, $p < .001$, 95%CI = [-1.05, -.24]).

Table 5

Means, standards deviation and correlations with 95%CI between all variables of interest

	Mean (SD)	T2PAM	T1PAS	T2PAS	Attachment
T1PAM	5.22(1.11)	.38 [.25, .51]	.28 [.15, .39]	.16 [.02, .29]	.16 [.03, .29]
T2PAM	5.35(1.19)	1	.29 [.15, .43]	.23 [.07, .37]	.30 [.15, .43]
T1PAS	5.70(1.17)	-	1	.59 [.50, .67]	.41 [.30, .51]
T2PAS	5.64(1.21)	-	-	1	.47 [.36, .57]
Attachment	3.80(.86)	-	-	-	1

Note: PAM is autonomous motivation reported for parent supported goals. PAS is perceived autonomy support from parents.

SEM Model with Secure Attachment. To test a parsimonious model which explored the relation between secure attachment, motivation, and support at the beginning of the school year, a structural equation model (Figure 3) was created using MPlus Software (Muthen & Muthen, 2015). The model was identified, so fit statistics are not reported. Syntax and output are available on OSF. All associations and confidence intervals are included in Table 6. Students with more secure parental attachment reported perceiving more autonomy support from their parents over the school year, when controlling for baseline autonomy support. Students with more secure parental attachment also reported more autonomous motivation over the school year for goals their parents supported them on, when controlling for baseline autonomous motivation. Additionally, end of year motivation and support were no longer correlated, and the reciprocal

relations were not significant, this suggests that baseline secure attachment, motivation and support explain most of the variance shared between those variables at the end of the year[6].

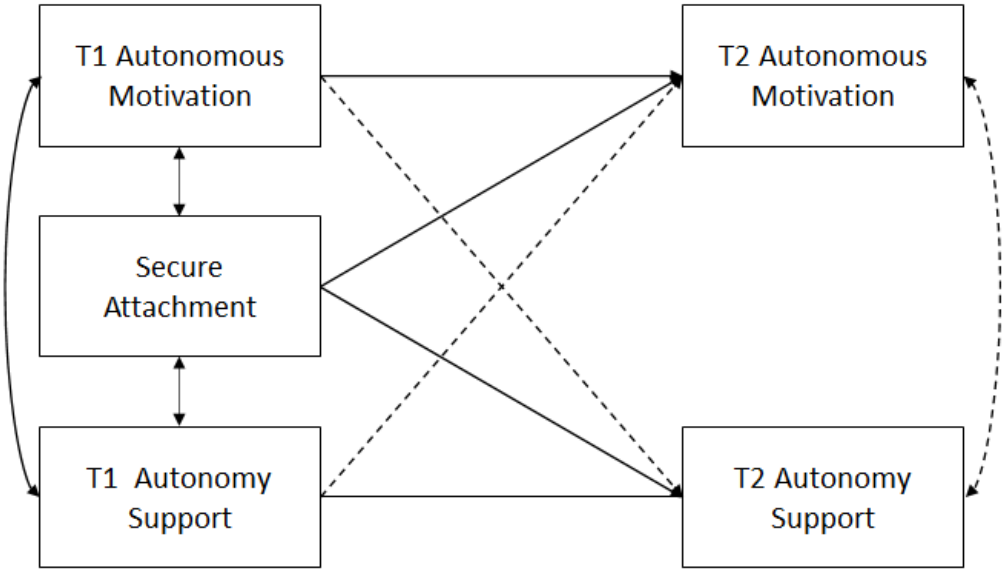

Figure 3. The model representing the influence of secure parental attachment on motivation, and support at baseline. Solid lines indicate $p < .05$.

[6] Additional exploratory analyses were conducted to determine whether secure attachment moderated the relation between autonomy support and autonomous motivation. There was an interaction between autonomy support and secure attachment predicting change in end of year autonomous motivation. For these results please see OSF.

Table 6

The coefficients for the path model of secure attachment on changes in autonomous motivation and perceived autonomy support

Path	*B*[95%CI]	B	*t*	*p*
T1AM w T1AS	**.29[.18, .39]**	**.38**	**4.75**	**<.001**
T2AM w T2AS	.00[-.16, .16]	.00	.02	.980
Secure w T1AM	**.19[.05, .33]**	**.18**	**2.58**	**.010**
Secure w T1AS	**.45[.33, .57]**	**.46**	**5.77**	**<.001**
T1AM→ T2AM	**.34[.19, .49]**	**.39**	**4.60**	**<.001**
T1AS → T2AS	**.49[.36, .62]**	**.51**	**6.90**	**<.001**
T1AM → T2AS	-.03[-.15, .08]	-.04	-.58	.563
T1AS → T2AM	.13[-.04, .30]	.13	1.47	.142
Secure → T2AM	**.24[.05, .44]**	**.35**	**2.37**	**.018**
Secure → T2AS	**.30[.16, .44]**	**.44**	**4.04**	**<.001**

Note: STDYX standardized values are reported

Research Question 4: Is there a higher-order collaborative personality factor related to growth in autonomous motivation, support, and progress during goal pursuit?

SEM Model with a Latent Collaborative Factor. To test a parsimonious model which explored the relation between collaborative personality, motivation, support, and goal progress, a structural equation model was created using MPlus Software (Muthen & Muthen, 2015). The entire sample (N=1544) was used for this analysis. First, a higher order latent collaborative factor was tested against a null model, and the latent factor was found to have better fit[7]. To create the higher order factor, we used all the personality variables we found to be related to collaboration in previous analyses, trait agreeableness, assisted autonomy striving, and secure attachment.

[7] A summary of this analysis can be found on OSF. Additionally, this model was ran with each variable as a separate predictor and results were similar. This analysis can be found in the supplementary analyses section on OSF.

Conscientiousness was added as a control variable to the model. This model (Figure 4, Table 7) had good fit: BIC = 27079.41, χ^2 (16) = 92.93 $p < .001$, CFI = 0.946, RMSEA = .06[.04, .07], SRMR = .035. Syntax and output are available on OSF. Trait agreeableness, assisted autonomy striving, and secure attachment all loaded onto a higher order factor that we termed collaborative personality. Students higher in this collaborative personality factor reported perceiving more autonomy support from their supporters, and experienced more autonomous motivation over the academic year, when controlling for baseline scores. Conscientiousness was not associated with change in motivation or support over the academic year but was significantly correlated with the collaborative traits factor. Autonomous motivation and support also predicted increased goal progress over the academic year, meaning that collaborative personality facilitates goal progress over the academic year. Additionally, end of year motivation and support, and the reciprocal relations between these variables, were no longer correlated, this suggests that collaborative personality explains most of the variance shared between those variables at the end of the year[8, 9]. This overall model explained a significant portion of the variance in end-of-year autonomous motivation ($R^2 = .23$, $p < .001$), autonomy support ($R^2 = .45$, $p < .001$), and goal progress ($R^2 = .11$, $p < .001$) over the year. Collaborative personality traits contribute to growth in autonomy support and autonomous motivation over the academic year, and this results in greater goal progress for those individuals.

[8] Additionally, a full SEM model with latent variable was run, but had poor fit. A more detailed explanation of this model, as well as the syntax and output can be found on OSF

[9] Gender analyses were done to examine whether these results held for both male and female participants. The link between collaborative personality and motivation and support was found in female, but not male participants. The male analysis was underpowered, and the analysis constrained for gender had poorer fit. Additionally, the models for male and female participants could not be constrained in the same way. These supplemental analyses are included on OSF, but would need to be further studied and examined to learn more about whether gender differences exist between males and females during goal striving.

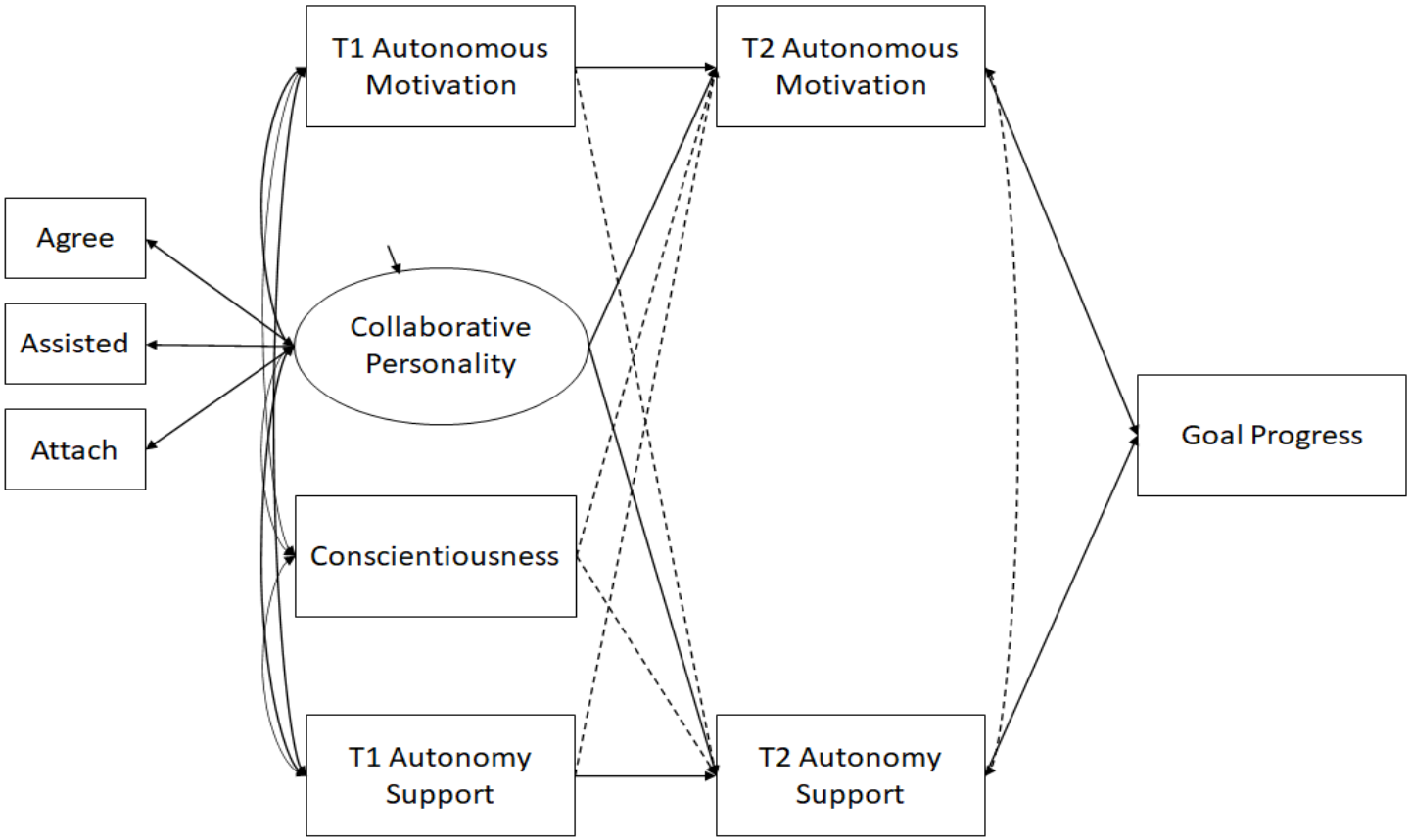

Figure 4. The model representing the influence of a higher order latent collaborative personality factor on change in autonomy support, autonomous motivation, and goal progress over an academic year. Solid lines indicate $p < .05$.

Table 7

The coefficients for the path model of collaborative autonomy on changes in autonomous motivation and perceived autonomy support

Path	*B*[95%CI]	B	*t*	*P*
Collab by Agree	**.35[.29, .42]**	**1.00**	**10.18**	**<.001**
Collab by Assist	**.69 [.61, .78]**	**3.56**	**15.51**	**<.001**
Collab by Secure	**.59[.49, .69]**	**2.22**	**11.27**	**<.001**
Collab w T1AM	**.19[.11, .28]**	**.04**	**4.43**	**<.001**
Collab w T1AS	**.54[.46, .63]**	**.11**	**12.49**	**<.001**
Cons w T1AM	**.15[.10, .20]**	**.09**	**6.12**	**<.001**
Cons w T1AS	**.22[.18, .27]**	**.14**	**9.15**	**<.001**
Collab w Cons	**.38[.29, .46]**	**.06**	**8.77**	**<.001**
T1AM w T1AS	**.18[.13, .23]**	**.14**	**7.22**	**<.001**
T2AM w T2AS	-.00[-.07, .07]	-.00	-.05	.962
T1AM → T2AM	**.37[.32, .42]**	**.43**	**14.76**	**<.001**
T1AS → T2AS	**.42[.34, .50]**	**.47**	**10.53**	**<.001**
T1AM → T2AS	-.00[-.05, .05]	-.00	-.06	.949
T1AS → T2AM	.04[-.05, .12]	.04	.85	.396
Collab → T2AM	**.24[.12, .37]**	**1.05**	**3.80**	**<.001**
Collab → T2AS	**.30[.18, .43]**	**1.32**	**4.95**	**<.001**
Cons → T2AM	-.03[-.09, .04]	-.04	-.78	.433
Cons → T2AS	.05[-.01, .21]	.07	1.57	.117
T2AM → Goal Prog	**.25[.20, .31]**	**.35**	**9.78**	**<.001**
T2AS → Goal Prog	**.16[.10, .23]**	**.22**	**5.82**	**<.001**

Note: STDYX standardized values are reported

Discussion

Setting goals in emerging adulthood is a normative experience which can facilitate growth and personal success (Koestner et al., 2008, 2020). Although goal setting in emerging

adulthood is often considered a claiming of one's independence, the current research suggests collaboration might be a key factor for improving autonomous motivation and support during goal pursuit. The current research used longitudinal assessments over the course of a year in a large sample to provide evidence that individuals higher in collaborative personality factors are more likely to experience a growth in autonomous motivation over the year, as well as increased perceptions of support from others, and greater goal progress. Collaborative personality factors (agreeableness, assisted autonomy, and secure attachment) contribute to the growth of autonomous motivation and perceived autonomy support over time, which further supports the transactive goal model which suggests that goal striving occurs as an interpersonal process. The current research suggests that cooperative individuals are more likely to report growth in their autonomous motivation and support during goal pursuit which is likely beneficial for their well-being and success.

Autonomous motivation flourishes for collaborative individuals, and this was examined by determining whether cooperative dispositional styles predicted growth in personal and interpersonal perceptions of autonomy. Trait agreeableness, assisted autonomy, and secure parental attachment were all related to growth in autonomous motivation over the academic year. These individual difference variables are all defined primarily by cooperation, trust, and empathy (Bowlby, 1988; John & Srivastava, 1999; Legault et al., 2017). Individuals with dispositions that favor cooperation and collaboration appear to benefit by gaining both autonomous motivation and perceptions of support. Suggesting students who openly share their goals, search for others to work with, or trust that others might have the best intentions to help them during goal pursuit are more likely to create a more enriching goal environment that is openly supportive and fuels the individual's volition.

There is limited research on whether disposition can influence motivation within the framework of self-determination theory, but some research has found that agreeableness is related to intrinsic achievement striving and motivation (Hart et al., 2007; Holding et al., 2019). Additionally, during development, secure attachment fosters independent growth and exploration in play, a form of personal autonomy (Elliot & Reis, 2003). Overall, these findings suggest that that the development of autonomous personal goals flourishes as a collaborative process, and it appears that individuals who work well with others, or trust others with their goals, experience growth in their personal autonomy over the school year. Additionally, in this research individuals who were more securely attached to their parents were more likely to rely on one or both parents for goal support. Providing further evidence that collaborative individuals can engage with their environments to mobilize the support necessary for productive goal pursuit. Secure attachment might be a precursor to productively foster goal pursuit in young adulthood and should be studied further to determine what about secure attachment allows for the development of autonomy, or independence with open exploration and trust.

