THE ROLE OF HARDINESS AND AUTONOMY SUPPORT IN COLLEGE

STUDENT ENGAGEMENT

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Abstract

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The gap between college student enrollment and graduation rates remains a problem for college students and administrators. Literature on persistence in college suggests that factors such as hardiness and autonomy support may contribute to student perseverance through degree attainment. The current study focused on these constructs using a framework based on self-determination theory (SDT; Ryan & Deci, 1985). Factors related to student persistence, namely hardiness and autonomy support, were expected to positively predict college student engagement. Furthermore, hardiness was expected to moderate the relationship between autonomy support and college student engagement. College students from a university and a community college (N = 184) participated in a survey on their perceptions, attitudes, beliefs, behaviors, and experiences related to the college environment. Hypotheses were tested using a hierarchical multiple regression model. Both autonomy support and hardiness positively predicted college student engagement, but the interaction effect of hardiness was nonsignificant. These results inform the literature on SDT, the validity of hardiness, and are applicable to programs and interventions aimed at improving college students’ persistence in academic goal pursuit.
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Introduction

Improving college student retention and graduation rates has long been a goal for college administrators (see Barefoot, 2004; Cvetkovski et al., 2018; Glenn et al., 1990; Noble et al., 2007; Wilder, 1983). Between 2000 and 2007, the number of students enrolling in 2- and 4-year degree-granting institutions in the United States (U.S.) grew by 27% and growth is expected to continue with 17.2 million students predicted by 2028 (U.S. Department of Education, 2019). Since 2000, this trend in enrollment has been especially strong for ethnically and racially diverse students who are enrolling at the highest rates, especially at 2-year institutions (U.S. Department of Education, 2019). Yet, when compared to enrollment rates, graduation within the recommended time frame (i.e., within 6-years of enrollment) remains relatively inflexible and worryingly low for educational institutions, particularly those with less selective criteria that welcome a wider range of students (U.S. Department of Education, 2019). Nearly 40% of students who enrolled in a 4-year university in 2011 did not obtain a degree within 6-years of enrollment (U.S. Department of Education, 2019). This problem becomes magnified when considering the benefits individuals derive from obtaining a college degree.

Post-secondary education has become more important for those who want to be considered competitive in the U.S. job market and earn a more substantial wage. Having a bachelor’s degree relates to less unemployment and higher median weekly income (U.S. Department of Labor, 2019a). In a review of economic data from the last four decades, those with an associate degree made 21% more than those with a high school
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diploma; those with a bachelor’s degree made 56% more (Abel & Deitz, 2014). These statistics indicate that there is a clear economic advantage to having a college degree.

Even with the positive economic forecast for those who obtained a college degree, there are concerns related to the rising costs of college and the relative value of a college education (Taylor et al., 2011). The amount of outstanding debt of families accounted for by student loans has more than doubled since 2001 (Taylor et al., 2011). Despite increasing student debt, a pair of surveys on attitudes regarding the value of a college education reported that 86% of graduates believed that their college degree was a good investment (Taylor et al., 2011). Additionally, individuals’ reasons for pursuing a college degree are not limited to better occupational outlook. Although most first-year students cited improving their occupational outlook as their primary reason for obtaining a degree, adults who had graduated perceived benefits of having a degree as multi-faceted, emphasizing the development of new career skills, personal satisfaction, and increased independence, among others (see Mischler, 1983; Van Etten et al., 1998). These results suggest that while individuals’ reasons for pursuing a college degree vary according to immediate and future goals, pursuing a degree to better one’s self or one’s situation remains a priority for many. Unfortunately, when compared to enrollment rates, retention and graduation rates indicate that a substantial portion of students that enroll dropout before graduation (U.S. Department of Education, 2019a).

Despite the long history of research and numerous interventions addressing college retention, improving the retention of college students through attainment of a college degree remains a problem for both institutions and students, emphasizing the need for
additional research. Along these lines, the current study examines how factors that have been connected to student persistence (e.g., experiences of stress; coping; autonomy) relate to college student engagement. This line of inquiry can potentially add to the base of knowledge on the attitudes, beliefs, attributions, and behaviors that may promote or hinder college students’ persistence. Addressing the issue of retention through graduation in college students requires an understanding of why college students drop out, why they persist, and what factors are influential in supporting or thwarting students’ motivation and persistence in achieving their academic goals.

**Theories and Constructs in College Students’ Attrition and Persistence**

Several models have addressed college student retention and dropout from an integration and adjustment perspective, suggesting that personal background and attributes (e.g., socioeconomic status, sex, race/ethnicity), environmental characteristics (e.g., course offerings, faculty), and institutional experiences (e.g., interpersonal relationships with peers) are interactive factors in student persistence and drop-out decisions (e.g., Astin, 1975; Milem & Berger, 1997; Tinto, 1975). The most well-known is Tinto’s (1975) model of college withdrawal, which proposes a pathway between individuals’ characteristics and background through their academic and social experiences, which directly and indirectly influence later commitment to and persistence in meeting social and academic goals (Kingston, 2008; Mckinney et al., 2019; Tinto, 1975). In Tinto’s (1975) model, academic integration and social integration are emphasized as critical areas of adjustment necessary for students’ successful integration
into college. Academic integration, or attachment to academic life in college, includes both formal (e.g., studying, maintaining a certain GPA) and informal (e.g., perceived relationships with instructors, the nature of interactions with instructors) experiences. Similarly, social integration, or the creation of relationships beyond the classroom, can include formal (e.g., discussing assignments or learning objectives with peers) and informal (e.g., nonacademic social contact and interaction with peers) experiences (Severiens & Schmidt, 2009). The degree to which students’ academically and socially integrate and adjust to their new physical and sociocultural contexts predict their persistence through graduation (Tinto, 1975). Interactions between individual characteristics and perceptions of the environment contribute to students’ integration in both domains, summarily, academic and social integration form a pathway through which individual and environmental factors may influence students’ persistence in meeting their academic and social goals (Aldridge & Rowley, 2010; Pascarella & Chapman, 1983; Tinto, 1975). The literature on the model of college withdrawal indicates good predictive validity across institution type, but some studies have demonstrated that the salience of academic and social integration vary by institution type (Pascarella & Chapman, 1983; Peng & Fetters, 1978). For instance, academic integration predicted higher persistence for students enrolled in 4-year universities while social integration was more predictive of persistence in students enrolled in 2-year community colleges (Pascarella & Chapman, 1983). While this suggests that forms of integration may vary along with students’ salient
goals and institution type, both social and academic integration could be necessary components for students’ successful adjustment to college life.

Subsequent studies have combined these distinct domains into a singular conceptualization of student integration, including students’ academic performance, intellectual development, peer and faculty interactions, and commitments to their goals and the institution (Pascarella & Terenzini, 1980). Under this conceptualization, student integration has been found to predict higher grade point average, greater learning, higher overall satisfaction and persistence in college (Berger & Milem, 1999; Goegan & Daniels, 2019). These relationships have been particularly strong for first-generation students and students of color who tend to report less and lower quality involvement and integration in college and have higher rates of dropout (Bers & Smith, 1991; Hicks & Woods, 2015; Roth, 2017).