Contrary to our hypothesis, agreeableness was unrelated to growth in perceptions of autonomy support over the school year. Instead, conscientiousness was the only trait associated with increases in perceived autonomy support over the year. Conscientiousness is a trait defined by being organized, disciplined and diligent (John & Srivastava, 1999). Interestingly, in his review of personality development over the life course, McAdams (2015) links the traits of agreeableness and conscientiousness as the two traits that promote social maturity in young adulthood. The two traits are distinct, but they share many common outcomes such as secure attachment relationships, better marriages and lower divorce rates, and stronger investments in family roles. The link between conscientiousness and autonomy support may be consistent with

our idea that the growth of autonomy occurs as a collaborative process, as more conscientious individuals may be better able to mobilize support around themselves. Further research is needed to understand how personality factors influence perceptions of support and how to promote dispositional styles which can be beneficial for one's motivation.

Our findings that collaborative traits lead to gains in goal progress, autonomous motivation and perceived autonomy support over time provides further support for the collaborative nature of autonomy. Collaborative autonomy suggests autonomous motivation and support are reciprocal, and that autonomous individuals can seek out, elicit or perceive more autonomy support from others, and that this cascade of autonomy is beneficial for goal progress and well-being (Levine et al., 2020). Consistent with the transactive goal model, a person does not strive for goals in isolation and being more open to help from others within your interpersonal environment might be beneficial during goal pursuit (Fitzsimmons & Finkel, 2018). One can imagine how an individual who aims to openly work with their environment while goal striving will be more likely to receive volitional support, compared to an individual who asserts their goal striving by trying to claim independence. The environment and the supporters someone surrounds themselves with can influence how one strives for their goals (Fitzsimmons & Finkel, 2018). Conversely, the way one engages with their goals may also actively change the type of support they elicit. For example, when someone is autonomously motivated, they may be likely to share their interest regarding goal, and this is likely to elicit autonomy support. Further studying goals through a transactive model shows that the hyper-competitive nature of independent struggle in goal striving may represent an outdated view which impairs rather than helps those struggling to reach their personal goals. The current

research provides evidence that being collaborative can be beneficial to one's motivation and to the support one perceives, and that strength and success in goal striving emerges from this.

Limitations & Future Directions

There are several limitations to consider within the current research. First, this research was conducted with a university sample, and more research is needed to determine whether this phenomenon extends beyond emerging adulthood. However, this may also be a strength of this research, as young adulthood is a time when many people make career decisions, search for their identity, and achieve independence from their parents (Salmela-Aro, 2010). It is a relevant period to test the collaborative nature of traits, as young adulthood is one of the most volitional life stages, and when many people set crucial life goals (Shulman & Nurmi, 2010). Further research is needed to determine whether autonomy flourishes as a collaborative process throughout the life span. Second, this research only examined self-reported motivation, support, and personality dispositions. Self-report measures might not be entirely accurate. Self-report is commonly used in social science research and has been found to be correlated with more objective measures (e.g. Chan, 2009; Riemann, Angleitner & Stelau, 1997).

Additionally, the current research aggregated across all types of goals and supporters rather than searching for distinct patterns for, say, social versus achievement goals, or parent versus peer supporters. This allows these findings to be more generalizable, but it also limits the specificity of what we can claim about the influence of collaborative traits on goal striving. Further research is needed to determine how broadly applicable this process might be for a variety of goals, or beyond goals for an individual's general autonomous motivation and daily perceived support across different situations. Additionally, some of the scales, like the autonomy support scale had high average levels, so there may have been some ceiling effect, but the

support variables did have standard deviations comparable to other variables in the study. We did not assess support for specific goals, and in future research it would be interesting to examine how much variability exists for goal support, or if there are types of goals you are more likely to turn to specific supporters for. This research only focused on autonomy support and did not discriminate this form of support from more controlling support, and if collaborative traits are only beneficial for this form of support. Future research is needed to better understand how effective collaborative traits might be for goal pursuit. In addition, the current research used a path model, which is not as precise or can have more measurement error than SEM models. We tried to run an SEM, but it had poor fit due to the unequal weighting of the responses from different goals or different supportive others in the latent variables, which we felt was not an accurate test of our current hypothesis. This supplemental analysis is included in on OSF. Additionally, a latent collaborative trait factor was created for the final model, but latent factors do not weigh each variable equally, and it is possible that the most collaborative of these traits accounted for more of the variance in the outcome. Finally, most of this sample was female, Caucasian and of a relatively high socio-economic status. Future research is needed to determine whether this phenomenon generalizes across more diverse populations. Some supplemental analyses have shown that there might be gender differences in relation to collaborative traits, but there were too few males to run adequately powered analyses. More research is needed to examine whether the benefits of collaboration differ for males and females.

Self-reported trait agreeableness, secure attachment, and assisted autonomy predicted growth in perceived autonomy support and autonomous motivation over the academic year. These traits are all collaborative in nature, and it might be that collaborative behaviours stemming from these dispositions mediate this mechanism. However, collaborative behaviors

were not measured, so this is only a proposed possible mechanism for how autonomy may flourish in emerging adulthood. Collectively across thousands of studies, the traits of agreeableness, conscientiousness, and secure attachment have been shown to have many diverse correlates including academic, job and marital success (McAdams, 2015), and it is possible that these traits may be associated with a diverse number of behaviours beyond collaboration that contribute to these outcomes. Additionally, if individuals higher in these traits are achieving success this then may lead others to be more trusting/supportive, which then reinforces their autonomous motivation and confidence while pursuing a goal. The current study cannot assert whether collaborative behaviors or any of the many other manifestations of these traits might explain the observed associations, but rather suggests that this might be a possible mechanism that warrants further investigation. To test our hypotheses regarding how agreeableness, conscientiousness, secure attachment, and assisted autonomy might promote autonomy support and/or autonomous motivation, it would be necessary to conduct studies that measure the proposed mediating behaviors. Future research could examine this mechanism by observing whether individuals higher in these traits report more collaborative behaviours or perform more collaboratively in an in-laboratory task.

Conclusion

The flourishing of autonomous motivation and perceived autonomy support during goal pursuit is supported by collaborative personality factors, like agreeableness, assisted autonomy striving, and secure attachment. University students higher in these personality and developmental factors reported experiencing more growth in autonomous goal motivation, perceived autonomy support, and goal progress over the year. Future research is needed to

determine whether these findings generalize beyond emerging adulthood, and to determine whether collaborative behaviours mediate this mechanism.

References

Ainsworth, M. S. (1979). Infant–mother attachment. *American psychologist*, *34*(10), 932.

Bowlby, J. (1988). Developmental psychiatry comes of age. *The American journal of psychiatry*.

Branje, S. J., van Lieshout, C. F., & van Aken, M. A. (2004). Relations between Big Five personality characteristics and perceived support in adolescents' families. *Journal of personality and social psychology*, *86*, 615.

Brennan, K. A., & Shaver, P. R. (1995). Dimensions of adult attachment, affect regulation, and romantic relationship functioning. *Personality and Social Psychology Bulletin*, *21*, 267-283.

Chan, D. (2009). So why ask me? Are self-report data really that bad. *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences*, 309-336.

Collins, N. L., & Feeney, B. C. (2004). Working models of attachment shape perceptions of social support: evidence from experimental and observational studies. *Journal of personality and social psychology*, *87*(3), 363.

Collins, N. L., & Read, S. J. (1990). Adult attachment, working models, and relationship quality in dating couples. *Journal of personality and social psychology*, *58*, 644.

Duchesne, S., & Larose, S. (2007). Adolescent Parental Attachment and Academic Motivation and Performance in Early Adolescence 1. *Journal of Applied Social Psychology*, *37*, 1501-1521.

Dunkley, D. M., Sanislow, C. A., Grilo, C. M., & McGlashan, T. H. (2006). Perfectionism and depressive symptoms 3 years later: Negative social interactions, avoidant coping, and perceived social support as mediators. *Comprehensive psychiatry*, *47*, 106-115.

Elliot, A. J., & Reis, H. T. (2003). Attachment and exploration in adulthood. *Journal of personality and social psychology*, *85*, 317.

Fitzsimons, G. M., & Finkel, E. J. (2018). Transactive-Goal-Dynamics Theory: A Discipline-Wide Perspective. *Current Directions in Psychological Science*, *27*, 332-338.

Gaudreau, P., Carraro, N., & Miranda, D. (2012). From goal motivation to goal progress: the mediating role of coping in the Self-Concordance Model. *Anxiety, Stress & Coping*, *25*, 507-528.

Girme, Y. U., Overall, N. C., & Hammond, M. D. (2019). Facilitating autonomy in interdependent relationships: Invisible support facilitates highly avoidant individuals' autonomy. *Journal of Family Psychology*, *33*, 154.

Gorin, A. A., Powers, T. A., Koestner, R., Wing, R. R., & Raynor, H. A. (2014). Autonomy support, self-regulation, and weight loss. *Health Psychology*, *33*, 332.

Hart, J. W., Stasson, M. F., Mahoney, J. M., & Story, P. (2007). The Big Five and Achievement Motivation: Exploring the Relationship Between Personality and a Two-Factor Model of Motivation. *Individual Differences Research, 5*.

Holding, A., Hope, N., Verner-Filion, J., & Koestner, R. (2019). In good time: A longitudinal investigation of trait self-control in determining changes in motivation quality. *Personality and Individual Differences*, *139*, 132-137.

Jensen-Campbell, L. A., Knack, J. M., & Gomez, H. L. (2010). The psychology of nice people. *Social and Personality Psychology Compass*, *4*, 1042-1056.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. *Handbook of personality: Theory and research*, *2*, 102-138.

Kafetsios, K., & Sideridis, G. D. (2006). Attachment, social support and well-being in young and older adults. *Journal of health psychology*, *11*, 863-875.

Kelly, R. E., Mansell, W., & Wood, A. M. (2015). Goal conflict and well-being: A review and hierarchical model of goal conflict, ambivalence, self-discrepancy and self-concordance. *Personality and Individual Differences*, *85*, 212-229.

Koestner, R., Lekes, N., Powers, T. A., & Chicoine, E. (2002). Attaining personal goals: self-concordance plus implementation intentions equals success. *Journal of personality and social psychology*, *83*, 231.

Koestner, R., Otis, N., Powers, T. A., Pelletier, L., & Gagnon, H. (2008). Autonomous motivation, controlled motivation, and goal progress. *Journal of personality*, *76*, 1201-1230.

Koestner, R., Powers, T. A., Carbonneau, N., Milyavskaya, M., & Chua, S. N. (2012). Distinguishing autonomous and directive forms of goal support: Their effects on goal progress, relationship quality, and subjective well-being. *Personality and Social Psychology Bulletin*, *38*, 1609-1620.

Legault, L., Ray, K., Hudgins, A., Pelosi, M., & Shannon, W. (2017). Assisted versus asserted autonomy satisfaction: Their unique associations with wellbeing, integration of experience, and conflict negotiation. *Motivation and Emotion*, *41*, 1-21.

Levine, S. L., Holding, A. C., Milyavskaya, M., Powers, T. & Koestner, R. (2020). Collaborative autonomy: The dynamic relations between personal goal autonomy and perceived autonomy support in emerging adulthood results in positive affect and goal progress. *Motivation Science.* https://doi.org/10.31234/osf.io/jr32c

McAdams, D. P. (2015). *The art and science of personality development*. Guilford Publications.

Milyavskaya, M., Inzlicht, M., Hope, N., & Koestner, R. (2015). Saying "no" to temptation: Want-to motivation improves self-regulation by reducing temptation rather than by increasing self-control. *Journal of Personality and Social Psychology*, *109*, 677.

Muthén, L. K., & Muthén, B. O. (2015). Mplus user's guide (1998–2015). *Muthén & Muthén: Los Angeles, CA*.

Reisz, Z., Boudreaux, M. J., & Ozer, D. J. (2013). Personality traits and the prediction of personal goals. *Personality and Individual Differences*, *55*, 699-704.

Riemann, R., Angleitner, A., & Strelau, J. (1997). Genetic and environmental influences on personality: A study of twins reared together using the self-and peer report NEO-FFI scales. *Journal of Personality*, *65*(3), 449-475.

Roohafza, H., Feizi, A., Afshar, H., Mazaheri, M., Behnamfar, O., Hassanzadeh-Keshteli, A., & Adibi, P. (2016). Path analysis of relationship among personality, perceived stress, coping, social support, and psychological outcomes. *World journal of psychiatry*, *6*, 248.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55*, 68.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.

Salmela-Aro, K. (2010). Personal goals and well-being: How do young people navigate their lives? *New directions for child and adolescent development*, *2010*, 13-26.

Shulman, S., & Nurmi, J. E. (2010). Understanding emerging adulthood from a goal-setting perspective. *New directions for child and adolescent development*, *2010*, 1-11.

Sheldon, K. M., & Houser-Marko, L. (2001). Self-concordance, goal attainment, and the pursuit of happiness: Can there be an upward spiral? *Journal of personality and social psychology*, *80*, 152.

Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress, but not all progress is beneficial. *Personality and social psychology bulletin*, *24*, 1319-1331.

Steiger, H., Sansfaçon, J., Thaler, L., Leonard, N., Cottier, D., Kahan, E., ... & Gauvin, L. (2017). Autonomy support and autonomous motivation in the outpatient treatment of adults with an eating disorder. *International Journal of Eating Disorders*, *50*, 1058-1066.

Su, Y. L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review*, *23*, 159-188.

Swickert, R. J., Hittner, J. B., & Foster, A. (2010). Big Five traits interact to predict perceived social support. *Personality and Individual Differences*, *48*, 736-741.

Vansteenkiste, M., Sierens, E., Goossens, L., Soenens, B., Dochy, F., Mouratidis, A., ... & Beyers, W. (2012). Identifying configurations of perceived teacher autonomy support and structure: Associations with self-regulated learning, motivation and problem behavior. *Learning and instruction*, *22*, 431-439.

Werner, K. M., Milyavskaya, M., Foxen-Craft, E., & Koestner, R. (2016). Some goals just feel easier: Self-concordance leads to goal progress through subjective ease, not effort. *Personality and Individual Differences*, *96*, 237-242.

Bridge to Article 3

Both article 1 and 2 utilized longitudinal methods to expand self-determination theory by proposing that autonomous motivation and support flourish for collaborative individuals and this is an upward spiral that results in improved goal progress and well-being over time. Self-determination theory is often described as a theory of human flourishing and wellness, however, more recently there has been a larger pull to examine whether these principles can be used to understand psychological distress and psychopathology (Ryan & Deci, 2017; Vansteenkiste et al., 2020). So, shifting contexts, but utilizing the same longitudinal design and advanced statistical analyses, article 3 aims to explore this broader research question. How can we utilize self-determination theory to better understand psychological distress?

Thus far, basic psychological need satisfaction and frustration have been used to explain well-being and distress from a self-determination theory perspective. Additionally, there has been a significant amount of research which examines the impact of need satisfaction on well-being over time, but there has yet to be extensive longitudinal research on the impact of need frustration on ill-being (Vansteenkiste et al., 2020). So, article 3 aimed to further extend self-determination theory by using fully cross-lagged models to examine whether need frustration, depressive symptoms or negative affect predict psychological distress over the academic year, and due to the novel nature of this research a replication is included over the start of the global pandemic. Article 3 aimed to utilize the same prospective longitudinal research design and statistical methods to further our understanding of the role basic psychological need frustration has in predicting psychological distress over time in university students, an at-risk population for the development of mental health problems. Please note the first study in Article 3 was based on the same studies and participants as Article 1 and 2.