A similar theory which addresses student retention through behavioral measures is Astin’s (1975) theory of involvement, which predicts that students who are academically involved will persist in their educational goals, while those who are uninvolved may not. Student involvement, or the amount, breadth, and quality of effort that students put into accessing and engaging with college resources and opportunities, has been described as occurring along a continuum, with students investing varying degrees of physical or psychological energy across varying objects and times (e.g., joining a student club, tutoring; Astin, 1984). This involvement has been found to be facilitated through interactions with college faculty, staff, and peers (Berger & Milem, 1999). High quality and quantity of student involvement has been associated with greater persistence,
learning, development, personal growth, purpose in life, and more positive relationships with others (Astin, 1984; Kuh et al., 2008). In a longitudinal study on college students’ persistence, involvement was associated with persistence, with the inverse relationship found for student dropout (Friedlander & Macdougall, 1992). Furthermore, greater student involvement has predicted greater integration into the college environment (Berger & Milem, 1999).

Researchers have suggested that Tinto’s (1975) model of college withdrawal and Astin’s (1975) theory of involvement are quite similar (Milem & Berger, 1997; Terenzini & Pascarella, 1998). Both theories connect student behaviors and perceived involvement with learning and persistence, however Tinto (1975) focuses on perceptual measures and Astin (1975) on behavioral measures (Milem & Berger, 1997). To integrate these theories, Milem and Berger (1997) proposed a modified model of persistence where student involvement behaviors and their perceptions of the college environment influence persistence and drop-out from college. A study of undergraduate students from a highly selective private university found longitudinal support for a significant, positive pathway between student entry characteristics (e.g., sex, race/ethnicity, political ideology, academic orientation) and decisions to drop-out through involvement behaviors (e.g., participating in extracurricular activities) and perceptions of the institution (e.g., university support, peer support) (Milem & Berger, 1997). Milem and Berger’s (1997) modified model of persistence emphasizes interactions between behaviors, perceptions, and environmental supports, and how these influence college students’ commitment, involvement, and integration in college settings. Based on this perspective, individuals’
characteristics, background, and institutional experiences are important influences in meeting their higher education goals.

Several measures have built upon these early operationalizations of student involvement and integration, reconceptualizing these into constructs measuring student engagement, or the active participation of students in academic and social activities in their respective educational contexts (e.g., Martin, 2009; Nora et al., 1996; Waldrop et al., 2019). Across more contemporary conceptualizations, student engagement has been operationalized to include cognitive (e.g., goal setting, value placed on learning), affective (e.g., interpersonal relationships), and behavioral domains (e.g., attendance, work completion) (Martin, 2009; Nora et al., 1996; Waldrop et al., 2019). What can be gleaned from comparing these more contemporary measures with those of Tinto (1975), Astin (1975), and Milem and Berger (1997) is that, while conceptually distinct, each seeks to capture a similar construct: college students’ beliefs, attitudes, and behaviors that indicate their active participation in their educational context. A possible framework for examining the negotiation between individual characteristics and perceptions, and the construct of student engagement is found in motivational literature and theory.

**Motivation and Self-Determination Theory**

Motivation is defined as an internal experience that influences an individual to act or behave in a certain way (Reeve et al., 2004). There are many theories of motivation that seek to explain factors in human behavior across a wide range of developmental stages and environmental contexts (see Adams, 1965; Bandura, 1982; Heckhausen et al.,
These theories vary on a range of emphasis in their proximal to distal contiguity of individuals’ goals, as well as varying in describing motivation as a function of internalized individual factors interacting with external environmental factors. A particularly intriguing theory of motivation which has integrated internalized and externalized processes in pursuing both proximal and distal goals is self-determination theory (SDT; Ryan & Deci, 1985).

SDT is an organismic theory of human behavior that describes a continuum from extrinsic (i.e., pressures to act that are controlled by sources outside of one’s own interest and desire) to intrinsic (i.e., pressures to act based upon one’s own legitimate interests and desires) motivation (Ryan & Deci, 2017). Individuals are motivated to fulfill three basic psychological needs: autonomy, competence, and relatedness. Factors that support an individual’s fulfillment of these needs are associated with more intrinsic perceptions of motivation, whereas factors that thwart the fulfillment of these needs are associated with more extrinsic perceptions of motivation (Ryan & Deci, 1985; 2017). Along the continuum of extrinsic to intrinsic motivation (see Figure 1), there are hierarchical levels that describe differing motivational and regulatory styles as they relate to the perceived origin of pressure to act (i.e., locus of causality): non-regulation, external, introjected, identified, internalized, and intrinsic regulation (Ryan & Deci, 2017; Vansteenkiste et al., 2004).

Regulatory styles differ in how individuals experience and prescribe loci of causality, their reasons for acting, as well as the range of attitudes, beliefs, and behaviors that are produced in response to motivating stimuli (Ryan & Deci, 2017). On the far left
of the SDT continuum, nonregulation, or a lack of intention to act, is associated with amotivation, apathy, fear, avoidance, resistance and oppositional behavior (Ryan & Deci, 2000, p.72).

**Figure 1**

*The Self-determination Continuum Showing Types of Motivation with Their Regulatory Styles, Loci of Causality, and Corresponding Processes (Ryan & Deci, 2000, p.72)*
External and introjected regulation are perceived as external to the individual and experienced as an action that one must engage in, rather than an action the individual wants engage in (Ryan & Deci, 2017; Vansteenkiste et al., 2004). These forms of regulation motivate behavior through external and internal rewards and punishments and are associated with feelings of tension, anxiety, and guilt as well as low self-esteem and low persistence (Ryan & Deci, 2017; Vansteenkiste, 2004).

Identified and internalized regulation, while extrinsically oriented to the individual, are experienced as internal in that they are useful or valuable to the individual’s legitimate interests (Ryan & Deci, 2017; Vansteenkiste, 2004). Intrinsic regulation is experienced as truly internal to the individual; action is based on one’s legitimate interests and desires without the need for reward or coercion (Ryan & Deci, 2017; Vansteenkiste, 2004).

Intrinsic, as well as identified and internalized regulation, are positively associated with volition, energy, persistence, deep learning, enhanced performance, and gratification (Ryan & Deci, 2017; Vansteenkiste, 2004). Thus, according to SDT, interactions between environmental factors and individuals’ beliefs and attributions (in relation to their goals) influence the choice of, intensity, and persistence in behaviors that lead to fulfillment of their psychological needs. As a theory, SDT has been widely applied and validated. An international cohort of SDT researchers have examined and supported SDT in samples from Europe, Canada, the U.S., Israel, Korea, Japan, Singapore, Ghana, and South Africa (Marbell & Grolnick, 2012; Ryan & Deci, 2017; Van Dyk, 2015).

SDT has been supported in various domains of self-regulation and self-control, including domain specific performance (e.g., academic, occupational, physical), social
development, and overall wellbeing (e.g., satisfaction with life; Gagne & Deci, 2005; Niemiec & Ryan, 2009; Ryan & Deci, 2000; Werner & Milyavskaya, 2018). Furthermore, SDT has been examined and supported in a variety of contexts, including academic, occupational, sports and physical activity, psychotherapeutic and behavioral interventions, health care, and even virtual environments (Ryan & Deci, 2000). The generalizability of SDT across domains, contexts, and populations emphasizes its usefulness as a theoretical framework. Consequently, SDT is proposed as the theoretical framework for examining motivational factors, such as autonomy support, as they relate to development.

**Autonomy and Autonomy Support**

Development of autonomous functioning has long been considered a critical step for individuals’ psychosocial development, starting with autonomous exploration away from parents as a predictor of secure attachment in childhood and positive developmental outcomes in later life stages (Bowlby, 1988; Erikson, 1968; Sroufe, 2002). In SDT, autonomy is derived from experiences and behaviors that are viewed as self-regulated, self-endorsed, and aligned with individuals’ genuine values and interests (Ryan & Deci, 2017). Thus, behaviors and attitudes that are encountered via interpersonal interactions can be autonomy supportive if they are perceived as promoting self-regulated choices and motivations (Reeve, 2009; Ryan & Deci, 2017).