Article 3

Unhappy or unsatisfied: Distinguishing the role of negative affect and need frustration in depressive symptoms over the academic year and during the COVID-19 pandemic*

Shelby L. Levine*, Claire J. Brabander, Amanda M. Moore, Anne C. Holding & Richard Koestner

McGill University

*Publication Citation

Levine, S. L., Brabander, C. J., Moore, A. M., Holding, A. C., & Koestner, R. (2022). Unhappy or unsatisfied: distinguishing the role of negative affect and need frustration in depressive symptoms over the academic year and during the COVID-19 pandemic. *Motivation and Emotion, 46*(1), 126-136.

Abstract

Mental health problems are becoming increasingly prevalent across college campuses. Past research has found that negative affect and frustration of basic psychological needs contribute to the development of depressive symptoms, but there is limited research which compares whether these are antecedents or concomitants of depressive symptoms. The present set of studies aimed to distinguish the differential associations of affect and need frustration on depressive symptoms. Students (N_{study1} = 379; N_{study2} = 235) completed measures on negative affect, need frustration (e.g., relatedness, competence, and autonomy), and depressive symptoms over an academic year and during the start of the COVID-19 pandemic. In both samples, fully cross-lagged path models were used to examine the relation between need frustration, negative affect, and depressive symptoms over time. Across both studies, basic psychological need frustration was the only consistent predictor of both negative affect and depressive symptoms over time, suggesting that need frustration is an antecedent of depressive symptoms over time, and especially during vulnerable time periods. Additionally, in Study 2, reports from close others confirm that need frustration is the largest indicator of depressive presentation in students. These results highlight the relative importance of basic psychological need frustration in predicting depressive symptoms in university students.

Keywords: self-determination theory, basic psychological needs, affect, depressive symptoms

Unhappy or unsatisfied: Distinguishing the role of negative affect and need frustration in depressive symptoms over the academic year and during the COVID-19 pandemic

Depression is one of the most common and persistent mental health problems that university students report (Song et al., 2008). Depressive symptoms can persist throughout university and can significantly affect students' academics, relationships, and daily functioning (Porter, 2018). The increased prevalence of mental health problems has spurred researchers to explore what contributes to ill-being on university campuses. Previous research has shown that both negative affect and frustration of basic psychological needs (e.g. autonomy, competence, and relatedness) can contribute to depressive symptoms (Vansteenkiste & Ryan, 2013; Watson et al., 1988). Experiencing increased negative affect is closely linked to experiencing depressive symptoms (Watson et al., 1988). Similarly, frustration of one's basic psychological needs, thwarting of a sense of competence, relatedness, or autonomy, is associated with increased likelihood of suffering from depressive symptoms (Costa et al., 2015; Ryan & Deci, 2017).

However, the conceptual overlap of negative affect, need frustration, and depressive symptoms has yet to be explored, even though these constructs are often highly correlated. The present study aimed to examine how need frustration, negative affect and depressive symptoms develop over the course of an academic year and during the COVID-19 pandemic. The main goal of this research was to be able to better understand what might put students at risk of experiencing more severe depressive symptoms and ill-being over time.

Depressive Symptoms

Depressive symptoms, along with other mental health problems, have become increasingly prevalent across university campuses over recent decades (Porter, 2018; Rosenthal & Schreiner, 2000; Storrie et al., 2010). Reports of depressive symptoms among university

students are higher than in the adult population and higher than that of their peers who do not attend university (Chen et al., 2013; Wells et al., 1987). Additionally, throughout the duration of university, depressive symptoms persist; one study found that 60% of the students who indicated a mental health problem at the start of a study reported a mental health problem again 2 years later (Zivin et al., 2009). The prevalence and persistence of depressive symptoms compromises the daily functioning of students and makes it difficult for them to pursue their academic career (Song et al., 2008).

Depressive symptoms commonly present as heightened negative affect, anhedonia (loss of positive affect), weight loss or gain, motor retardation, impaired concentration, insomnia, restlessness, agitation, and feelings of worthlessness (Trivedi, 2004). On average, students report increased depressive symptoms over an academic year (Levine et al., 2020). If antecedents can be identified, students could receive early support to counteract more mild depressive symptoms (Jackson et al., 2003). The current research aims to distinguish whether negative affect and need frustration are distinct antecedents of depressive symptoms across the academic year.

Affect

Affect is a critical component of psychopathology, and often a core symptom of mood and anxiety disorders. Affect is a general measure of a person's emotional experience over time (Emmons, 1992). Affect integrates one's physiological and cognitive appraisals, as well as the valence and intensity of an experience (Munezero, et al., 2014). To determine an individual's well and ill-being, researchers will often measure general affect (Emmons, 1992; Watson & Clark, 1995).

Negative affect is a strong predictor and correlate of psychopathology generally (Watson & Clark, 1995). Additionally, high levels of negative affect are highly correlated to symptoms and diagnoses of depression (Nima et al., 2013; Watson et al., 1988). Affect can also reinforce cognitive patterns, for example, ruminating about negative feelings can often enhance depressive symptoms, like feelings of worthlessness, insomnia or inattention (Raes et al., 2012). High negative affect is often observed prior to the onset of depression and may actively contribute to the development and worsening of depressive symptoms (Watson et al., 1988). The current research examines how negative affect relates to need frustration and depressive symptoms during emerging adulthood.

Basic Psychological Needs Theory

Basic psychological needs theory, a mini-theory within Self Determination Theory (Ryan & Deci, 2017), posits that need frustration contributes to ill-being (Vansteenkiste et al., 2020). A person's three basic psychological needs are competence (feeling able and confident in one's abilities), relatedness (feeling close to others), and autonomy (feeling free and volitional) (Ryan & Deci, 2017). These needs must be satisfied in order to promote one's growth, vitality, and general psychological well-being, while active need thwarting leads to frustration, dissatisfaction, and ill-being (Diener & Oishi, 2000). There are many aspects of university life that may be need frustrating for an individual, for example receiving grades below one's expectations (competence frustration), feeling isolated from one's peers (relatedness frustration), or perhaps feeling compelled to follow a certain career path (autonomy frustration). The current research aims to explore whether need frustration serves as a predictor of depressive symptoms over the academic year.

Need frustration is the active thwarting of one's needs, and need dissatisfaction is the lack of fulfillment of one's basic needs (Ryan & Deci, 2017). For example, a plant will not fair well if it does not have sunlight (low need satisfaction) but will wither and die quickly if you use salt water on it (need frustration). When controlling for need frustration, need dissatisfaction did not predict ill-being, meaning need frustration is a unique contributor to negative outcomes (Cordeiro et al., 2016). For example, an environment where one does not get along with colleagues will result in low feelings of relatedness and low well-being, but a workplace where one is rejected and socially isolated by others effectively thwarts relatedness and leads to ill-being (Schultz et al., 2015; Vansteenkiste & Ryan, 2013).

Need frustration often mediates the relationship between negative environments and depressive symptoms, suggesting that psychological needs may play a role in explaining why psychopathology occurs (Campbell et al., 2018). However, there have been only two studies that examined the relation between need frustration and ill-being in multi-wave longitudinal studies (Cordeiro et al., 2016; Vermote et al., 2021). Self-determination theory suggests that need frustration is a unique predictor of ill-being, but without rigorous longitudinal research, how can we determine whether need frustration precedes ill-being, or whether it is just a natural correlate of ill-being over time.

Study 1

The current research uses fully cross-lagged path modelling to examine the associations between need frustration, negative affect, and depressive symptoms over the academic year. Conceptually, there is a lot of overlap between these constructs, and the current methodology allows us to observe how these constructs influence each other over time while controlling for

that shared variance. We hypothesized that both negative affect and need frustration would be unique predictors of depressive symptoms over the academic year, and that these variables would have reciprocal accumulation. In order to test these hypotheses, we conducted a 3-wave longitudinal survey over the course of a full 8-month academic year at a large Canadian university, and focused on students' reports of affect, basic psychological needs and depressive symptoms at beginning (September), middle (December) and end of the academic year (April). This study aims to highlight how self-determination theory can help our understanding of how depressive symptoms develop in university students, by highlighting the incremental validity of basic psychological need frustration relative to negative affect.

Method

Participants and Procedure

The 379 participants for this year-long online study were recruited from a large Canadian university. Participants were undergraduate and graduate university students (M_{age} = 20.44, SD = 3.19) of which 85% were female, and 89% were undergraduate students. The ethnic background of our sample was predominantly European descent (52%) but included 33% Asian descent, 2% African descent, 7% Middle Eastern descent, 5% Hispanic, and 1% First Nations. Recruitment was done through traditional and online platforms such as posters around campus, lecture hall announcements, and Facebook posts. The study was conducted through a series of online surveys administered through Qualtrics at 3 time points throughout the school year in September (T1), December (T2) and April (T3). The surveys assessed psychological needs, affect, and depressive symptoms. The current study examined the data that was collected in the 2018-2019 academic

year, for which 80% of participants were retained for all surveys[10] (T1: N=379, T2: N=333, T3: N=304). Participants were compensated up to $50 for their time.

Measures

Affect. The Scale of Positive and Negative Experience (SPANE) was used to assess negative affect (Emmons, 1992). Emmons' (1992) scale reliably and consistently measures negative affect. Five adjectives, such as unhappy and frustrated, are used to describe negative affect. Participants rated these items on a 7-point Likert scale ranging from 1 "I felt it not at all" to 7 "I felt it extremely much". The ratings were averaged to yield a negative affect score (α_{NAT1} = 0.75, α_{NAT2} = 0.84, α_{NAT3} = 0.83).

Basic Psychological Need Frustration. The 9-item Balanced Measure of Psychological Needs scale (BMPN) was used to assess psychological need frustration (Cordeiro et al., 2016; Sheldon & Hilpert, 2012). This scale uses three statements each to assess need frustration for each basic psychological need (relatedness, competence, and autonomy). An example of a prompt to measure relatedness frustration was "I feel lonely"; a prompt to measure competence frustration was "I experienced some kind of failure or was unable to do well at something"; and to measure autonomy frustration, "I feel pressured in my life". Participants rated their agreement with a series of statements on a 7-point Likert scale ranging from 1 "not at all true" to 7 "very true". All the frustration items were averaged to compute a measure of overall psychological need frustration (α_{NFT1} = 0.77, α_{NFT2} = 0.75, α_{NFT3} = 0.86).

Depressive Symptoms. The Centre for Epidemiologic Studies Depression Scale Revised (CESD-R 10) was used to assess symptoms of depression (Andresen, Malmgren, Carter, & Patrick, 1994). The CESD-R 10 is a validated and reliable self-report measure of depression

[10] There were no significant differences between individuals who dropped out of the study on all baseline and mid-year measurements. A summary of this analysis is included on OSF: https://osf.io/a6feq/

symptoms that focuses on the affectivity component of depressed mood (Andresen et al., 1994). The scale includes items such as "I could not get going" and "I was bothered by things that usually don't bother me". It is measured on a four-point Likert scale ranging from 1 "rarely or none of the time (<1 day)" to 4 "most or all the time (5 - 7 days)". A depressive symptoms score was computed by averaging the ten items ($\alpha_{T1} = 0.79$, $\alpha_{T2} = 0.85$, $\alpha_{T3} = 0.86$).

Results

Preliminary Analysis

Means, standard deviations and correlations between all variables are included in Table 1 below[11]. Need frustration, depressive symptoms and negative affect were positively correlated.

Table 1.

Mean, standard deviations and correlations between all variables of interest

Variable	Mean(SD)	2.	3.	4.	5.	6.	7.	8.	9.
1. T1 Dep	2.06 (.51)	**.74**	**.56**	**.52**	**.44**	**.38**	**.40**	**.32**	**.30**
2. T1 NA	3.50 (1.08)	1	**.54**	**.40**	**.43**	**.30**	**.30**	**.28**	**.26**
3. T1 NF	3.64 (1.10)	-	1	**.39**	**.39**	**.50**	**.28**	**.27**	**.40**
4. T2 Dep	2.29 (.61)	-	-	1	**.78**	**.67**	**.44**	**.36**	**.35**
5. T2 NA	3.95 (1.28)	-	-	-	1	**.67**	**.41**	**.42**	**.38**
6. T2 NF	4.02 (1.25)	-	-	-	-	1	**.40**	**.38**	**.43**
7. T3 Dep	2.04 (.59)	-	-	-	-	-	1	**.76**	**.62**
8. T3 NA	3.26 (1.22)	-	-	-	-	-	-	1	**.66**
9. T3 NF	3.56 (1.26)	-	-	-	-	-	-	-	1

Note. Bolded terms represent $p < .05$. Dep means Depressive symptoms, NA means negative affect, and NF means need frustration.

[11] All data is available on OSF.

Main Analysis

To test whether negative affect, need frustration and depressive symptoms were concomitants or antecedents of one another, a fully cross-lagged path model[12] was created using MPlus software (Muthen & Muthen, 2015). Missing data was handled using FIML in MPlus. The model had good fit (BIC = 6543.72, $\chi^2(9) = 36.77$, $p < .001$, RMSEA = .09[.06, .12], CFI = .979, SRMR = .048). For a summary of the statistics and a display of the model please see Table 2 and Figure 1. Each variable was a consistent predictor of itself over time, meaning someone who reported more negative affect in September was more likely to report greater negative affect in December and April, and this was true for all the variables. From the beginning of the year to the end of the year, need frustration was the only consistent predictor of negative affect and depressive symptoms over time. In September students who reported greater need frustration experienced more negative affect in December and additionally, students who reported more need frustration in December experienced even more negative affect and depressive symptoms in April. At the beginning of the year, students who reported depressive symptoms reported more negative affect and need frustration in the middle of the academic year. However, reports of depressive symptoms in December did not predict negative affect or need frustration at the end of the year when controlling for all the other variables. Negative affect at the beginning of the year did not predict depressive symptoms or need frustration in the middle of the year, but negative affect in December predicted greater need frustration at the end of the academic year, suggesting a recursive effect of need frustration. Across all the time points the variables were correlated and this variance was controlled for over time.

[12] Supplemental analysis was completed to test whether a latent SEM or random intercept cross-lag panel model worked with this data set. The supplemental analysis can be found on OSF.

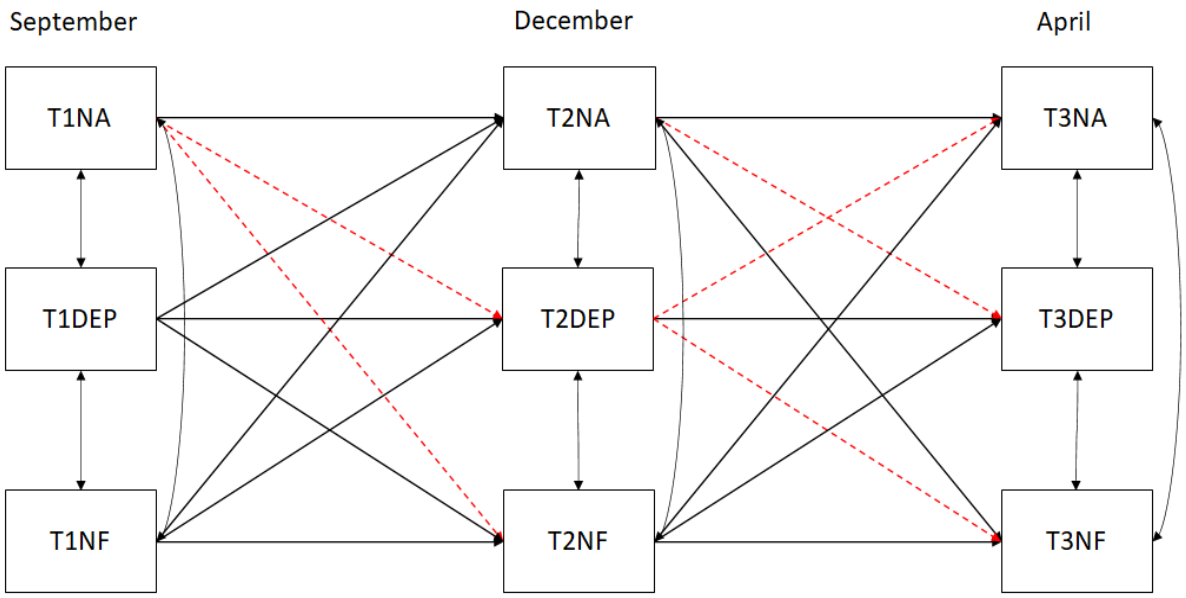

Figure 1. The fully cross-lagged path model between negative affect, depression and need frustration at the beginning, middle and end of the academic year. Black solid lines represent significant associations, and red dashed lines signify non-significant relations.

Table 2

The coefficients for fully cross-lagged model with depressive symptoms, negative affect and need frustration over the academic year

Path	B[95%CI], *p*	Path	B[95%CI], *p*
T1NA → T2NA	**.19 [.05, .34], *p* =.007**	T1DEP → T2NF	**.20 [.05, .34], *p* = .007**
T2NA → T3NA	**.33 [.16, .49], *p* < .001**	T1NF → T2NA	**.18 [.06, .29], *p* = .002**
T1DEP → T2DEP	**.46 [.32, .59], *p* < .001**	T1NF → T2DEP	**.13 [.03, .25], *p* = .01**
T2DEP → T3DEP	**.26 [.09, .43], *p* = .002**	T2NA → T3DEP	.10 [-.07, .27], *p* = .25
T1NF → T2NF	**.43 [.32, .54], *p* < .001**	T2NA → T3NF	**.17 [.01, .34], *p* = .04**
T2NF → T3NF	**.32 [.18, .46], *p* < .001**	T2DEP → T3NA	.01 [-.17, .17], *p* = .97
T1NA → T2DEP	-.01 [-.15, .12], *p* = .85	T2DEP → T3NF	.01 [-.16, .18], *p* = .88
T1NA → T2NF	-.07 [-.22, .06], *p* = .27	T2NF → T3NA	**.16 [.02, .31], *p* = .02**
T1DEP → T2NA	**.19 [.05, .34], *p* = .007**	T2NF → T3DEP	**.17 [.03, .31], *p* = .02**

Note: Bolded values indicate significance. STDYX values reported.

Brief Discussion

The current study aimed to distinguish the relative contribution of affect and basic psychological need frustration on the development of depressive symptoms longitudinally. Need frustration was the only consistent predictor of depressive symptoms and negative affect over the academic year. This research provides additional evidence that need frustration is both an antecedent and concomitant for depressive symptoms across the academic year. Meaning it is both correlated over time with depression and anxiety (concomitant) and precedes these outcomes when examined longitudinally (antecedent). Depressive symptoms often increase across the academic year and have become an increasingly prevalent problem across university

campuses (Evans et al., 2018; Levine et al., 2021). The current research suggests that need frustration is a risk factor for this decline in mental health.

Depressive symptoms at the beginning of the school year predicted need frustration, and negative affect in the middle of the academic year, but not from the middle of the academic year to the end of the year. Experiencing depressive symptoms is likely to make students feel more need frustrated. For example, a depressed student might withdraw from their social groups (relatedness frustration), be less able to concentrate and study (competence frustration) or feel increasingly overwhelmed with school tasks (autonomy frustration). Again, any combination of these or other events might occur if an individual is feeling more depressed that might make their environment need frustrating. Students who perceive their environment to be need frustrating are at higher risk of experiencing depressive symptoms, and students who are experiencing depressive symptoms are more likely to find their university environment to be need frustrating.

Negative affect was not found to be associated with later depressive symptoms, but there was a recursive effect, such that mid-year negative affect was related to increased need frustration at the final time point. These findings show that psychological needs, not affect, predict depressive symptoms over the year. However, affect still clearly plays a role in depression, and is highly correlated with depressive symptoms over time. These findings are contrary to previous cross sectional research which has shown that affect does contribute to depressive symptoms (Nima et al., 2013). Our study suggests that negative affect has less incremental validity as a predictor of depressive symptoms when compared to psychological need frustration. This might suggest that one’s perception of autonomy, competence and relatedness in their environment is a greater predictor of ill-being, than affect. This study also suggests that need frustration may precede feelings of negative affect. Affective changes

associated with depressive symptoms are actually the result of need frustration, which might be why previous studies have shown affect to predict depressive symptoms (Gunnell et al., 2013). Study 2 aims to replicate the current set of novel findings in a sample of university students during the start of the 2020 COVID-19 pandemic. Additionally, this sample uses the reports of close others to examine whether self-reported affect and need frustration predicted the presentation of depressive symptoms.

Study 2

The COVID-19 pandemic has been an unprecedented global stressor. During the pandemic, the world experienced adversity together, and a collective uncertainty of what might happen. Preliminary research has found that living through the COVID-19 pandemic was a stressful event and related to increased psychopathology including anxiety, depression, and loneliness (e.g. Cullen et al., 2020; Lei & Klopack, 2020; Pfefferbaum & North, 2020). Our emotional and psychological health has been impacted during this time. However, there has yet to be extensive research on how need frustrating this time may have been, and how perceptions of need frustration may have impacted mental health during this time. At the start of the novel COVID-19 pandemic in North America, many students were isolated from others (relatedness frustration), were unable to complete their school year or extracurricular activities normally (competence frustration) and were unable to control or choose what they were able to do (autonomy frustration). Basic psychological need satisfaction has been found to be associated with increased well-being during the COVID-19 pandemic (Cantarero et al., 2020). Additionally, a recent study has found that need frustration predicted increased anxiety and depression over 10 days of lockdown during the pandemic (Vermote et al., 2021).

The goal of this second study was to replicate our previous finding in a pandemic sample. Again, we examined the cross-lagged relations between negative affect, need frustration and depressive symptoms across 6 weeks at the beginning of the global pandemic (early April 2020 to late May 2020). We hypothesized, that need frustration would be an antecedent and concomitant of depressive symptoms and negative affect during the COVID-19 pandemic. A secondary goal of this second study was to examine whether these results could be replicated using the reports of close family members and friends to confirm changes in depressive symptoms associated with need frustration. The reports were intended to corroborate the participant self-reports and help us to further understand depressive presentation in these individuals.

Method

Participants and Procedure

The 235 participants for this year-long online study were recruited from a large Canadian public university. Participants were university students (83% female, M_{age} 20.82, SD = 3.40). The ethnic background of our sample was predominantly European descent (46%) but included 38% Asian descent, 3% African descent, 5% Middle Eastern descent, and 4% Hispanic. Recruitment was done through traditional and online platforms such as posters around campus, lecture hall announcements, and Facebook posts. The study was conducted through online surveys administered through Qualtrics at the start of the pandemic in April 2020 (T1), and participants were followed up 6 weeks afterwards in late May 2020 (T2). The surveys assessed psychological needs, affect, and depressive symptoms at each time point. Participants were compensated up to $20 for their time[13].

[13] This was a part of a larger year-long goal study. The other measures collected are included on our OSF.

This study was part of a larger year long research project, and peer and family reports were collected in September 2019 and May 2020. In September, each participant nominated a family member and friend to complete a short survey. The family and friend surveys were brief and asked about the nominating participant's mental health. These reports were entirely voluntary. To maximize these reports, we averaged family and friend reports at each time point. This also allowed us to have a better idea of how the participant was functioning overall[14]. At the first time point about 200 family members and 204 peers filled out reports, and at the second time point 146 family members, and 144 peers filled out reports (Combined $N_{T1} = 242$; $N_{T2} = 200$). For family member reports, 72% were parents, 17.5% were siblings, and the remainder were other relatives. For peer reports, 77% were friends, 18% were romantic partners.

Measures

Affect. The same measure of affect was used, please see above for detail ($\alpha_{NAT1} = 0.84$, $\alpha_{NAT2} = 0.87$).

Basic Psychological Need Frustration. The same measure of need frustration was used, please see above for detail ($\alpha_{NFT1} = 0.82$, $\alpha_{NFT2} = 0.73$).

Depressive Symptoms. The same measure of depressive symptoms was used, please see above for detail ($\alpha_{T1} = 0.84$, $\alpha_{T2} = 0.87$).

Depressive Presentation. To measure how depressed a student presented to their family and friends, we used two items from the Big-Five Inventory (BFI; John & Srivastava, 1999). Reporters rated these items on a 5-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree". The items were, "[insert participant's name] is someone who is depressed" and "[insert participant's name] is someone who can be moody". These items were averaged across

[14] Data for this study is also available on OSF.

both supporters to compute a depressive presentation score at each time point ($\alpha_{T1} = 0.62$; $\alpha_{T2} = 0.67$).

Results

Preliminary Analysis

Means, standard deviations and correlations between all variables are included in Table 3 below. Need frustration, depressive symptoms and negative affect were positively correlated.

Table 3.

Mean, standard deviations and correlations between all variables of interest.

Variable	Mean(SD)	2.	3.	4.	5.	6.	7.	8.
1. T1 Dep	2.06 (.51)	**.75**	**.63**	**.63**	**.51**	**.43**	**.23**	**.34**
2. T1 NA	3.50 (1.08)	1	**.66**	**.54**	**.62**	**.47**	**.23**	**.32**
3. T1 NF	3.64 (1.10)	-	1	**.52**	**.51**	**.64**	.10	**.29**
4. T2 Dep	2.29 (.61)	-	-	1	**.77**	**.66**	**.28**	**.37**
5. T2 NA	3.95 (1.28)	-	-	-	1	**.63**	**.31**	**.37**
6. T2 NF	4.02 (1.25)	-	-	-	-	1	**.15**	**.23**
7. DepO_0	2.34 (1.10)	-	-	-	-	-	1	**.63**
8. DepO_2	2.28 (1.11)	-	-	-	-	-	-	1

Note. Bolded terms represent $p < .05$. Dep means Depressive symptoms, NA means negative affect, NF means need frustration, and Dep O means Others' reports of depression. DepO_0 is the September 2019 time point, and DepO_2 is the May 2020 measurement.

Main Analysis

To test whether negative affect, need frustration and depressive symptoms were concomitants or antecedents of one another, a fully cross-lagged path model was created using MPlus software (Muthen & Muthen, 2017). Missing data was handled using FIML in MPlus. The model was identified, so fit statistics are not reported. The syntax and output are available on

OSF. For a summary of the statistics and a display of the model please see Figure 2 and Table 4. Each variable was a consistent predictor of itself over the 6-week period. Over this 6-week period, the only significant cross-lagged predictor was need frustration. During the start of the COVID-19 pandemic, individuals who reported finding this experience more need frustrating were more likely to experience negative affect and depressive symptoms six weeks later. Across all the time points the variables were correlated and this variance was controlled for over time.

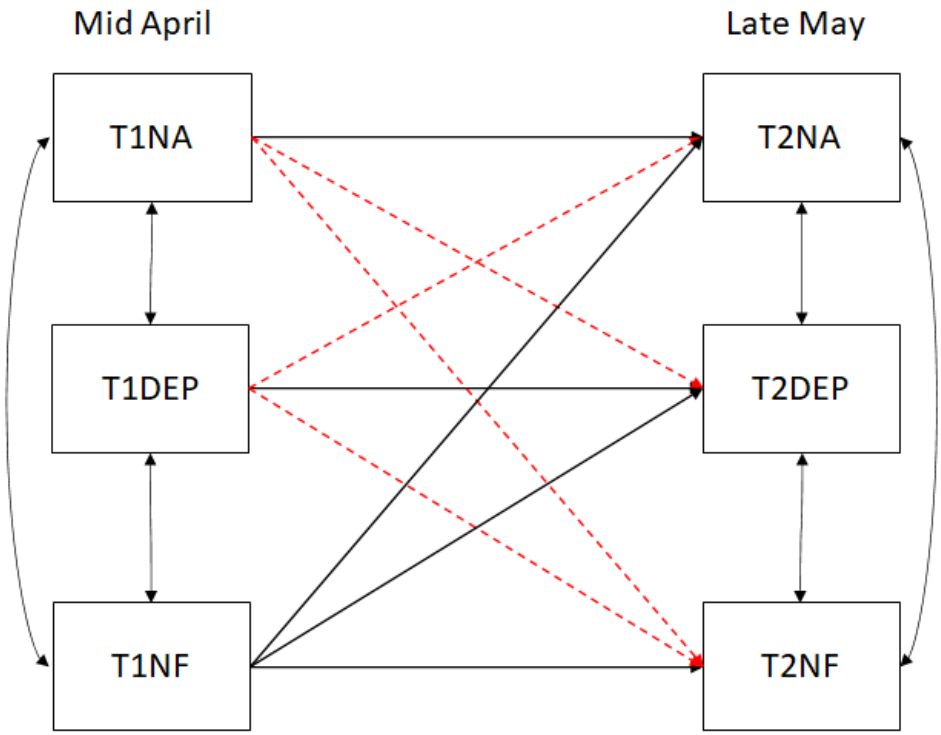

Figure 2. The fully cross-lagged path model between negative affect, depression and need frustration at the beginning and end of the academic year. Black solid lines represent significant associations, and red dashed lines signify non-significant relations.

Table 4

The coefficients for fully cross-lagged model with depressive symptoms, negative affect and need frustration over 6 months

Path	B[95%CI], *p*
T1NA → T2NA	**.47 [.31, .62], *p* < .001**
T1DEP → T2DEP	**.46 [.31, .61], *p* < .001**
T1NF → T2NF	**.59 [.46, .71], *p* < .001**
T1DEP → T2NA	.06 [-.10, .21], *p* = .487
T1NF → T2NA	**.17 [.03, .30], *p* = .018**
T1NA → T2DEP	.07 [-.07, .24], *p* = .287
T1NF → T2DEP	**.18 [.04, .32], *p* = .010**
T1NA → T2NF	.09 [-.07, .25], *p* = .287
T1DEP → T2NF	-.01 [-.16, .16], *p* = .987

Note: Bolded values indicate significance. STDYX values reported.

Supplementary Analyses: Others' Reports

To further confirm our results, we gathered peer and family member reports of depressive symptoms. Using hierarchical linear regression (Table 5), we examined whether participant reports of depressive sympotms, negative affect and need frustration in April at the start of the pandemic would predict others' reports of depression, or dperessive presentation. Baseline reports from others about depressive symptoms, and participant reports of depressive symptoms, affect and need frustration accounted for 48.6% of the variance in end of year others' reports of depressive symptoms ($F(4, 165) = 39.01$, $p < .001$, $r^2 = .486$). Baseline reports of depressive symptoms predicted end of year reports of depressive sympotms. Need frutration was a marginally significant predictor of others' reports of depressive symptoms when controlling for baseline reports, beta = .14, $p = .07$. This suggests that effect of need frustration on depressive

symptoms is somewhat observable to close others, thus lending weight to the self-reported effects.

Table 5

Regression coefficients for participant depression, affect and need frustration predicting others' reports of depression while controlling for others' baseline reports.

Predictor	B [95% CI], *p*
DepO_0	.62[.51, .75], $p < .001$
T1Dep	.08[-.18, .44] $p = .397$
T1NA	.03[-.13, .18], $p = .743$
T1NF	.14[-.01, .29], $p = .074$

Note: DepO_0 is baseline of others' reports of depression.

Brief Discussion

This second study replicated our initial results in a pandemic sample, basic psychological need frustration was found to predict depressive symptoms and negative affect during the start of the COVID-19 pandemic. This further supports our initial findings that need frustration is an antecedent of psychological distress. Additionally, these results compliment initial findings that implicate the importance of basic psychological need satisfaction for well-being and ill-being during the pandemic (Cantarero et al., 2020). The novel COVID-19 pandemic was a time of uncertainty and change for many. Individuals who experienced autonomy, competence and relatedness frustration during the pandemic were more likely to experience sadness, loneliness, anger, amotivation, loss of pleasure and overall distress. Additionally, reports from family members and friends confirm this association. Need frustration may represent an important and identifiable predictor of how an individual may cope during a stressful life event, like a pandemic.