It is important to note that autonomy does not have a prioritized position when compared to the related basic psychological needs of relatedness and competence (Ryan & Deci, 2017). Indeed, the simultaneous satisfaction of all three basic psychological
needs is critical for optimized motivation and wellbeing (Ryan & Deci, 2017). Given that these constructs are distinct, yet related, contexts that support autonomy may also support individuals’ relatedness and competence needs as well; for example, autonomy supportive contexts promote overall basic psychological need satisfaction even when accounting for the unique support of individuals’ autonomy (Ryan & Deci, 2017; Vansteenkiste, 2004). As such, autonomy support, while emphasizing perceptions of control over environmental factors, is conceptualized as supporting the overall satisfaction of basic psychological needs.

In young adults, autonomy support has been positively associated with self-regulated learning, deep information processing, persistence in setting and meeting goals, higher academic performance and wellbeing, and less anxiety in undergraduates (Kins et al., 2009; Kunst et al., 2019; Pelletier et al., 2001; Young, 2004). Within the academic domain, autonomy support promotes intrinsic motivation which, in turn, enhances student learning, adjustment, and performance on academic tasks (Niemac & Ryan, 2009). Thus, autonomy support is a crucial factor in the internalization and the pursuit of educational goals and academic performance.

Of course, there are limitations in the provision of autonomy support, especially within environments where the needs of a group (e.g., organization, class) may compete with the satisfaction of basic psychological needs of an individual. SDT holds that truly autonomous regulation is very specific, and that many actions are instead regulated externally, and thus, extrinsically (Ryan & Deci, 2017). In conditions where autonomy support may not be salient, or perhaps, is absent altogether, SDT predicts that motivation
will be perceived as external or introjected, potentially leading to tension, anxiety, and experiences of strain and stress on the individual (Ryan & Deci, 2017; Taylor, 2003; Vansteenkiste, 2004). These experiences of stress may have wide-ranging negative effects on individuals’ motivation and subsequent behaviors that affect student engagement in college settings.

**Perceived Stress in College Students**

Stress varies in how it is perceived and interpreted across individuals; some find stress challenging and motivating while others find stress aversive and engage in avoidant styles of coping (Folkman & Lazarus, 1984; Robotham, 2008). Diathesis stress theory suggests that experiences of stress can be explained through biological, psychological, emotional or genetic vulnerabilities that interact with stressful events (Ingram & Luxton, 2005; Monroe & Simons, 1991). As such, stress can be a highly individualized experience and while an environmental event may serve as the stimulus for experiencing stress, the relationship is mediated by the individuals’ perception and interpretation of the event as stressful (Ross et al., 1999). Within college student populations, diathesis stress models have been used to predict college adjustment based on experiences of stress interacting with perfectionist attitudes and rumination in producing psychological distress and social dysfunction (Chang & Rand, 2000; Morrison & Conner, 2005).

Transactional models of stress appraisal suggest that interpretations of stress and subsequent coping strategies and behaviors include several distinct, yet simultaneously occurring, processes (Folkman & Lazarus, 1984). In primary appraisal, stressors are
perceived and interpreted as a threat, a challenge, and evaluated for the potential for harm. Simultaneously, secondary appraisal assesses personal resources that may be available in coping with the perceived stressor and both the stressor and ability to cope are reappraised. Through this, coping styles and strategies are selected and enacted, leading to specific coping behaviors (e.g., adaptive versus avoidant, active versus passive) that manifest as performance under stress and strain (Folkman & Lazarus, 1984).

College students face numerous stressors in their transition to and engagement in college life (Fisher, 2004). In a review of stress in college students, student stressors were broadly categorized into four areas: studying and exams, finances, integration into university life, and acculturative pressures (Robotham, 2008). Within these dimensions, academic factors (e.g., workload, perceived academic ability) have been identified as a greater generator of stress than physical, social, or emotional factors (Bedewy & Gabriel, 2013). Across behavioral, emotional, cognitive, and physiological domains, stress in college students has been associated with negative situational appraisals; unplanned weight gain and loss; substance use; increased guilt, anxiety and depressive symptoms; lower levels of self-esteem; and poorer academic performance (Broman, 2005; Hudd et al., 2000; Rawson et al., 1994). Furthermore, disproportionate experiences of stress are experienced by students of color, first-generation college students, and female students, emphasizing additional challenges and contributing factors magnified by the college experience (Alvin et al., 1996; Brougham et al., 2009; Rayle & Chung, 2007). For example, Latinx students’ stress and college adjustment was related to a loss of social support related to separation from home and family (Solberg et al., 1994).
Summarily, stress, particularly stress attributed to academic factors, may contribute to poor academic outcomes for college students; this effect could be compounded for nontraditional college students. What then, drives some individuals to persist despite experiences of stress? Ryan and Deci (2017) contend that, in line with SDT, personality traits and social contexts influence the perception of motivation as either external and controlling (i.e., introjected) or controlling yet internal (i.e., identified and internalized). One such trait-based construct that links persistence and experiences of stress is hardiness.

**Hardiness and Persistence Under Stress**

Resiliency literature suggests that individual characteristics, familial influences, and social environments play a role in the development of resilience (Luthar et al., 2000). As an individual characteristic, hardiness has been described as a pathway to resilience and as the courage to engage in resilient behavior (Maddi, 2016). As such, hardiness is often construed as a trait-based quality which promotes wellbeing in response to stress (Maddi et al., 2006). However, hardiness is not limited to those who are born as “hardy” individuals; hardiness has been successfully trained in individuals across age groups and life domains (Maddi, 1996). This suggests that hardy attitudes and beliefs can be both a predictor and an outcome of adaptive coping with stress. From a developmental perspective, hardiness can be thought of as rooted in individual differences (e.g., genetic
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and physical variations in neural pathways that regulate stress responses) which interact with environmental stress in ways that manifest as cognitive and behavioral outcomes.

Based in existential theory and humanistic psychology, hardiness is a constellation of attitudes and beliefs that provide courage and persistence, buffering individuals’ experiences of stress and promoting resiliency and growth in the face of adversity (Kobasa, 1979; Maddi & Kobasa, 1984). Three main aspects of hardiness have been described: commitment, or dedication to being involved with people and events in the environment; control, or a sense of agency in personal trajectory; and challenge, or acceptance that stress and adversity are a part of existential life and provide opportunities for growth and development (Maddi, 1999; Maddi et al., 2006). These three “C’s” of hardiness are commonly operationalized in order to quantitatively examine hardiness (Maddi, 2004).

Over decades of research, hardiness has been extensively examined in a variety of contexts and related outcomes. Generally, high hardiness has been positively associated with active coping strategies (e.g., seeking information or social support), problem solving behavior (e.g., critical thinking), and reinterpretation of challenging situations, while low hardiness has been positively associated with avoidance, denial, and disengagement (Baumgartner, 2002). Hardiness is positively associated with SAT scores and class rank in high school and negatively associated with alcohol and drug use during high school and afterwards (Lifton et al., 2000; Maddi et al., 1996). In college undergraduates, hardiness has been negatively associated with hostility, depression, anxiety, repressive coping styles, and physiological signs of strain and positively
associated with academic self-efficacy, creative expression, overall adaptiveness, innovative functioning, and organization (Maddi, 1999; Maddi et al., 2006; 2009b; Viola et al, 2016). Among graduate students, hardiness is associated with commitment and academic performance as measured by GPA and dissertation completion (Sheard & Golby, 2007). In a sample of U.S. Military Academy undergraduate cadets, hardiness predicted retention and performance through the first year and beyond (Maddi et al., 2014). Together, these results suggest that hardiness is expressed momentarily in person-environment interactions (e.g., being assigned a task with an imminent due date) which predispose individuals’ active and transformational coping in confronting and thriving in stressful situations (e.g., interpretation of the event as an opportunity for growth, rather than a threat to escape from or avoid; Maddi, 1999). Summarily, hardiness represents a possible pathway to resilience for college students who may experience disruptive levels of stress in transitioning to college and in pursuing their educational goals. As such, hardiness and its interaction with autonomy support on college student engagement are of primary interest in the current study.