Discussion

Need frustration was found to be an antecedent and concomitant of depressive symptoms over an average academic year, and during the COVID-19 pandemic. Depressive symptoms often increase across the academic year and have become an increasingly prevalent problem across university campuses (Evans et al., 2018; Levine et al., 2021). Need frustration might be one factor that explains who is more likely to experience severe depressive symptoms over time, and during vulnerable periods of time, like the start of a global pandemic.

The current findings further support the assertion that psychological need frustration predicts ill-being (Sheldon & Gunz, 2009). Not only is need satisfaction central to well-being, but active thwarting of a person's needs is detrimental to one's mental health (Chen et al., 2015). The study of need frustration is still a relatively new area in self-determination theory. The current research further implicates need frustration as a transdiagnostic risk factor, as it was both a predictor of negative affect and depressive symptoms longitudinally. Additionally, this research adds to the literature by examining the impact of need frustration on psychopathology longitudinally over an entire academic year. Students often experience an increase in depressive symptoms over an academic year and this study suggests a new mechanism for understanding how depressive symptoms develop in emerging adulthood (Levine et al., 2021). With the increased prevalence of depression on university campuses, risk factors need to be determined to help identify students who may suffer.

Need frustration is often used as a mediator to explain changes in affect and psychopathology (e.g. Campbell et al., 2018; Costa et al., 2016; Levine et al., 2020). The current research provides statistical evidence that need frustration has *incremental* validity as a predictor of psychopathology over time. The present research is crucial to self-determination theory as it

provides further evidence for the importance of basic psychological needs as an underlying mechanism of ill-being (Ryan & Deci, 2017). The current research was a stringent test and suggests that need frustration is an antecedent of depressive symptoms and negative affect over time.

Need frustration also emerged as a marginally significant predictor of depressive symptoms when examining close others' reports. This further strengthens this research by suggesting that an individual's experience of need frustration may also contribute to how much an individual presents as depressed or how noticeable their mental health problems are to others. Alternatively, the peer and family reports remove the problem of shared method variance that plagues self-report studies in this area. The easier it is to identify mental health problems, the easier it may be to provide early intervention (Calear & Christensen, 2010).

Limitations and Future Directions

There are limitations to consider within the current research. Although we controlled for depressive symptoms throughout the year, extraneous variables like personality could also be contributing to the observed effect. A study by Nishimura and Suzuki (2016) found that accounting for personality traits attenuated the relationship between psychological need satisfaction and well-being, suggesting the present effects might not be entirely the result of psychological needs. Additionally, our study mainly assessed self-report data from surveys. Although self-report data was corroborated with reports from close family and friends in study 2, we did not have an expert rating of depressive symptoms. Additionally, this research used only one measure of affect (Emmons, 1992). There is a vast literature on the study of affect, and future research should try to replicate this research with other affect measures. Additionally, we looked at need frustration generally, and future research could examine whether a specific form

of need frustration might be most detrimental for mental health problems. Most research examining need frustration does not break down this variable by components (Ryan & Deci, 2017). Additionally, the current samples were underpowered to run a full latent SEM, so future research should aim to replicate these findings using these more sophisticated analyses. The current study was also observing change overtime and cannot be used as evidence for causation.

Furthermore, the study focused on a specific sample, university students. Further research would be needed to determine whether these findings extend beyond the university setting. However, mental health problems are becoming increasingly prevalent across all university campuses and more research is needed to understand why this is occurring (Ketchen Lipson et al, 2015). Students in demanding programs may experience a particularly need thwarting environment, which would take a toll on their mental health. For instance, enthusiastic first year law students tend to report diminished well-being throughout their education due to the autonomy-thwarting environment (Krieger, 2002; Sheldon & Krieger, 2007). So, university students might be an especially important population to understand for this research question. To evaluate the universality of need thwarting in contributing to the mental health crisis, future research could assess different populations (e.g. older adults, children) cross culturally.

This research suggests that there may be clinical utility in assessing need frustration in at-risk individuals or individuals seeking treatment. Need frustration appears to be an early indicator of depressive symptoms and determining how to target these frustrated needs may help to reduce the severity of a patient's symptom trajectory. Need frustration is a construct that measures how one perceives the environment, so as a clinician it may be possible to work with patients through multiple modalities to either address factors that contribute to need frustrating environments or maladaptive thinking patterns that exacerbate the perception of need frustration.

For example, if a patient reported feeling like a failure (competence frustration), a clinician may work with this individual to restructure this thought or consider the evidence for and against it. Alternatively, if a patient reported feeling isolated, or being bullied, it would be possible to work on interpersonal effectiveness skills to help reduce these need frustrating problems (Teixeira et al., 2019). As such, assessing need frustration may help to guide clinical interventions aimed at overcoming individuals' perceptions of isolation, incompetence, or control, which may reduce depressive symptoms over time.

Need frustration was found to be an early warning sign of future depressive symptoms. Using need frustration as an early screening tool for depressive symptoms could help to identify who might be more likely to experience more severe depressive symptoms. Recognizing need frustration early on and improving need support in universities would improve well-being for subclinical, and perhaps even clinical cases. An intervention could be created to promote healthy response to need thwarting, and to equip students with tools to buffer against the frustration of their basic psychological needs. There are many interventions that promote need satisfaction by focusing on increasing autonomy support within one's environment (Cheon et al., 2016; Edmunds et al., 2007). However, lacking need satisfaction is not equivalent to need frustration. More research is needed to determine what interventions are more effective at buffering against psychological need frustration. Perhaps, an intervention focused on coping tools to help buffer against need frustration might be helpful for college students. Some self-care strategies, like reading have been found to reduce need frustration in college students (Levine et al., 2020). Future research is needed to see whether other self-care activities, like yoga or baking could also buffer against need frustration when practiced regularly. Future research is needed to understand

how basic psychological needs can be intervened upon to promote well-being in at-risk individuals during emerging adulthood.

Conclusion

The present study found that need frustration was a predictor of depressive symptoms across a "typical" academic year, and during the COVID-19 pandemic. Additionally, there was some evidence that depressive symptoms and negative affect lead individuals to experience more need frustration. Need frustration was the only consistent predictor of depressive symptoms and negative affect over the academic year, and during the COVID-19 pandemic, and even when examining close others' reports. The present study supports the importance of psychological needs in ill-being and psychopathology. Future research is needed to examine the applicability of need frustration as a mechanism which explains ill-being and psychopathology, and ultimately, research is needed to examine how need frustration can be intervened upon to reduce psychological distress in emerging adulthood.

Compliance with Ethical Standards:

Funding: This study was funded by The Social Sciences and Humanities Research Council of Canada (435-2014-20463); Fonds de Recherche du Quebec – Sante (2017-SE-196443)

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

References

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: Evaluation of a short form of the CES-D. *American Journal of Preventive Medicine, 10*, 77–84. https://doi.org/10.1016/s0749-3797(18)30622-6

Calear, A. L., & Christensen, H. (2010). Systematic review of school-based prevention and early intervention programs for depression. *Journal of Adolescence, 33*(3), 429-438. doi: 10.1016/j.adolescence.2009.07.004

Campbell, R., Boone, L., Vansteenkiste, M., & Soenens, B. (2018). Psychological need frustration as a transdiagnostic process in associations of self-critical perfectionism with depressive symptoms and eating pathology. *Journal of Clinical Psychology, 74*, 1775–1790. https://doi.org/10.1002/jclp.22628

Cantarero, K., van Tilburg, W. A., & Smoktunowicz, E. (2020). Affirming basic psychological needs promotes mental well-being during the COVID-19 outbreak. *Social Psychological and Personality Science,* 1948550620942708.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., … Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*, 216–236. https://doi.org/10.1007/s11031-014-9450-1

Chen, L., Wang, L., Qiu, X. H., Yang, X. X., Qiao, Z. X., Yang, Y. J., & Liang,Y. (2013). Depression among Chinese University Students: Prevalence and Socio-Demographic Correlates. *PLoS ONE, 8*, 1–6. https://doi.org/10.1371/journal.pone.0058379

Cheon, S. H., Reeve, J., & Song, Y. G. (2016). A teacher-focused intervention to decrease PE students' amotivation by increasing need satisfaction and decreasing need frustration.

Journal of Sport and Exercise Psychology, *38*, 217–235. https://doi.org/10.1123/jsep.2015-0236

Cordeiro, P., Paixão, P., Lens, W., Lacante, M., & Sheldon, K. (2016). Factor structure and dimensionality of the balanced measure of psychological needs among Portuguese high school students. Relations to well-being and ill-being. *Learning and Individual Differences*, *47*, 51–60. https://doi.org/10.1016/j.lindif.2015.12.010

Costa, S., Cuzzocrea, F., Gugliandolo, M. C., & Larcan, R. (2015). Associations between parental psychological control and autonomy support, and psychological outcomes in adolescents: The mediating role of need satisfaction and need frustration. *Child Indicators Research*, *9*, 1059–1076. https://doi.org/10.1007/s12187-015-9353-z

Cullen, W., Gulati, G., & Kelly, B. D. (2020). Mental health in the COVID-19 pandemic. *QJM: An International Journal of Medicine, 113*(5), 311-312. doi: 10.1093/qjmed/hcaa110

Diener, E., & Oishi, S. (2000). Money and happiness: Income and subjective well-being across nations. *Culture and subjective well-being*, 185-218.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2007). Adherence and well-being in overweight and obese patients referred to an exercise on prescription scheme: A self-determination theory perspective. *Psychology of Sport and Exercise, 8*, 722-740. https://doi.org/10.1016/j.psychsport.2006.07.006

Emmons, R. A. (1992). Abstract versus concrete goals: Personal striving level, physical illness, and psychological well-being. *Journal of Personality and Social Psychology*, *62*, 292–300. https://doi.org/10.1037/0022-3514.62.2.292

Evans, T. M., Bira, L., Gastelum, J. B., Weiss, L. T., & Vanderford, N. L. (2018). Evidence for a mental health crisis in graduate education. *Nature Biotechnology*, *36*, 282–284.

https://doi.org/10.1038/nbt.4089

Gunnell, K. E., Crocker, P. R. E., Wilson, P. M., Mack, D. E., & Zumbo, B. D. (2013). Psychological need satisfaction and thwarting: A test of basic psychological needs theory in physical activity contexts. *Psychology of Sport and Exercise, 14*, 599–607. https://doi.org/10.1016/j.psychsport.2013.03.007

Jackson, A., Cavanagh, J., & Scott, J. (2003). A systematic review of manic and depressive prodromes. *Journal of Affective Disorders*, *74*, 209–217. https://doi.org/10.1016/S0165-0327(02)00266-5

John, O. P., & Srivastava, S. (1999). *The Big-Five trait taxonomy: History, measurement, and theoretical perspectives* (Vol. 2, pp. 102-138). Berkeley: University of California.

Ketchen Lipson, S., Gaddis, S. M., Heinze, J., Beck, K., & Eisenberg, D. (2015). Variations in student mental health and treatment utilization across US colleges and universities. *Journal of American College Health*, *63*, 388–396. https://doi.org/10.1080/07448481.2015.1040411

Krieger, L. S. (2002). Institutional denial about the dark side of law school, and fresh empirical guidance for constructively breaking the silence. *Journal of Legal Education*, *52*, 112–129.

Lei, M. K., & Klopack, E. T. (2020). Social and psychological consequences of the COVID-19 outbreak: The experiences of Taiwan and Hong Kong. *Psychological trauma: theory, research, practice, and policy*, *12*(S1), S35. doi: 10.1037/tra0000633

Levine, S. L., Cherrier, S., Holding, A. C., & Koestner, R. (2020). For the love of reading: Recreational reading reduces psychological distress in college students and autonomous motivation is the key. *Journal of American College Health*, 1-7. doi: 10.1080/07448481.2020.1728280

Levine, S. L., Milyavskaya, M., & Zuroff, D. C. (2020). Perfectionism in the transition to

university: Comparing diathesis-stress and downward spiral models of depressive symptoms. *Clinical Psychological Science, 8,* 52-64. https://doi.org/10.1177/2167702619865966

Levine, S. L., Tabri, N., & Milyavskaya, M. (2021). Trajectories of depression and anxiety symptoms over time in the transition to university: Their co-occurrence and the role of self-critical perfectionism.*Development & Psychopathology.* doi: 10.31234/osf.io/zxg8h

Munezero, M., Montero, C. S., Sutinen, E., & Pajunen, J. (2014). Are they different? affect, feeling, emotion, sentiment, and opinion detection in text. *IEEE Transactions on Affective Computing*, *5*, 101–111. https://doi.org/10.1109/TAFFC.2014.2317187

Muthén, B., & Muthén, L. (2017). *Mplus* (pp. 507-518). Chapman and Hall/CRC.

Nima, A. Al, Rosenberg, P., Archer, T., & Garcia, D. (2013). Anxiety, affect, self-esteem, and stress: Mediation and moderation effects on depression. *PLoS ONE*, *8*. https://doi.org/10.1371/journal.pone.0073265

Nishimura, T., & Suzuki, T. (2016). Basic psychological need satisfaction and frustration in Japan: Controlling for the big five personality traits. *Japanese Psychological Research*, *58*, 320–331. https://doi.org/10.1111/jpr.12131

Pfefferbaum, B., & North, C. S. (2020). Mental health and the Covid-19 pandemic. *New England Journal of Medicine*, *383*(6), 510-512. doi: 10.1056/NEJMp2008017

Porter, S. (2018). A Descriptive Study of Post-Secondary Student Mental Health Crises. *College Quarterly*, *21*.

Raes, F., Smets, J., Nelis, S., & Schoofs, H. (2012). Dampening of positive affect prospectively predicts depressive symptoms in non-clinical samples. *Cognition and Emotion*, *26*, 75–82. https://doi.org/10.1080/02699931.2011.555474

Rosenthal, B. S., & Schreiner, A. C. (2000). Prevalence of psychological symptoms among undergraduate students in an ethnically diverse urban public college. *Journal of the American College Health Association*, *49*, 12–18. https://doi.org/10.1080/07448480009596277

Ryan, R. M., & Deci, E. L. (2017). Self-Determination Theory: Basic psychological needs in motivation, development, and wellness. In *Guilford*.

Schultz, P. P., Ryan, R. M., Niemiec, C. P., Legate, N., & Williams, G. C. (2015). Mindfulness, work climate, and psychological need satisfaction in employee well-being. *Mindfulness*, *6*, 971–985. https://doi.org/10.1007/s12671-014-0338-7

Sheldon, K. M., & Gunz, A. (2009). Psychological needs as basic motives, not just experiential requirements. *Journal of Personality*, *77*, 1467–1492. https://doi.org/10.1111/j.1467-6494.2009.00589.x

Sheldon, K. M., & Hilpert, J. C. (2012). The balanced measure of psychological needs (BMPN) scale: An alternative domain general measure of need satisfaction. *Motivation and Emotion*, *36*, 439–451. https://doi.org/10.1007/s11031-012-9279-4

Sheldon, K. M., & Krieger, L. S. (2007). Understanding the negative effects of legal education on law students: A longitudinal test of self-determination theory. *Personality and Social Psychology Bulletin*, *33*, 883–897. https://doi.org/10.1177/0146167207301014

Song, Y., Huang, Y., Liu, D., Kwan, J. S. H., Zhang, F., Sham, P. C., & Tang, S. W. (2008). Depression in college: Depressive symptoms and personality factors in Beijing and Hong Kong college freshmen. *Comprehensive Psychiatry*, *49*, 496–502. https://doi.org/10.1016/j.comppsych.2008.02.005

Storrie, K., Ahern, K., & Tuckett, A. (2010). A systematic review: Students with mental health

problems-A growing problem. *International Journal of Nursing Practice*, *16*, 1–6. https://doi.org/10.1111/j.1440-172X.2009.01813.x

Teixeira, P. J., Marques, M. M., Silva, M. N., Brunet, J., Duda, J., Haerens, L., & Hagger, M. S. (2019). Classification of techniques used in self-determination theory-based interventions in health contexts: An expert consensus study. *PsyArXiv, doi: https://doi. org/10.31234/osf. io/z9wqu*.

Trivedi, M. H. (2004). The link between depression and physical symptoms. *Primary Care Companion to the Journal of Clinical Psychiatry*, *6*, 12–16. PMID: 16001092

Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration*, *23*, 263–280. https://doi.org/10.1037/a0032359

Vansteenkiste, M., Ryan, R.M. & Soenens, B. Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation & Emotion* 44, 1–31 (2020). https://doi.org/10.1007/s11031-019-09818-1

Vermote, B., Waterschoot, J., Morbée, S., Van der Kaap-Deeder, J., Schrooyen, C., Soenens, B., Ryan, R., & Vansteenkiste, M. (2021). Do psychological needs play a role in times of uncertainty? Associations with well-being during the COVID-19 crisis. *Journal of happiness studies*, 1–27. https://doi.org/10.1007/s10902-021-00398-x

Watson, D., & Clark, L. A. (1995). Depression and the melancholic temperament. *European Journal of Personality*, *9*, 351–366. https://doi.org/10.1002/per.2410090505

Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology*, *97*, 346–353. https://doi.org/10.1037/0021-843X.97.3.346

Wells, V. E., Klerman, G. L., & Deykin, E. Y. (1987). The prevalence of depressive symptoms in college students. *Social Psychiatry*, *22*, 20–28. https://doi.org/10.1007/BF00583616

Werner-Seidler, A., Banks, R., Dunn, B. D., & Moulds, M. L. (2013). An investigation of the relationship between positive affect regulation and depression. *Behaviour Research and Therapy*, *51*, 46–56. https://doi.org/10.1016/j.brat.2012.11.001

Zivin, K., Eisenberg, D., Gollust, S. E., & Golberstein, E. (2009). Persistence of mental health problems and needs in a college student population. *Journal of Affective Disorders*, *117*, 180–185. https://doi.org/10.1016/j.jad.2009.01.001

General Discussion

The present thesis presents a series of research articles that extend self-determination theory by utilizing longitudinal research design and statistical analyses. Self-determination theory is a leading theory of human motivation, relationships, and flourishing. A major contribution of this theory is examining the quality of one's motivation, support, and well-being (Ryan & Deci, 2017). The quality of one's motivation is viewed as a continuum ranging from more autonomous (because an individual wants-to pursue it) to more controlled (because an individual has-to pursue it) (Koestner et al., 2008). Further support is viewed in the same lens, it is not the quantity of support you perceive, but rather the quality that matters, and again quality is viewed in terms of how much a supporter understands and values your volition (Koestner et al., 2012). Finally, well-being is also examined in this way, it is not happiness or sadness, but rather self-determination theory suggests that there are basic components to flourishing and that one's basic psychological needs for competence (feeling confident in one's abilities), relatedness (feeling close to others), and autonomy (feeling volitional) must be met for an individual to flourish (Deci & Ryan, 2000). The current thesis aimed to further extend these main concepts in self-determination theory by examining them over time using prospective longitudinal design and statistical analyses. Overall, each article provides a unique theory congruent contribution to self-determination theory. Each article implicates the importance of self-determination theory in predicting changes over time and suggests that when integrating self-determination theory with other personality, emotion, and support theories, that autonomous motivation, support and need frustration are predictors or antecedents of changes in flourishing and psychological distress over time. These findings also create new avenues for replication and intervention to help buffer against distress and improve flourishing.

Collaborative Autonomy

Although autonomy is not a synonym for independence, it is often considered a highly personal form of motivation. Article 1 advances self-determination theory by providing evidence for the opposite assertion. The development of autonomous motivation flourishes within openly cooperative and satisfying interpersonal environments. Additionally, autonomy supportive environments are fueled by individuals who pursue their goals with whole-hearted volition. The influence of autonomy support on autonomous motivation has been well-documented within the literature (see Su & Reeves, 2011 or Vansteenkiste et al., 2012, for reviews). There is limited empirical evidence which finds that autonomous individuals can influence the type of support they receive. Article 1 provides longitudinal evidence that autonomous individuals elicit, seek out, or pursue more autonomy supportive environments.

Although this has not yet been tested within a self-determination theory framework, personality theories often suggest that individuals will either select or manipulate their environments to suit their disposition (Caplan, 1987; McAdams, 2015). The current research broadens the implications of personality-environment fit, by suggesting that perhaps motivation-environment fit may also be important for an individual's flourishing. Selecting the proper environment to pursue one's goals may facilitate growth in motivation, support, and progress (Roberts et al., 2008). An autonomously motivated student working in a controlling environment may work harder to exercise their volition, then the student may be able to manipulate the environment to be more autonomy supportive. Or the student may choose to leave and find a more autonomy supportive environment. When an individual volitionally and wholeheartedly pursues a goal, they may increase their likelihood of eliciting open and understanding support.

Autonomously motivated individuals may act as the agent of change in their own lives to gain these more autonomy supportive environments.

The upward spiral of autonomy suggests that both autonomous motivation and autonomy support continuously contribute to the growth of each other over time, and that this autonomy spiral is fueled by gains in positive emotions. The upward spiral of autonomy might be consistent with the broaden and build theory, which suggests that positive emotions lead to a broadening of one's thought-action repertoires, which over time leads to a building of one's skills and resources (Fredrickson, 2001). Positive emotions experienced while acting autonomously or receiving autonomy support may be reinforcing and lead one to continue to pursue autonomous action or autonomy support from others which further fuels gains in positive emotions. Both autonomous motivation and autonomy support are related to need satisfaction and well-being (e.g. Kelly et al., 2015; Gagne, 2003; Sheldon & Elliot, 1999). An individual identifying with their goals more autonomously or a more enriching support environment, may lead to growth in personal and interpersonal autonomy. Additionally, each incremental increase in either personal or interpersonal autonomy is predicted to lead to this reciprocal upward spiral and well-being over time. Article 1 used longitudinal analyses to further our understanding of how motivation and support can flourish as a collaborative process during goal pursuit.

Collaborative Traits

Article 2 found that collaborative traits (trait agreeableness, assisted autonomy, and secure parental attachment) were all related to growth in autonomous motivation, autonomy support and flourishing in goal pursuit over the academic year. These individual difference variables are all defined primarily by cooperation and trust (Bowlby, 1988; John & Srivastava, 1999; Legault et al., 2017). This suggests that students who openly share their goals, search for

others to work with, or trust that others might have the best intentions to help them during goal pursuit are more likely to create a more enriching goal environment that is openly supportive and fuels the individual's volition.

There is limited research on whether dispositions can influence goal pursuit over time within the framework of self-determination theory. Some research has found that agreeableness is related to intrinsic achievement striving and motivation (Hart et al., 2007; Holding et al., 2019). Additionally, during development, secure attachment fosters independent growth and exploration in play, a form of personal autonomy (Elliot & Reis, 2003). These findings suggest that that the development of autonomous personal goals flourishes as a collaborative process, and it appears that individuals who work well with others, or trust others with their goals, experience growth in their personal autonomy over the school year.

Collaborative autonomy suggests autonomous motivation and support are reciprocal, and that autonomous individuals can seek out, elicit, or perceive more autonomy support from others, and that this cascade of autonomy is beneficial for goal progress and well-being (Levine et al., 2020). Consistent with the transactive goal model, a person does not strive for goals in isolation and being more open to help from others within your interpersonal environment might be beneficial during goal pursuit (Fitzsimmons & Finkel, 2018). One can imagine how an individual who aims to openly work with their environment while goal striving will be more likely to receive volitional support, compared to an individual who asserts their goal striving by trying to claim independence. The environment and the supporters someone surrounds themselves with can influence how one strives for their goals (Fitzsimmons & Finkel, 2018). Conversely, the way one engages with their goals may also actively change the type of support they elicit. For example, when someone is autonomously motivated, they may be likely to share their interest,

and this is likely to elicit autonomy support. Further studying goals through a transactive model shows that the hyper-competitive nature of independent struggle in goal striving may represent an outdated view which impairs rather than helps those struggling to reach their personal goals. Article 2 provides evidence that being collaborative can be beneficial to one's motivation and to the support one perceives, and that strength and success in goal striving emerges from this.

Need Frustration as an Antecedent of Distress

Need frustration was found to be an antecedent and concomitant of depressive symptoms over an average academic year and during the COVID-19 pandemic. Depressive symptoms often increase across the academic year and have become an increasingly prevalent problem across university campuses (Evans et al., 2018; Levine et al., 2021). Need frustration might be one factor that explains who is more likely to experience severe depressive symptoms over time, and during vulnerable periods of time, like the start of a global pandemic.

Article 3 further supports the assertion that psychological need frustration predicts ill-being over time (Sheldon & Gunz, 2009). Not only is need satisfaction central to well-being, but active thwarting of a person's needs is detrimental to one's mental health (Chen et al., 2015). The study of need frustration is still a relatively new area within self-determination theory. The current research further implicates need frustration as a transdiagnostic risk factor, as it was both a predictor of negative affect and depressive symptoms longitudinally. Additionally, this research adds to the literature by examining the impact of need frustration on psychopathology longitudinally over an entire academic year. Students often experience an increase in depressive symptoms over an academic year and this study suggests a new mechanism for understanding how depressive symptoms develop in emerging adulthood (Levine et al., 2021).

Need frustration is often used as a mediator to explain changes in affect and psychopathology (e.g. Campbell et al., 2018; Costa et al., 2016; Levine et al., 2020). The current research provides statistical evidence that need frustration has *incremental* validity as a predictor of psychopathology over time. Meaning at each time point it explained variance in distress when controlling for its previous impact, and this means at each time point how need frustrated a student felt was a significant contributor to their mental health a few months later. The present research is crucial to self-determination theory as it provides further evidence for the importance of basic psychological needs as an underlying mechanism of ill-being (Ryan & Deci, 2017). The current research was a stringent test and suggests that need frustration is an antecedent of depressive symptoms and negative affect over time.

Need frustration also emerged as a marginally significant predictor of depressive symptoms when examining close others' reports. This further strengthens this research by suggesting that an individual's experience of need frustration may also contribute to how much an individual presents as depressed or how noticeable their mental health problems are to others. Alternatively, the peer and family reports remove the problem of shared method variance that plagues self-report studies in this area. The easier it is to identify mental health problems, the easier it may be to provide early intervention (Calear & Christensen, 2010). Article 3 utilized longitudinal methods to confirm that need frustration is a predictor of ill-being over time.

General Limitations

There are several limitations to consider within the current research articles. First, the current set of studies were all conducted with a university sample, and more research is needed to determine whether these phenomena extend beyond young adulthood. However, this may also be a strength of this research, as young adulthood is a time when many people make career

decisions, search for their identity, and achieve independence from parents (Salmela-Aro, 2010). It is a relevant period to test the collaborative nature of autonomy, as young adulthood is one of the most volitional life stages, and when many people set crucial life goals (Shulman & Nurmi, 2010). Young adulthood is a time when many individuals proclaim their independence, so it is perhaps especially convincing that during young adulthood cooperation and collaboration with others is especially relevant for growth in autonomous motivation, support, and well-being. Additionally, mental health problems are becoming increasingly prevalent across university campuses and more research is needed to understand why this is occurring (Ketchen Lipson et al, 2015). Students in demanding programs may experience a particularly need thwarting environment, which would take a toll on their mental health. For instance, enthusiastic first year law students tend to report diminished well-being throughout their education due to the autonomy-thwarting environment (Krieger, 2002; Sheldon & Krieger, 2007). So, university students might be an especially important population to understand for this research question. Future research is needed to test these extensions in self-determination theory across the lifespan or in specialized samples to determine whether these findings generalize beyond student populations, and to determine how well these theoretical extensions can be applied in different settings.

Second, for article 1 and 2, the research aggregated across all types of goals rather than searching for distinct patterns for, say, social versus achievement goals. This allows these findings to be more generalizable, but it also limits the specificity of what can be claimed about the development of collaborative autonomy. Further research is needed to determine how broadly applicable this process might be for a variety of goals, or beyond goals for an individual's general autonomous motivation and daily perceived support across different

situations. Additionally, we only examined autonomous goal motivation, and not controlled goal motivation. Self-determination theory posits that individuals pursue goals for reasons ranging from more controlled (to avoid punishment or gain approval from others) to more autonomous (for personal enjoyment and fulfillment). More research is needed to see how controlled motivation may influence the type of support an individual receives and if that can influence their motivation.

Third, this research mostly examined self-reported motivation, support, personality, and affect. Self-report may not be completely accurate but is commonly used in social science research and has been found to be relatively accurate (e.g. Chan, 2009; Koestner et al., 2002). In the second study in Article 3, self-report data was corroborated with reports from close family and friends. This is a strength in this research and moving forward, the entirety of this research would be strengthened by adding either peer reports, or other more objective measures of support, like video-taping dyad interactions.

Finally, the current studies used path models, which is not as precise or can have more measurement error than structural equation models (SEM) (Muthen & Muthen, 2015). Across all the studies SEM were run but had poor fit due to the unequal weighting of the response in the latent variables, which we felt was not an accurate test of our current hypotheses. This supplemental SEM analysis is included on OSF for all the articles.

Future Directions

This set of research studies provides evidence that longitudinal modelling can be used to further advance our understanding of self-determination theory and how this theory can contribute to ill and well-being over time. In the future, longitudinal models could be used to test

or advance other mini theories in self-determination theory, or these models could be applied to observe change over time in more specialized populations. For example, longitudinal modelling could help to advance mini theories like general causality orientations, or the examination of need frustration and depression could be observed overtime in adolescent or clinical populations. There is a plethora of research in self-determination theory that uses longitudinal modelling (i.e., Campbell et al., 2018; Holding et al., 2019; Werner et al., 2016), and as the present set of research articles suggests there is still a lot of theory advancing and testing to be done within self-determination theory, not just the replication of cross-sectional findings. More research is needed to continue testing how self-determination theory can be integrated with other theories using longitudinal methods. Further, each article presents a unique contribution to self-determination theory and the next section goes on to suggest how each article could inspire future research.

For Article 1, autonomous motivation was associated with perceiving more autonomy support from others. This research provides preliminary evidence that autonomous goal motivation and perceived autonomy goal support influence each other in a cyclical manner, but how does this cycle start, and is it possible to jump start this upward spiral of autonomy? More research is needed to see whether this cycle could be intervened upon. Prior research suggests that when someone is in crisis, they may need more directive or active support from others to help them (Feeney & Collins, 2015). When an individual is looking for growth related support, a more autonomy supportive form of support may be more appropriate. For example, if an individual is in trouble, giving them positive guidance or solving their problems might be necessary. When an individual whole-heartedly endorses a volitional goal, just listening and being open to them may be the more apt response. Additionally, when someone is volitional,

they might be prouder of their goals, or more likely to tell more family, and friends, or to enlist more supporters. Maybe more autonomous individuals are better at choosing autonomy supportive facilitators, or autonomy supportive situations. Conversely, perhaps over time our regular supporters learn the most effective style of support across similar situations. For example, an autonomously motivated student in class might consistently need fewer controlling instructions over time and receive more autonomy support from this source. Perhaps, autonomous motivation elicits more autonomy support from others, as autonomy support is the most congruent response when working with an autonomous individual. Alternatively, it may also be that more autonomous individuals are just more open to this form of support, or that they perceive support differently. When you volitionally and wholeheartedly pursue a goal, all support, however passive, might be perceived in a positive manner, or as support for your ambitions. Further research is needed to determine how others respond to more autonomously motivated individuals and how individuals higher in autonomous motivation elicit this rich source of support.