The Current Study

Given the numerous economic, social, and development benefits that students derive from obtaining an advanced degree, additional research into college students’ persistence to graduate is not only warranted, but necessary. The purpose of the current study is to further examine influential constructs on college students’ motivation and persistence in order to add to the literature on college student persistence. Using an SDT
framework, the current study will examine hardiness and autonomy support in college student engagement at a public university and a community college.

In the literature, many studies address college students’ motivation and persistence through students’ academic and social involvement, integration, or engagement. Separate studies have investigated autonomy support and hardiness with respect to college student outcomes such as persistence and goal attainment. Yet, there is a lack of research that explicitly examines these constructs in an integrated model, including the corresponding interaction between constructs, despite evidence for significant, independent relationships between hardiness and autonomy support on a number of outcomes related to college student engagement. This provokes several research questions of interest to the current study. Taken together, do autonomy support and hardiness predict beliefs, behaviors, and attitudes indicative of student engagement in college? Do hardy individuals have a differing need for autonomy support than their less-hardy counterparts when predicting engagement behaviors? Based upon these questions and the literature on these constructs, the current study proposes a regression model in which hardiness, autonomy support, and the interaction of these variables predict college student engagement.

**Hardiness Autonomy Support, and College Student Engagement**

Hardiness and autonomy support have been independently associated with a variety of outcomes in college students, including persistence, academic self-efficacy, and internalized motivation (Maddi et al., 2009b; Niemac & Ryan, 2009; Sheard &
Golby, 2007; Viola et al., 2016). Student involvement and engagement in college has been positively associated with greater persistence, learning, and personal growth; additionally, it has been found to predict integration into college, indirectly predicting higher grade point average, greater learning, higher overall satisfaction, and persistence in college (Astin, 1984; Berger & Milem, 1999; Broman, 2005; Goegan & Daniels, 2019; Kuh et al., 2008; Martin, 2009). While student engagement is perpetuated across multiple domains, all of which are closely related, cognitive and affective factors are expected to precede behavioral changes in engagement (Waldrop et al., 2019). Subsequently, the current study focuses on the measurement of cognitive and affective factors in college student engagement. The beliefs, attitudes, and perceptions that have been operationalized in hardiness and autonomy support measures, respectively, are expected to predict the affective and cognitive (and indirectly, behavioral) aspects encapsulated in college student engagement. As such, the current study expects to find significant main
effects for hardiness and autonomy support in a prediction model; a significant interaction between these predictors on college student engagement is expected as well.

**Hypothesized Main Effects of Predictors on College Student Engagement**

The current study hypothesizes that, when taken together in a hierarchical regression model: hardiness will positively predict college student engagement (H$_1$) and autonomy support will positively predict college student engagement (H$_2$).

**Hypothesized Interaction Between Predictors on College Student Engagement**

Hardiness will moderate the relationship between autonomy support and student engagement, significantly contributing to the explained variance above that explained by the unique contributions of the predictor variables within the theoretical model (H$_3$). Hardiness is expected to buffer individuals’ experiences of stress when support of individual autonomy is low, promoting student engagement. High-hardy individuals are expected to report significantly greater student engagement when autonomy support is low than their low-hardy counterparts (H$_{3a}$). As autonomy support rises, both high- and low-hardy individuals are expected to report an increase in student engagement (H$_{3b}$). Additionally, college student engagement is expected to be highest when both hardiness and autonomy support are high (H$_{4c}$) and lowest when both autonomy support and hardiness are low (H$_{4d}$).

Finally, academic (e.g., institutional commitment), demographic (e.g., race/ethnicity), and perceived sources of stress (e.g., academic, general, COVID-related)
will be tested as covariates to control for additional expected variance on college student engagement.
Method

Design

The current study used a cross-sectional survey design with data collected through an online questionnaire including both close-ended and open-ended questions. Approval to conduct research using human subjects was granted by the Humboldt State University Institutional Review Board on September 14th, 2020 (IRB #: IRB 20-021).

Participants

Participants included 184 undergraduate and graduate college students from Humboldt State University (HSU), a public university in Arcata, California and from College of the Redwoods (CR), a community college in Eureka, California. Participants were selected from both sites to capture students at different stages of educational goal pursuit. A demographic breakdown of categorical variables (e.g., gender, sexual orientation, race/ethnicity) can be found in Table 1. In order to participate in the study, students were required to be at least 18 years of age, able to give informed consent, pursuing a post-secondary degree (e.g., A.A., B.A., etc.), and enrolled at their respective campus for at least one semester.

An overwhelming majority of the sample attended a 4-year university rather than a community college, received financial aid, lived off campus, reported a strong desire to graduate from their current institution, and attended classes in a fully online format due to
campus closures in response to the COVID-19 pandemic. Proportionally, Junior and Senior class standing was most common, with small proportions of 1st year, 2nd year, and graduate students. Institutional commitment was originally measured at four levels, however, participants only reported institutional commitment at two levels: the majority of the sample reported graduation from their current institution as very important, with the remaining participants reporting graduation from their current institution as moderately important. Regional data were collected; the majority of students who participated in the study lived in California while several reported living in other states or countries, respectively.

**Measures**

*Demographic Covariates*

Age, gender, sexual orientation, race/ethnicity, parents’ highest education level, average work hours per week, living situation, financial aid status, and current location (region) were measured. Age was reported in years. Participants indicated their gender as either female, male, or non-binary/non-conforming, and not listed (please specify); sexual orientation as asexual, bisexual, gay or lesbian, heterosexual/straight, pansexual, queer, or or not listed (please specify); race/ethnicity as Asian/Asian American, Black/African-American, Hispanic/Latinx, Native American/indigenous, Native Hawaiian or Other Pacific Islander, White/European-American (EA), and not listed (please specify). Due to low participant numbers and issues with multicollinearity, participant race and ethnicity was dichotomized into White/EA students and students of color for hypothesis testing.
Table 1