In the future, research is needed to determine how to facilitate this dynamic growth between personal goal autonomy and interpersonally autonomy supportive environments. The current research suggests that interventions which promote need satisfaction (especially autonomy and relatedness satisfaction) in individuals during goal pursuit may help promote successful goal pursuit. Basic psychological need satisfaction has been shown to be related to many well-being and productivity outcomes, as well as to setting more autonomous goals (e.g. Milyavskaya & Koestner, 2011; Milyavskaya et al., 2014; Ryan and Deci, 2017; Vansteenkiste et al., 2020). There are many interventions that have been shown to be effective at facilitating need supportive behaviour (Teixeira et al., 2019). An intervention focused on teaching goal

supporters to act in a need satisfying way might be most effective for facilitating goal pursuit. For example, teaching supporters how to encourage open sharing of goals, or how to use non-controlling language while helping support someone's goal pursuit would likely facilitate the goal pursuers autonomy (Teixeira et al., 2019). Many individuals in emerging adulthood rely on their parents during goal pursuit (Koestner et al., 2020), so targeting this intervention to parents might be especially effective for encouraging autonomy during emerging adulthood.

In Article 2, self-reported trait agreeableness, secure attachment, and assisted autonomy predicted growth in perceived autonomy support and autonomous motivation over the academic year. These traits are all collaborative in nature, and it might be that collaborative behaviours stemming from these dispositions mediate this mechanism. However, collaborative behaviors were not measured, so this is only a proposed possible mechanism for how autonomy may flourish in emerging adulthood. Collectively across thousands of studies, the traits of agreeableness, conscientiousness, and secure attachment have been shown to have many diverse correlates including academic, job and marital success (McAdams, 2015), and it is possible that these traits may be associated with a diverse number of behaviours beyond collaboration that contribute to these outcomes. Additionally, if individuals higher in these traits are achieving success this then may lead others to be more trusting/supportive, which then reinforces their autonomous motivation and confidence while pursuing a goal. Article 2 cannot assert whether collaborative behaviors or any of the many other manifestations of these traits might explain the observed associations, but rather suggests that this might be a possible mechanism that warrants further investigation. To test our hypotheses regarding how agreeableness, secure attachment, and assisted autonomy might promote autonomy support and/or autonomous motivation, it would be necessary to conduct studies that measure the proposed mediating behaviors. Future

research could examine this mechanism by observing whether individuals higher in these traits report more collaborative behaviours or perform more collaboratively in an in-laboratory task.

Finally, Article 3 suggests that there may be clinical utility in assessing need frustration in at-risk individuals or individuals seeking treatment. Need frustration appears to be an early indicator of depressive symptoms and determining how to target these frustrated needs may help to reduce the severity of a patient's symptom trajectory. Need frustration is a construct that measures how one perceives the environment, so as a clinician it may be possible to work with patients through multiple modalities to either address factors that contribute to need frustrating environments or maladaptive thinking patterns that exacerbate the perception of need frustration. For example, if a patient reported feeling like a failure (competence frustration), a clinician may work with this individual to restructure this thought or consider the evidence for and against it. Alternatively, if a patient reported feeling isolated, or being bullied, it would be possible to work on interpersonal effectiveness skills to help reduce these need frustrating problems (Teixeira et al., 2019). As such, assessing need frustration may help to guide clinical interventions aimed at overcoming individuals' perceptions of isolation, incompetence, or control, which may reduce depressive symptoms over time.

Need frustration was found to be an early warning sign of future depressive symptoms. Using need frustration as an early screening tool for depressive symptoms could help to identify who might be more likely to experience more severe depressive symptoms. Recognizing need frustration early on and improving need support in universities would improve well-being for subclinical, and perhaps even clinical cases. An intervention could be created to promote healthy response to need thwarting, and to equip students with tools to buffer against the frustration of their basic psychological needs. There are many interventions that promote need satisfaction by

focusing on increasing autonomy support within one's environment (Cheon et al., 2016; Edmunds et al., 2007). However, lacking need satisfaction is not equivalent to need frustration. More research is needed to determine what interventions are more effective at buffering against psychological need frustration. Perhaps, an intervention focused on coping tools to help buffer against need frustration might be helpful for college students. Some self-care strategies, like reading have been found to reduce need frustration in college students (Levine et al., 2020). Future research is needed to see whether other self-care activities, like yoga or baking could also buffer against need frustration when practiced regularly. Future research is needed to understand how basic psychological needs can be intervened upon to promote well-being in at-risk individuals during emerging adulthood.

The current thesis is composed of a number of studies which contribute to our understanding of self-determination theory by using longitudinal models. Longitudinal methods and analyses allow researchers to examine change over time to better observe dynamic relations. This helps to further our understanding of self-determination theory, while integrating it with other theories on support, goals, personality, and emotions. The future directions listed suggest ideas inspired by these findings, but also studies that would need to be longitudinal to further understand this theory and how it predicts change, growth and flourishing over time.

Conclusion

The overarching goal of the current research program was to extend our understanding of how self-determination theory predicts psychological distress and well-being over time using longitudinal modelling. Across the research articles in this thesis, longitudinal design and statistical analyses were used to observe change over time from a self-determination theory perspective. This thesis highlights the role motivation, support, and need frustration have as

antecedents of flourishing and distress over time. Further, this research extends our understanding of self-determination theory, and each article provides a unique theory building set of findings.

First, article 1 disproves the myth that autonomy is a "me, myself, and I" form of motivation and in contrast suggests that collaboration may be the antecedent, and maintenance factor that helps autonomous motivation and support to flourish in emerging adulthood. Article 1 establishes the collaborative nature of autonomy by examining the dynamic reciprocal relations between autonomous motivation and autonomy support. Autonomy support has been found to lead to autonomous motivation across many contexts, but the reciprocal relation has not been examined. This first article suggests that autonomy flourishes as a collaborative experience because individuals higher in autonomous motivation perceive, seek out, or elicit more autonomy support from others. This suggests that those higher in autonomous motivation play an active role in their successful goal pursuit, and that they might do this by using their supporters. Article 1 asserts that individuals who whole-heartedly endorse their goals, while surrounding themselves with individuals who support their volition, will flourish through gains in motivation, support, progress, and positive affect.

Article 2 adds to our understanding of how autonomous motivation and support flourish in emerging adulthood by examining whether collaborative traits are an antecedent of this positive motivational process. Individuals higher in a broad array of collaborative personality and developmental factors (trait agreeableness, assisted autonomy striving, and secure parental attachment) experience growth in both autonomous motivation and perceived autonomy support during goal pursuit, and this ultimately facilitates greater goal progress and flourishing. Again, this second article broadens our understanding of what individual difference factors contribute to

successful goal pursuit, and further suggests that collaboration is key during the goal pursuit process. Articles 1 and 2 extend self-determination theory by proposing that collaboration is a central process in the flourishing of autonomy and provides evidence across multiple studies for its benefits.

Article 3 applies longitudinal research modelling to another mini theory within self-determination theory and implicates need frustration as a predictor of depressive symptoms across a typical academic year and at the start of the COVID-19 pandemic. Need frustration was the only consistent predictor of depressive symptoms and negative affect over the academic year, and during the COVID-19 pandemic, even when examining close others' reports. The present study supports the importance of psychological needs in ill-being and psychopathology and is the first to test this longitudinal relation over time while controlling for highly correlated variables-negative affect and depressive symptoms. Article 3 is a rigorous test of self-determination theory, and concludes with a parsimonious and theory congruent conclusion, that as self-determination theory posits, the frustration of one's basic psychological needs for autonomy, competence and relatedness is the antecedent of distress and psychopathology over time.

Across the series of articles presented in this thesis, the main concepts in self-determination theory are replicated when examined longitudinally, and further, when tested or compared over time. Theory congruent findings emerged which confirm the importance and applicability of this theory. Longitudinal modeling should be further applied within self-determination theory to test and extend this theory, and to observe whether these findings replicate or can be applied in interventions to help individuals flourish during goal pursuit, and buffer against psychological distress during periods of stress.

General References

Ainsworth, M. S. (1979). Infant–mother attachment. *American psychologist*, *34*(10), 932.

Andresen, E. M., Malmgren, J. A., Carter, W. B., & Patrick, D. L. (1994). Screening for depression in well older adults: Evaluation of a short form of the CES-D. *American Journal of Preventive Medicine*, *10*, 77–84. https://doi.org/10.1016/s0749-3797(18)30622-6

Bao, X. H., & Lam, S. F. (2008). Who makes the choice? Rethinking the role of autonomy and relatedness in Chinese children's motivation. *Child development*, *79*, 269-283.

Black, A. E., & Deci, E. L. (2000). The effects of instructors' autonomy support and students' autonomous motivation on learning organic chemistry: A self-determination theory perspective. *Science education*, *84*, 740-756.

Bowlby, J. (1988). Developmental psychiatry comes of age. *The American journal of psychiatry*.

Branje, S. J., van Lieshout, C. F., & van Aken, M. A. (2004). Relations between Big Five personality characteristics and perceived support in adolescents' families. *Journal of personality and social psychology*, *86*, 615.

Brennan, K. A., & Shaver, P. R. (1995). Dimensions of adult attachment, affect regulation, and romantic relationship functioning. *Personality and Social Psychology Bulletin*, *21*, 267-283.

Calear, A. L., & Christensen, H. (2010). Systematic review of school-based prevention and early intervention programs for depression. *Journal of Adolescence, 33*(3), 429-438. doi: 10.1016/j.adolescence.2009.07.004

Campbell, R., Boone, L., Vansteenkiste, M., & Soenens, B. (2018). Psychological need frustration as a transdiagnostic process in associations of self-critical perfectionism with

depressive symptoms and eating pathology. *Journal of Clinical Psychology, 74*, 1775–1790. https://doi.org/10.1002/jclp.22628

Cantarero, K., van Tilburg, W. A., & Smoktunowicz, E. (2020). Affirming basic psychological needs promotes mental well-being during the COVID-19 outbreak. *Social Psychological and Personality Science,* 1948550620942708.

Caplan, R. D. (1987). Person-environment fit theory and organizations: Commensurate dimensions, time perspectives, and mechanisms. *Journal of Vocational behavior, 31*, 248-267.

Chan, D. (2009). So why ask me? Are self-report data really that bad. *Statistical and methodological myths and urban legends: Doctrine, verity and fable in the organizational and social sciences*, 309-336.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., … Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion, 39*, 216–236. https://doi.org/10.1007/s11031-014-9450-1

Chen, L., Wang, L., Qiu, X. H., Yang, X. X., Qiao, Z. X., Yang, Y. J., & Liang,Y. (2013). Depression among Chinese University Students: Prevalence and Socio-Demographic Correlates. *PLoS ONE*, *8*, 1–6. https://doi.org/10.1371/journal.pone.0058379

Cheon, S. H., Reeve, J., & Song, Y. G. (2016). A teacher-focused intervention to decrease PE students' amotivation by increasing need satisfaction and decreasing need frustration. *Journal of Sport and Exercise Psychology*, *38*, 217–235. https://doi.org/10.1123/jsep.2015-0236

Collins, N. L., & Feeney, B. C. (2004). Working models of attachment shape perceptions of social support: evidence from experimental and observational studies. *Journal of personality and social psychology*, *87*(3), 363.

Collins, N. L., & Read, S. J. (1990). Adult attachment, working models, and relationship quality in dating couples. *Journal of personality and social psychology*, *58*, 644.

Cordeiro, P., Paixão, P., Lens, W., Lacante, M., & Sheldon, K. (2016). Factor structure and dimensionality of the balanced measure of psychological needs among Portuguese high school students. Relations to well-being and ill-being. *Learning and Individual Differences*, *47*, 51–60. https://doi.org/10.1016/j.lindif.2015.12.010

Costa, S., Cuzzocrea, F., Gugliandolo, M. C., & Larcan, R. (2015). Associations between parental psychological control and autonomy support, and psychological outcomes in adolescents: The mediating role of need satisfaction and need frustration. *Child Indicators Research*, *9*, 1059–1076. https://doi.org/10.1007/s12187-015-9353-z

Cullen, W., Gulati, G., & Kelly, B. D. (2020). Mental health in the COVID-19 pandemic. *QJM: An International Journal of Medicine*, *113*(5), 311-312. doi: 10.1093/qjmed/hcaa110

Diener, E., & Oishi, S. (2000). Money and happiness: Income and subjective well-being across nations. *Culture and subjective well-being*, 185-218.

Duchesne, S., & Larose, S. (2007). Adolescent Parental Attachment and Academic Motivation and Performance in Early Adolescence 1. *Journal of Applied Social Psychology*, *37*, 1501-1521.

Dunkley, D. M., Sanislow, C. A., Grilo, C. M., & McGlashan, T. H. (2006). Perfectionism and depressive symptoms 3 years later: Negative social interactions, avoidant coping, and perceived social support as mediators. *Comprehensive psychiatry*, *47*, 106-115.

Edmunds, J., Ntoumanis, N., & Duda, J. L. (2007). Adherence and well-being in overweight and obese patients referred to an exercise on prescription scheme: A self-determination theory perspective. *Psychology of Sport and Exercise*, *8*, 722-740. https://doi.org/10.1016/j.psychsport.2006.07.006

Elliot, A. J., & Reis, H. T. (2003). Attachment and exploration in adulthood. *Journal of personality and social psychology*, *85*, 317.

Emmons, R. A. (1992). Abstract versus concrete goals: personal striving level, physical illness, and psychological well-being. *Journal of personality and social psychology*, *62*, 292.

Evans, T. M., Bira, L., Gastelum, J. B., Weiss, L. T., & Vanderford, N. L. (2018). Evidence for a mental health crisis in graduate education. *Nature Biotechnology*, *36*, 282–284. https://doi.org/10.1038/nbt.4089

Feeney, B. C., & Collins, N. L. (2015). A new look at social support: A theoretical perspective on thriving through relationships. *Personality and Social Psychology Review*, *19*, 113-147.

Fitzsimons, G. M., & Finkel, E. J. (2018). Transactive-Goal-Dynamics Theory: A Discipline-Wide Perspective. *Current Directions in Psychological Science*, *27*, 332-338.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American psychologist*, *56*, 218

Gagne, M. (2003). Autonomy support and need satisfaction in the motivation and well-being of gymnasts. *Journal of applied sport psychology*, *15*, 372-390.

Gaudreau, P., Carraro, N., & Miranda, D. (2012). From goal motivation to goal progress: the mediating role of coping in the Self-Concordance Model. *Anxiety, Stress & Coping*, *25*, 507-528.

Girme, Y. U., Overall, N. C., & Hammond, M. D. (2019). Facilitating autonomy in interdependent relationships: Invisible support facilitates highly avoidant individuals' autonomy. *Journal of Family Psychology*, *33*, 154.

Gorin, A. A., Powers, T. A., Koestner, R., Wing, R. R., & Raynor, H. A. (2014). Autonomy support, self-regulation, and weight loss. *Health Psychology*, *33*, 332.

Grolnick, W. S., Raftery-Helmer, J. N., Marbell, K. N., Flamm, E. S., Cardemil, E. V., & Sanchez, M. (2014). Parental provision of structure: Implementation and correlates in three domains. *Merrill-Palmer Quarterly (1982-)*, *60*, 355-384.

Gunnell, K. E., Crocker, P. R. E., Wilson, P. M., Mack, D. E., & Zumbo, B. D. (2013). Psychological need satisfaction and thwarting: A test of basic psychological needs theory in physical activity contexts. *Psychology of Sport and Exercise, 14*, 599–607. https://doi.org/10.1016/j.psychsport.2013.03.007

Hart, J. W., Stasson, M. F., Mahoney, J. M., & Story, P. (2007). The Big Five and Achievement Motivation: Exploring the Relationship Between Personality and a Two-Factor Model of Motivation. *Individual Differences Research, 5*.