Demographic Breakdown of Student Groups Across Categorical Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>133</td>
<td>72.3%</td>
</tr>
<tr>
<td>Male</td>
<td>42</td>
<td>22.8%</td>
</tr>
<tr>
<td>Non-conforming</td>
<td>8</td>
<td>4.3%</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asexual</td>
<td>6</td>
<td>3.3%</td>
</tr>
<tr>
<td>Bisexual</td>
<td>43</td>
<td>23.4%</td>
</tr>
<tr>
<td>Gay/Lesbian</td>
<td>7</td>
<td>3.8%</td>
</tr>
<tr>
<td>Heterosexual/Straight</td>
<td>112</td>
<td>60.9%</td>
</tr>
<tr>
<td>Pansexual</td>
<td>6</td>
<td>3.3%</td>
</tr>
<tr>
<td>Queer</td>
<td>6</td>
<td>3.3%</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Students of Color a</td>
<td>90</td>
<td>48.9%</td>
</tr>
<tr>
<td>White/EA Students</td>
<td>94</td>
<td>51.1%</td>
</tr>
<tr>
<td>Institution Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community College</td>
<td>45</td>
<td>24.5%</td>
</tr>
<tr>
<td>University</td>
<td>139</td>
<td>75.5%</td>
</tr>
<tr>
<td>Ins. Commitment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Important</td>
<td>167</td>
<td>90.8%</td>
</tr>
<tr>
<td>Mod. Important</td>
<td>17</td>
<td>9.2%</td>
</tr>
<tr>
<td>Class Standing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshperson/1st Year</td>
<td>21</td>
<td>11.4%</td>
</tr>
<tr>
<td>Sophomore/2nd Year</td>
<td>44</td>
<td>23.9%</td>
</tr>
<tr>
<td>Junior</td>
<td>85</td>
<td>31.5%</td>
</tr>
<tr>
<td>Senior</td>
<td>52</td>
<td>28.3%</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>9</td>
<td>4.9%</td>
</tr>
<tr>
<td>Current Living Situation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On Campus</td>
<td>14</td>
<td>7.6%</td>
</tr>
<tr>
<td>Off Campus</td>
<td>170</td>
<td>92.4%</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>California</td>
<td>179</td>
<td>97.3%</td>
</tr>
<tr>
<td>Other State</td>
<td>3</td>
<td>1.6%</td>
</tr>
<tr>
<td>Other Country</td>
<td>2</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

Note: a Students of color included 50% Hispanic/Latinx, 27% multiethnic/racial, 11% Black/African-American, 8% Native American/Indigenous, 3% Asian/Asian-American, 1% Native Pacific Islander.
Parents’ highest education level through two items, father’s education level and mother’s education level on a scale of 1 (*elementary or junior high school*) to 7 (*professional or graduate degree*). A composite score was created by retaining the highest education level associated with either the participants’ mother or father while the dyads’ lower education level score was dropped; this variable was then treated as interval/ratio for the purposes of the current study. Average work hours per week was measured as an open response; current living situation as either on-campus or off-campus; financial aid status as yes (*I am receiving financial aid*) and no (*I am not receiving financial aid*), and region by reporting their current country, state, and city. Following data collection, region was factored into three levels: California, other state, and other country.

**Academic Covariates**

Institution type, class standing, course load, institutional commitment, educational aspirations, current class format; and current cumulative college GPA were measured. Participants indicated their institution type as either community college student or university student; class standing as either freshperson, sophomore, junior, senior, or graduate student; course load as the number of semester unit hours currently enrolled in on a sliding scale from 0 to 25; institutional commitment with a single item asking the importance of graduating from their present institution on a scale from 1 (*not at all important*) to 4 (*very important*); educational aspirations as how far do you think you will go in school on a scale from 1 (*attend college but not graduate*) to 4 (*complete an advanced or professional degree beyond college graduation*). Educational aspirations
was treated as an interval variable during data analysis; current class format as fully online, partially online/partially in-person, or fully in-person; and cumulative college GPA on a scale from 0.00 to 4.00.

**Perceived Stress**

Perceived stress refers to the degree to which, in the last month, one’s life is perceived as uncontrollable, unpredictable, and overloading. Perceived stress was measured using the 10-item Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988) (e.g., *Found that you could not cope with all the things that you had to do?*) on a scale from 0 (*never*) to 6 (*strongly agree*) (See Appendix A). Four items were reverse coded and all items were averaged to give an average score of perceived stress. The PSS-10 has shown good internal reliability with a Cronbach alpha of .89 reported in a college student sample (Roberti et al., 2006). This measure demonstrated good reliability in the current study, $\alpha = .86$.

**Perceived Academic Stress**

Perceived academic stress refers to physiological and psychological strain generated as individuals strive to meet their academic goals in higher education contexts, including individuals’ academic self-perceptions about their academic abilities, performance, workload, and time constraints. Academic perceived stress was measured using the 18-item Perceptions of Academic Stress scale (PAS; Bedewy & Gabriel, 2015) (e.g., *The competition with my peers for grades is quite intense*) on a scale from 1 (*strongly agree*) to 5 (*strongly disagree*) (Bedewy & Gabriel, 2015; see Appendix B).
Five items were reverse coded and all items will be averaged so that scores indicate overall perception of academic perceived stress. The PAS has demonstrated acceptable construct validity and internal reliability with a Cronbach’s alpha of .70 being reported in a sample of undergraduate students (Bedewy & Gabriel, 2015). This scale demonstrated good reliability in the current study, $\alpha = .84$.

**COVID-Related Stress**

COVID-related stress refers to fears, anxieties and behaviors that are related to the COVID-19 pandemic. COVID-related stress was measured using the 12-items from the COVID Stress Scale (CSS; Taylor et al., 2020) (e.g., *I am worried about catching the virus*) on a scale from 0 (*not at all worried*) to 5 (*extremely worried*) (see Appendix C). All items were summed to give an overall score for COVID-related stress. The CSS showed good internal consistency in a North-American samples, with Cronbach’s alphas ranging from .83 to .95 (Taylor et al., 2020). This measure demonstrated excellent reliability in the current study, $\alpha = .95$.

**Hardiness**

Hardiness is a set of beliefs and attitudes that promote persistence and motivation in situations of stress. The 18-item Personality Views Survey III-R (PVS III-R) was used to measure the three components of hardiness: commitment (e.g., *By working hard, you can always achieve your goal*), control (e.g., *When I make plans, I’m certain I can make them work*), and challenge (e.g., *I often wake up eager to take up life wherever it left off*) on a scale from 0 (*not true*) to 3 (*very true*) (Maddi, et al., 2006; see Appendix D). As the
PVS III-R is a proprietary scale, overall scores and scores for commitment, control, and challenge subscales, as well as reliability, were computed by a third party. The PVS III-R has demonstrated adequate internal consistency in college students, with Cronbach’s alpha ranging from .71 to .80 across studies (Maddi et al., 2006; 2009; 2012). This measure demonstrated good reliability in the current study, α = .81.

**Institutional Autonomy Support**

Autonomy support refers to interpersonally transmitted beliefs and attitudes that promote individuals’ self-determined and self-regulated choices and motivation. Autonomy support in college was measured using and adapted version of the 15-item Learning Climate Questionnaire (LCQ) on a 7-point Likert Scale (e.g., *I feel that my instructor provides me choices and options*) (Williams & Deci, 1996; for the adapted version, see Appendix E). The LCQ is designed to be adapted to specific instructional situations; as such, items were modified to encompass perceptions of autonomy support related to the institution or institutional practices by pluralizing “instructor” to “instructors” and adjusting verbs to be grammatically correct in all cases (e.g., *I feel that my instructors offer me choices and options*). A single item was reverse coded and all scores averaged, with lower scores indicating less support and higher scores indicating greater support. Cronbach’s alphas for the LCQ have been reported as ranging from .93 to .96 across learning situations (Black & Deci, 2000; Williams & Deci, 1996). This scale had excellent reliability in the current study, α = .94.
College Student Engagement

College student engagement is the active cognitive, affective, and behavioral participation in learning, academic, and social opportunities at college. College student engagement was measured using the 33-item Student Engagement Inventory-College (SEI-C) (e.g., After finishing my schoolwork I check it over to see if it’s correct.) on a 4-point Likert type scale from 1 (strongly disagree) to 4 (strongly agree) (Waldrop et al., 2019; see Appendix F). The SEI-C measures five factors of cognitive and affective engagement: control and relevance of school work; future aspirations and goals; teacher-student relationships; peer support for learning; and family support for learning (Waldrop et al., 2019). Appropriate items were reverse coded and all items will be averaged to create an average score for college student engagement where higher scores indicate greater student engagement. Examination of the construct validity of the SEI-C has shown adequate to good internal reliability, with Cronbach’s alphas ranging from .82 to .91, as well as evidence of convergent and discriminant validity (Grier-Reed et al., 2012; Waldrop et al., 2019). This measure had excellent reliability in the current study, $\alpha = .92$.

Procedure

An online survey was created using Qualtrics and took participants approximately 30-minutes to complete. Prior to the study beginning, informed consent forms (see Appendix G) were provided to participants as a separate information sheet in which the purpose and procedure of the study was disclosed. Two options were available at the end of the form as checkboxes: “Yes, I am 18-years of age or older and I agree to participate
in this study” and “No, I do not want to participate in this study.” Written informed consent was obtained by the participant clicking the box agreeing to participate in the study. This included explicit notice that the participant may stop the study at any time without reprisals from the university or researcher. Any participants who declined to participate or retracted their willingness to participate at any point were immediately redirected to the end of the survey and thanked for their time.

Multiple forms of participant recruitment were used. Surveys completed by HSU students were collected through voluntary participation in student research through the Psychology Department Research Pool via SONA Systems and snowball sampling. Through SONA, students taking Psychology courses signed up for time slots to take the survey online on the personal device and follow an external link to Qualtrics where they could then complete the survey.

Students in Psychology courses at HSU who registered to participate in the study via SONA may have received credit in a course of their choosing for participating in the study. Any opportunity for students to receive extra credit, either through SONA or outside of SONA, was self-selected by instructors. Additionally, instructors may have advertised the study either in class or through the course online interactive platform, Canvas, without offering extra credit to students. Any form of compensation that was offered for participation was explicitly stated in course syllabi, flyers advertising the study, verbal advertisement by instructors, and informed consent forms. In many cases, no compensation was offered for participation in the study.
Instructors from both HSU and CR were contacted to advertise the study. Initial contact with instructors was made through an email detailing the purpose, procedure, and expected time commitment of the study, along with a notice of IRB approval and contact information for the researcher and principal investigator (see Appendix H). Secondary emails were sent to any instructors who did not respond within two weeks. Follow up emails were sent to instructors who did respond providing any additional requested information. HSU students unable to participate through SONA and CR students were given contact information (e.g., the email address of the researcher) where they could request a link to the survey.

Finally, upon finishing the survey, participants were asked to refer eligible students to take part in the study. After completion of the survey, an online debriefing (see Appendix I) was presented to offer resources and information pending any adverse experiences and to request that those who participated in the study refrain from discussing the study with any individuals who might still participate.
Results

Preliminary Analyses

All data manipulations and statistical analyses were completed using R Statistical Software and RStudio (RStudio Team, 2015). The data were visually inspected for missingness and errors. Multiple imputation was performed using the Amelia package (Honaker et al., 2011) in R. Multiple imputation has been suggested as a preferred method for handling missing data over other methods (e.g., listwise deletion, mean imputation) as a way to preserve sample size while returning accurate results for all types of missing data (Aberson, personal communication, 2020). A total of 20 iterations of the data were generated, inspected for convergence of estimates and pooled for further analysis.

Inspection of Continuous Variables

Continuous variables and potential covariates were screened using descriptive univariate statistics and scatterplots to inspect for potential outliers. Additionally, 99% confidence intervals were calculated around skew and kurtosis values to assess for normality of each variable.

Descriptive statistics for continuous variables can be found in Table 2. College student engagement, autonomy support, hardiness, cumulative GPA, perceived stress, perceived academic stress, and COVID-related stress distributions were relatively normal, with nonsignificant values of skew and kurtosis. Given the population from
which the sample was derived (i.e., community college and university students) positive skew was expected. Five participants who reported an age beyond the third standard deviation from the mean (49.52 years of age) were removed as outliers prior to further analysis.

Average weekly work hours was slightly negatively skewed (-1.00) with a high standard error (1.18). Visual inspection of a scatterplot of the data showed several potential outliers; these values were recoded to be equivalent with the third standard deviation from the mean (50 average hours per week) in order to preserve participant numbers. This improved the normality of the variable but the standard error remained high (1.11).

Educational aspirations was negatively skewed (-1.93) and leptokurtic (3.42). Square root, log, and inverse transformation of the variable did not yield a more normal distribution and the untransformed variable was included for further analyses. Parents’ highest level of education was negatively skewed (-1.20). Square root, log, and inverse transformations did not improve the normality of the distribution and the untransformed variable was included for further analyses.

**Zero-Order Correlations**

Zero-order correlations for continuous variables can be found in Table 1. Participants’ age had a weak, positive relationship with average weekly work hours and a weak, negative relationship with current course load (semester units). Current course load had a weak, positive relationship with perceived stress (both general and academic). Cumulative college GPA had a weak, negative relationship with perceived stress.
### Table 2

*Univariate Statistics and Zero-Order Pearson’s Correlations for Continuous Study Variables*

<table>
<thead>
<tr>
<th>Variables</th>
<th>M(SD)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
<td>23.56(6.17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Parents Highest Ed. Level</td>
<td>5.05(1.76)</td>
<td>-.03</td>
<td>-.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Average Work Hours</td>
<td>16.08(16.35)</td>
<td>.24**</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Course Load (Units)</td>
<td>13.21(3.54)</td>
<td>-.42**</td>
<td>-.03</td>
<td>.17*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Educational Aspirations</td>
<td>3.60(0.59)</td>
<td>-.00</td>
<td>.07</td>
<td>.13</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cumulative GPA</td>
<td>3.31(0.50)</td>
<td>.05</td>
<td>.05</td>
<td>-.05</td>
<td>-.12</td>
<td>.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Perceived Stress</td>
<td>3.14(0.64)</td>
<td>-.11</td>
<td>.07</td>
<td>-.02</td>
<td>.15*</td>
<td>.13</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Perceived Aca. Stress</td>
<td>2.93(0.58)</td>
<td>-.12</td>
<td>-.03</td>
<td>.06</td>
<td>.17*</td>
<td>.01</td>
<td>-.15*</td>
<td>.52**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. COVID-Related Stress</td>
<td>1.86(0.97)</td>
<td>-.08</td>
<td>-.03</td>
<td>.05</td>
<td>.11</td>
<td>.05</td>
<td>.02</td>
<td>.37**</td>
<td>.35**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Autonomy Support</td>
<td>5.32(1.05)</td>
<td>-.00</td>
<td>.05</td>
<td>-.04</td>
<td>.01</td>
<td>.01</td>
<td>-.02</td>
<td>-.18*</td>
<td>-.40**</td>
<td>.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Hardiness</td>
<td>32.80(7.60)</td>
<td>.18*</td>
<td>-.16*</td>
<td>.13</td>
<td>-.02</td>
<td>-.03</td>
<td>.02</td>
<td>-.66**</td>
<td>-.53**</td>
<td>-.22**</td>
<td>.27**</td>
<td></td>
</tr>
<tr>
<td>12. Student Engagement</td>
<td>3.11(0.36)</td>
<td>.08</td>
<td>-.04</td>
<td>-.10</td>
<td>.01</td>
<td>.07</td>
<td>-.02</td>
<td>-.26**</td>
<td>-.40**</td>
<td>.04</td>
<td>.66**</td>
<td>.38**</td>
</tr>
</tbody>
</table>

*Note.* *p* < .05, **p* < .01.
Perceived stress had a strong, positive relationship with perceived academic stress and a moderate, positive relationship with COVID-related stress. Perceived academic stress also had a moderate, positive relationship with COVID-related stress. College student engagement had a strong, positive relationship with perceived autonomy support; a moderate positive relationship with hardiness; a weak, negative relationship with perceived stress (general); and a moderate, negative relationship with perceived academic stress. Perceived autonomy support had a weak, positive relationship with hardiness; a weak, negative relationship with perceived stress; and a moderate, negative relationship with perceived academic stress. Finally, hardiness had a weak, positive relationship with age; a strong, negative relationship with perceived stress (both general and academic-related); and a weak, negative relationship with COVID-related stress.