Holding, A. C., Hope, N. H., Harvey, B., Marion Jetten, A. S., & Koestner, R. (2017). Stuck in limbo: Motivational antecedents and consequences of experiencing action crises in personal goal pursuit. *Journal of Personality*, *85*, 893-905.

Holding, A., Hope, N., Verner-Filion, J., & Koestner, R. (2019). In good time: A longitudinal investigation of trait self-control in determining changes in motivation quality. *Personality and Individual Differences*, *139*, 132-137.

Jackson, A., Cavanagh, J., & Scott, J. (2003). A systematic review of manic and depressive prodromes. *Journal of Affective Disorders*, *74*, 209–217. https://doi.org/10.1016/S0165-0327(02)00266-5

Jensen-Campbell, L. A., Knack, J. M., & Gomez, H. L. (2010). The psychology of nice people. *Social and Personality Psychology Compass*, *4*, 1042-1056.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. *Handbook of personality: Theory and research*, *2*, 102-138.

Kafetsios, K., & Sideridis, G. D. (2006). Attachment, social support and well-being in young and older adults. *Journal of health psychology*, *11*, 863-875.

Kelly, R. E., Mansell, W., & Wood, A. M. (2015). Goal conflict and well-being: A review and hierarchical model of goal conflict, ambivalence, self-discrepancy and self-concordance. *Personality and Individual Differences*, *85*, 212-229.

Ketchen Lipson, S., Gaddis, S. M., Heinze, J., Beck, K., & Eisenberg, D. (2015). Variations in student mental health and treatment utilization across US colleges and universities. *Journal of American College Health*, *63*, 388–396. https://doi.org/10.1080/07448481.2015.1040411

Koestner, R., Powers, T. A., Holding, A., Hope, N., & Milyavskaya, M. (2020). The relation of parental support of emerging adults' goals to well-being over time: The mediating roles of goal progress and autonomy need satisfaction. *Motivation Science*.

Koestner, R., Lekes, N., Powers, T. A., & Chicoine, E. (2002). Attaining personal goals: self-concordance plus implementation intentions equals success. *Journal of personality and social psychology*, *83*, 231.

Koestner, R., Otis, N., Powers, T. A., Pelletier, L., & Gagnon, H. (2008). Autonomous motivation, controlled motivation, and goal progress. *Journal of personality*, *76*, 1201-1230.

Koestner, R., Powers, T. A., Carbonneau, N., Milyavskaya, M., & Chua, S. N. (2012). Distinguishing autonomous and directive forms of goal support: Their effects on goal progress, relationship quality, and subjective well-being. *Personality and Social Psychology Bulletin*, *38*, 1609-1620.

Koestner, R., Ryan, R. M., Bernieri, F., & Holt, K. (1984). Setting limits on children's behavior: The differential effects of controlling vs. informational styles on intrinsic motivation and creativity. *Journal of personality*, *52*, 233-248.

Krieger, L. S. (2002). Institutional denial about the dark side of law school, and fresh empirical guidance for constructively breaking the silence. *Journal of Legal Education*, *52*, 112–129.

Lei, M. K., & Klopack, E. T. (2020). Social and psychological consequences of the COVID-19 outbreak: The experiences of Taiwan and Hong Kong. *Psychological trauma: theory, research, practice, and policy*, *12*(S1), S35. doi: 10.1037/tra0000633

Legault, L., Ray, K., Hudgins, A., Pelosi, M., & Shannon, W. (2017). Assisted versus asserted autonomy satisfaction: Their unique associations with wellbeing, integration of experience, and conflict negotiation. *Motivation and Emotion*, *41*, 1-21.

Levine, S. L., Cherrier, S., Holding, A. C., & Koestner, R. (2020). For the love of reading:

Recreational reading reduces psychological distress in college students and autonomous motivation is the key. *Journal of American College Health*, 1-7. doi: 10.1080/07448481.2020.1728280

Levine, S. L., Holding, A. C., Milyavskaya, M., Powers, T. & Koestner, R. (2020). Collaborative autonomy: The dynamic relations between personal goal autonomy and perceived autonomy support in emerging adulthood results in positive affect and goal progress. *Motivation Science.* https://doi.org/10.31234/osf.io/jr32c

Levine, S. L., Milyavskaya, M., & Zuroff, D. C. (2020). Perfectionism in the transition to university: Comparing diathesis-stress and downward spiral models of depressive symptoms. *Clinical Psychological Science*, *8*, 52-64. https://doi.org/10.1177/2167702619865966

Levine, S. L., Tabri, N., & Milyavskaya, M. (2021). Trajectories of depression and anxiety symptoms over time in the transition to university: Their co-occurrence and the role of self-critical perfectionism.*Development & Psychopathology.* doi: 10.31234/osf.io/zxg8h

McAdams, D. P. (2015). *The art and science of personality development*. Guilford Publications.

Milyavskaya, M., Inzlicht, M., Hope, N., & Koestner, R. (2015). Saying “no” to temptation: Want-to motivation improves self-regulation by reducing temptation rather than by increasing self-control. *Journal of Personality and Social Psychology*, *109*, 677.

Milyavskaya, M., Nadolny, D., & Koestner, R. (2014). Where do self-concordant goals come from? The role of domain-specific psychological need satisfaction. *Personality and Social Psychology Bulletin, 40,* 700-711.

Milyavskaya, M., & Koestner, R. (2011). Psychological needs, motivation, and well-being: A test of self-determination theory across multiple domains. *Personality and individual differences*, *50*, 387-391.

Moreau, E., & Mageau, G. A. (2012). The importance of perceived autonomy support for the psychological health and work satisfaction of health professionals: Not only supervisors count, colleagues too! *Motivation and Emotion*, *36*, 268-286.

Munezero, M., Montero, C. S., Sutinen, E., & Pajunen, J. (2014). Are they different? affect, feeling, emotion, sentiment, and opinion detection in text. *IEEE Transactions on Affective Computing*, *5*, 101–111. https://doi.org/10.1109/TAFFC.2014.2317187

Muthén, L. K., & Muthén, B. O. (2015). Mplus user's guide (1998–2015). *Muthén & Muthén: Los Angeles, CA*.

Nima, A. Al, Rosenberg, P., Archer, T., & Garcia, D. (2013). Anxiety, affect, self-esteem, and stress: Mediation and moderation effects on depression. *PLoS ONE*, *8*. https://doi.org/10.1371/journal.pone.0073265

Nishimura, T., & Suzuki, T. (2016). Basic psychological need satisfaction and frustration in Japan: Controlling for the big five personality traits. *Japanese Psychological Research*, *58*, 320–331. https://doi.org/10.1111/jpr.12131

Patall, E. A., Steingut, R. R., Vasquez, A. C., Trimble, S. S., Pituch, K. A., & Freeman, J. L. (2018). Daily autonomy supporting or thwarting and students' motivation and engagement in the high school science classroom. *Journal of Educational Psychology*, *110*, 269.

Pfefferbaum, B., & North, C. S. (2020). Mental health and the Covid-19 pandemic. *New England*

Journal of Medicine, *383*(6), 510-512. doi: 10.1056/NEJMp2008017

Porter, S. (2018). A Descriptive Study of Post-Secondary Student Mental Health Crises. *College Quarterly*, *21*.

Raes, F., Smets, J., Nelis, S., & Schoofs, H. (2012). Dampening of positive affect prospectively predicts depressive symptoms in non-clinical samples. *Cognition and Emotion*, *26*, 75–82. https://doi.org/10.1080/02699931.2011.555474

Reisz, Z., Boudreaux, M. J., & Ozer, D. J. (2013). Personality traits and the prediction of personal goals. *Personality and Individual Differences*, *55*, 699-704.

Riemann, R., Angleitner, A., & Strelau, J. (1997). Genetic and environmental influences on personality: A study of twins reared together using the self-and peer report NEO-FFI scales. *Journal of Personality*, *65*(3), 449-475.

Roberts, B. W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. *Handbook of personality: Theory and research*, *3*, 375-398.

Roohafza, H., Feizi, A., Afshar, H., Mazaheri, M., Behnamfar, O., Hassanzadeh-Keshteli, A., & Adibi, P. (2016). Path analysis of relationship among personality, perceived stress, coping, social support, and psychological outcomes. *World journal of psychiatry*, *6*, 248.

Rosenthal, B. S., & Schreiner, A. C. (2000). Prevalence of psychological symptoms among undergraduate students in an ethnically diverse urban public college. *Journal of the American College Health Association*, *49*, 12–18. https://doi.org/10.1080/07448480009596277

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist*, *55*, 68.

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness*. Guilford Publications.

Salmela-Aro, K. (2010). Personal goals and well-being: How do young people navigate their lives? *New directions for child and adolescent development*, *2010*, 13-26.

Selig, J. P., & Little, T. D. (2012). Autoregressive and cross-lagged panel analysis for longitudinal data. In B. Laursen, T. D. Little, & N. A. Card (Eds.), *Handbook of developmental research methods* (pp. 265–278). The Guilford Press.

Shulman, S., & Nurmi, J. E. (2010). Understanding emerging adulthood from a goal-setting perspective. *New directions for child and adolescent development*, *2010*, 1-11.

Schultz, P. P., Ryan, R. M., Niemiec, C. P., Legate, N., & Williams, G. C. (2015). Mindfulness, work climate, and psychological need satisfaction in employee well-being. *Mindfulness*, *6*, 971–985. https://doi.org/10.1007/s12671-014-0338-7

Sheldon, K. M. (2014). Becoming oneself: The central role of self-concordant goal selection. *Personality and Social Psychology Review*, *18*, 349-365.

Sheldon, K. M., & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: the self-concordance model. *Journal of personality and social psychology*, *76*, 482.

Sheldon, K. M., & Gunz, A. (2009). Psychological needs as basic motives, not just experiential requirements. *Journal of Personality*, *77*, 1467–1492. https://doi.org/10.1111/j.1467-6494.2009.00589.x

Sheldon, K. M., & Hilpert, J. C. (2012). The balanced measure of psychological needs (BMPN) scale: An alternative domain general measure of need satisfaction. *Motivation and Emotion*,

36, 439–451. https://doi.org/10.1007/s11031-012-9279

Sheldon, K. M., & Houser-Marko, L. (2001). Self-concordance, goal attainment, and the pursuit of happiness: Can there be an upward spiral? *Journal of personality and social psychology*, *80*, 152.

Sheldon, K. M., & Kasser, T. (1998). Pursuing personal goals: Skills enable progress, but not all progress is beneficial. *Personality and social psychology bulletin*, *24*, 1319-1331.

Sheldon, K. M., & Krieger, L. S. (2007). Understanding the negative effects of legal education on law students: A longitudinal test of self-determination theory. *Personality and Social Psychology Bulletin*, *33*, 883–897. https://doi.org/10.1177/0146167207301014

Sieber, V., Flückiger, L., Mata, J., Bernecker, K., & Job, V. (2019). Autonomous goal striving promotes a nonlimited theory about willpower. *Personality and Social Psychology Bulletin*, 0146167218820921.

Smith, A., Ntoumanis, N., & Duda, J. (2007). Goal striving, goal attainment, and well-being: Adapting and testing the self-concordance model in sport. *Journal of Sport and Exercise Psychology*, *29*, 763-782.

Soenens, B., & Vansteenkiste, M. (2005). Antecedents and outcomes of self-determination in 3 life domains: The role of parents' and teachers' autonomy support. *Journal of Youth and Adolescence*, *34*, 589-604.

Song, Y., Huang, Y., Liu, D., Kwan, J. S. H., Zhang, F., Sham, P. C., & Tang, S. W. (2008). Depression in college: Depressive symptoms and personality factors in Beijing and Hong Kong college freshmen. *Comprehensive Psychiatry*, *49*, 496–502. https://doi.org/10.1016/j.comppsych.2008.02.005

Steiger, H., Sansfaçon, J., Thaler, L., Leonard, N., Cottier, D., Kahan, E., ... & Gauvin, L. (2017). Autonomy support and autonomous motivation in the outpatient treatment of adults with an eating disorder. *International Journal of Eating Disorders*, *50*, 1058-1066.

Storrie, K., Ahern, K., & Tuckett, A. (2010). A systematic review: Students with mental health problems-A growing problem. *International Journal of Nursing Practice*, *16*, 1–6. https://doi.org/10.1111/j.1440-172X.2009.01813.x

Su, Y. L., & Reeve, J. (2011). A meta-analysis of the effectiveness of intervention programs designed to support autonomy. *Educational Psychology Review*, *23*, 159-188.

Swickert, R. J., Hittner, J. B., & Foster, A. (2010). Big Five traits interact to predict perceived social support. *Personality and Individual Differences*, *48*, 736-741.

Teixeira, P. J., Marques, M. M., Silva, M. N., Brunet, J., Duda, J., Haerens, L., & Hagger, M. S. (2019). Classification of techniques used in self-determination theory-based interventions in health contexts: An expert consensus study. *PsyArXiv, doi: https://doi. org/10.31234/osf. io/z9wqu*.

Trivedi, M. H. (2004). The link between depression and physical symptoms. *Primary Care Companion to the Journal of Clinical Psychiatry*, *6*, 12–16.

Vansteenkiste, M., & Ryan, R. M. (2013). On psychological growth and vulnerability: Basic psychological need satisfaction and need frustration as a unifying principle. *Journal of Psychotherapy Integration*, *23*, 263–280. https://doi.org/10.1037/a0032359

Vansteenkiste, M., Ryan, R.M. & Soenens, B. Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation & Emotion* 44, 1–31 (2020). https://doi.org/10.1007/s11031-019-09818-1

Vansteenkiste, M., Sierens, E., Goossens, L., Soenens, B., Dochy, F., Mouratidis, A., ... & Beyers, W. (2012). Identifying configurations of perceived teacher autonomy support and structure: Associations with self-regulated learning, motivation and problem behavior. *Learning and instruction*, *22*, 431-439.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: the synergistic effects of intrinsic goal contents and autonomy-supportive contexts. *Journal of personality and social psychology*, *87*, 246.

Vermote, B., Waterschoot, J., Morbée, S., Van der Kaap-Deeder, J., Schrooyen, C., Soenens, B., Ryan, R., & Vansteenkiste, M. (2021). Do psychological needs play a role in times of uncertainty? Associations with well-being during the COVID-19 crisis. *Journal of happiness studies*, 1–27. https://doi.org/10.1007/s10902-021-00398-x

Watson, D., & Clark, L. A. (1995). Depression and the melancholic temperament. *European Journal of Personality*, *9*, 351–366. https://doi.org/10.1002/per.2410090505

Watson, D., Clark, L. A., & Carey, G. (1988). Positive and negative affectivity and their relation to anxiety and depressive disorders. *Journal of Abnormal Psychology*, *97*, 346–353. https://doi.org/10.1037/0021-843X.97.3.346

Wells, V. E., Klerman, G. L., & Deykin, E. Y. (1987). The prevalence of depressive symptoms in college students. *Social Psychiatry*, *22*, 20–28. https://doi.org/10.1007/BF00583616

Werner, K. M., Milyavskaya, M., Foxen-Craft, E., & Koestner, R. (2016). Some goals just feel easier: Self-concordance leads to goal progress through subjective ease, not effort. *Personality and Individual Differences*, *96*, 237-242.

Werner-Seidler, A., Banks, R., Dunn, B. D., & Moulds, M. L. (2013). An investigation of the

relationship between positive affect regulation and depression. *Behaviour Research and Therapy*, *51*, 46–56. https://doi.org/10.1016/j.brat.2012.11.001

Zivin, K., Eisenberg, D., Gollust, S. E., & Golberstein, E. (2009). Persistence of mental health problems and needs in a college student population. *Journal of Affective Disorders*, *117*, 180–185. https://doi.org/10.1016/j.jad.2009.01.001

Zumbo, B. D. (1999). The simple difference score as an inherently poor measure of change: Some reality, much mythology. *Advances in social science methodology*, *5*, 269-304.