**Group Differences on Student Engagement, Autonomy Support, Hardiness, and Stress Covariates**

One-way analysis of variance (ANOVA) was used to test categorical variables for group differences on the study’s criterion, predictors, and stress covariates. The assumption of homogeneity of variance was tested for all models and a Welch test was used to adjust for heterogeneity of variance for appropriate models. Tukey tests were used to make pairwise comparisons for all models with three or more levels in which significant differences were indicated.

Group means and standard deviations for categorical variables and ANOVA results can be found in Table 3. There were significant differences in hardiness, perceived stress,
Table 3

Group Means, Standard Deviations, and Comparisons for Categorical Variables Across Criterion, Predictor, and Stress Covariates

<table>
<thead>
<tr>
<th>Variable</th>
<th>Student Engagement</th>
<th>Autonomy Support</th>
<th>Hardiness</th>
<th>Perceived Stress</th>
<th>Perceived Academic Stress</th>
<th>COVID-Related Stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>3.09(0.37)</td>
<td>5.24(1.06)</td>
<td>32.70(7.33)a</td>
<td>3.19(0.62)a</td>
<td>3.01(0.58)a</td>
<td>23.44(11.45)a</td>
</tr>
<tr>
<td>Male</td>
<td>3.15(0.35)</td>
<td>5.53(0.99)</td>
<td>34.31(8.06)a</td>
<td>2.89(0.64)b</td>
<td>2.70(0.49)b</td>
<td>17.38(10.85)b</td>
</tr>
<tr>
<td>Non-conforming</td>
<td>3.13(0.32)</td>
<td>5.54(1.14)</td>
<td>25.75(6.23)b</td>
<td>3.60(0.43)a</td>
<td>2.93(0.82)a,b</td>
<td>28.63(13.06)a</td>
</tr>
<tr>
<td>η²</td>
<td>.004</td>
<td>.02</td>
<td>.05</td>
<td></td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>F</td>
<td>0.21</td>
<td>1.04</td>
<td>3.27*</td>
<td>4.06**</td>
<td>3.06*</td>
<td>3.89*</td>
</tr>
<tr>
<td>Sexual Orientation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asexual</td>
<td>3.07(0.26)</td>
<td>5.22(1.36)</td>
<td>29.50(5.01)a,b</td>
<td>3.03(0.59)a,b</td>
<td>2.94(0.53)</td>
<td>16.33(9.40)a,b</td>
</tr>
<tr>
<td>Bisexual</td>
<td>3.03(0.34)</td>
<td>5.16(0.92)</td>
<td>29.23(5.38)a</td>
<td>3.47(0.50)a</td>
<td>3.03(0.58)</td>
<td>24.19(10.91)a</td>
</tr>
<tr>
<td>Gay/Lesbian</td>
<td>3.18(0.32)</td>
<td>5.48(1.04)</td>
<td>28.00(8.06)a,b</td>
<td>3.46(0.36)a,b</td>
<td>3.18(0.27)</td>
<td>28.57(9.88)a,b</td>
</tr>
<tr>
<td>Heterosexual/Straight</td>
<td>3.13(0.38)</td>
<td>5.38(1.06)</td>
<td>34.76(7.65)b</td>
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### Variables and Engagements

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<th>Perceived Stress</th>
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<th>COVID-Related Stress</th>
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*Note: Group means with different subscripts (e.g., a or b) differ from other levels of that variable at $\alpha = .05$. *$p < .05$, **$p < .01$, ***$p < .001$.}
perceived academic stress, and COVID-related stress based on participants’ gender. On average, nonbinary/nonconforming participants scored significantly lower than male ($p = .01$) and female participants ($p = .03$) on hardiness. Male participants reported significantly lower average perceived stress than nonbinary/nonconforming participants ($p = .01$) and female participants ($p = .04$) and significantly lower average perceived academic stress than female participants ($p = .01$), and significantly lower average COVID-related stress than both female ($p = .02$) and nonbinary/nonconforming participants ($p = .04$).

Significant differences were also found on hardiness, perceived stress, and COVID-related stress based on participants’ sexual orientation. On average, heterosexual/straight participants scored significantly higher on hardiness ($p < .001$) and reported significantly less perceived stress ($p < .001$) and COVID-related stress ($p < .001$) than bisexual participants. Students of color also reported significantly higher COVID-related stress than White/European American students ($p < .001$). Students who attended a university reported significantly higher perceived stress ($p = .02$) and perceived academic stress ($p = .006$) than students who attended a community college. Participants with high institutional commitment reported greater student engagement ($p = .003$) and autonomy support ($p = .01$) than participants with moderate institutional commitment. There were no significant group differences in student engagement, autonomy support, hardiness, perceived stress, perceived academic stress, or COVID-related academic stress, or COVID-related stress based upon participants’ class standing, financial aid status, living situation, or region.
Main Analyses

A three-step hierarchical multiple regression was conducted to test the hypothesized pathways of autonomy support, hardiness, and the interaction of autonomy support and hardiness on college student engagement. All continuous predictors and covariates were centered prior to analysis. Categorical variables with three levels or greater were dummy coded and tested in the regression models. Potential covariates were identified and selected for inclusion in the regression models prior to analysis and tested systematically for inclusion in the final models. The final regression model was tested to determine whether the assumptions for regression were met. To reduce chances of a Type I error, a Bonferroni adjusted $p$-value ($p < .016$) was used as the threshold for significance when interpreting results from the final regression model.

Identification and Selection of Covariates

Potential demographic, academic, and COVID-related covariates were selected based upon theoretical and empirically-supported relationships with college student engagement, autonomy support, and hardiness. In order to increase statistical power for the final regression model, several criteria were used in selecting control variables and covariates: theoretical and empirical support in the literature, significant zero-order correlation with the models’ predictor or criterion variables, and finally, significant prediction of the criterion variable in the final model. Students’ age, gender, race/ethnicity, parents’ highest education level (as a proxy measure for SES), cumulative college GPA, and institutional commitment were included as control variables based on
theoretical and empirical support. Perceived stress, perceived academic stress, and COVID-related stress were included based upon theoretical support as well as significant zero-order correlations with college student engagement, autonomy support, and hardiness, despite not significantly predicting college student engagement in the final regression model. Participants’ sexual orientation was included as a covariate in initial tests of the model, but due to persistent issues of multicollinearity, this variable was dropped as a control variable from the final model. Finally, students’ institution type, class standing, financial aid status, current living situation, region, current course load, and educational aspirations were systematically tested for significant contribution to the model fit (i.e., $R^2$ change) and significant prediction of college student engagement in the final regression model. Average weekly work hours was a significant predictor of college student engagement and was included in the final regression model, while the remaining variables were not included based upon nonsignificant contribution to the final model fit or prediction of the criterion variable.

Testing Assumptions for Regression

Beyond inspecting individual variables, the assumptions of normality, linearity, homoscedasticity, and lack of multicollinearity were tested for the final regression model. Normality, linearity, and homoscedasticity were assessed by visually inspecting the residuals of the final model in a residuals-versus-fitted values plot, normal Q-Q plot, scale-versus-location plot, and residuals-versus-leverage plot. Visual inspection showed that the final model met the assumptions of normality and linearity. The residuals
appeared slightly heteroscedastic and were tested using the Breusch-Pagan test. Results of the Breusch-Pagan test supported the rejection of the hypothesis of heteroscedasticity ($BP = .94, p = .33$); the assumption of homoscedasticity was met.

Variable inflation factor (VIF) and tolerance values were calculated for all variables included in the final model to test for multicollinearity. VIF values did not indicate problematic multicollinearity. When testing tolerance limits, perceived stress, perceived academic stress, and hardiness all had relatively low tolerance values. However, these values were greater than tolerance values that would indicate problematic multicollinearity (i.e., tolerance less than .20; Aberson, personal communication, 2020), supporting that the assumption of the absence of multicollinearity was met. Lastly, multivariate outliers were identified by calculating Mahalanobis distances of each data point in the final regression model and testing these values for significance. Three cases were identified that exceeded a Mahal distance of 34.53 (the limit for significance for multivariate outliers at $p < .001$) and were removed prior to hypothesis testing.

**Power Analyses**

An *a priori* power analysis was performed (using GPower v3.1.9.4; Faul et al., 2009) for the proposed model using a Bonferroni correction to adjust for testing three hypotheses. When accounting for a conservative effect size ($f^2 = .08$), a sample size of 164 was suggested to test all hypotheses at $\alpha = .016$ and with a power level of at least
A post hoc power analysis suggested that the current study was underpowered in detecting effects smaller than $f^2 = .08$.

**Testing the Main Effect of Hardiness**

Results of the final regression model with multivariate outlier cases included and with multivariate outlier cases removed are presented for comparison and can be seen in Table 4. As hypothesized, hardiness positively predicted college student engagement (H$_1$). Higher hardiness predicted greater college student engagement while lower hardiness predicted poorer college student engagement. Furthermore, hardiness improved the fit of the model and uniquely contributed about 2% ($sr^2 = .02, p = .007$) of the explained variance in college student engagement.

**Testing the Main Effect of Autonomy Support**

As hypothesized, autonomy support positively predicted college student engagement (H$_2$). Higher perceived autonomy support predicted greater college student engagement while lower perceived autonomy support positively predicted college student engagement (H$_2$). Autonomy support also improved the fit of the model and uniquely contributed about 20% of the explained variance in college student engagement ($sr^2 = .20, p < .001$).

**Testing the Interaction of Hardiness and Autonomy Support**

Hardiness was expected to moderate the relationship between autonomy support and student engagement, significantly contributing to the explained variance above that explained by the unique contributions of hardiness and autonomy support (H$_3$). However,
**Table 4**

*Hierarchical Regression of Autonomy Support, Hardiness and Demographic, Academic, and Stress Covariates on College Student Engagement*

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<th>Variables</th>
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<th>b* w/ multivariate outliers removed</th>
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*Note.* Standardized betas reported. Bonferroni adjusted threshold for significance is $p < .016$. * Race/ethnicity variable was dichotomized as 0 (students of color) and 1 (White/European American students). * $p < .016$, ** $p < .01$, *** $p < .001$. 

*a* Race/ethnicity variable was dichotomized as 0 (students of color) and 1 (White/European American students). * $p < .016$, ** $p < .01$, *** $p < .001$. 


the interaction of hardiness and autonomy support did not predict college student engagement nor did it significantly contribute to the explained variance of college student engagement.

**Exploratory Analyses**

A *post hoc* exploratory analysis of the data was conducted following interpretation of the results of the multiple regression analyses. The main research question driving this analysis was whether hardiness was actually an internal mechanism that explained the relationship between autonomy support and student engagement, rather than a moderator. In order to examine this question, a mediation model in which hardiness mediates the relationship between autonomy support and student engagement was tested.

A bootstrapped mediation analysis was completed using the lavaan package (Rosseel, 2012) in R-Studio. Age, gender, race/ethnicity, SES, institutional commitment, average weekly work hours, perceived stress, perceived academic stress, and COVID-related stress were included as control variables in the model.

Results of the mediation analysis can be found in Figure 2. The results of this analysis did not provide support for hardiness as a mediator in the relationship between autonomy support and student engagement. Greater autonomy support predicted higher hardiness and greater student engagement. Higher hardiness predicted greater student engagement as well. However, hardiness did not mediate the autonomy support-student engagement relationship.
Figure 2

*Post Hoc Exploratory Model of College Student Engagement Predicted by Autonomy Support and Mediated by Hardiness*

![Diagram showing the relationship between Hardiness, Autonomy Support, and Student Engagement.](image-url)
Discussion

College students’ perceived autonomy support and hardiness were expected to predict beliefs, attitudes, and behaviors indicative of college student engagement (e.g., success in forming positive relationships with peers and professors). The results of this study supported these predictions. College students who reported greater perceived autonomy support from their instructors also reported greater engagement when compared to students who reported lower perceived autonomy support. Likewise, college students who reported higher hardiness also reported greater engagement when compared with their low-hardy counterparts. These relationships persisted even after controlling for various demographic and academic variables (i.e., students’ age, gender, race/ethnicity, socioeconomic status, average weekly work hours, and institutional commitment). Despite evidence for each predictor variable independently, there was no difference in the relationship between autonomy support and college student engagement when comparing more-hardy and less-hardy students.

Relations of Findings to the Literature

These results converge with findings from the literature on autonomy support, hardiness, and student engagement, respectively. In SDT, support of individuals’ basic psychological needs (i.e., autonomy, relatedness, competence) promotes students’ self-determined motivation in goal pursuit (Deci & Ryan, 2017). Similarly, greater student engagement across both social and academic domains has been theorized as promoting
HARDINESS, AUTONOMY SUPPORT, AND STUDENT ENGAGEMENT

more positive academic and social outcomes for students (Milem & Berger, 1997). Several studies have demonstrated that student outcomes (e.g., academic performance, deep-processing of information, persistence in meeting goals), which are positively predicted by students’ autonomy support, are similarly predicted by college students’ social and academic engagement (see Astin, 1984; Kins et al., 2009; Kuh et al., 2008; Pelletier et al., 2001). Furthermore, students’ autonomy support has been found to directly and positively predict student engagement in academics, sports, and prosocial behaviors (Álvarez, 2001; Gagné, 2003; Jang et al., 2010). In the current study, results regarding autonomy support aligned with these findings. Of the variables included in the final regression model, autonomy support was the strongest predictor. Summarily, these results extend support for SDT and further validate findings in which autonomy support predicts domain-specific student engagement, even during the switch to online learning due to the COVID-19 pandemic.

At a theoretical level, hardiness supports students’ engagement through appraisals and interpretation of stress and stressors as a challenge to overcome and an opportunity for personal growth, rather than as adverse stimuli to escape from or avoid (Maddi, 2004; 2016). There is a dearth of research on direct relationships between hardiness and college student engagement, however, inferences can be made when comparing hardiness with similar (sometimes identical) favorable outcomes for college students (e.g., academic performance, persistence, commitment; Berger & Milem, 1999; Goegan & Daniels, 2019; Sheard & Golby, 2007). In a time-lagged investigation comparing first-year college students, those who remained in the university following their first year had higher
hardiness than those who dropped out (Ayala & Manzano, 2018). Similarly, student persistence versus dropout decisions have been predicted by student integration and involvement, central components of college student engagement (see Astin, 1975; Milem & Berger, 1997; Tinto, 1975).

Perhaps the strongest link between student engagement and hardiness is the pervasive stress experienced by college students. Increased experiences of stress have been linked to poorer student wellbeing, adjustment to college life, and academic performance, constructs which are promoted through college student engagement (Broman; 2005; Hudd et al., 2000; Rawson et al., 1994). The results from this study partially align with these findings; greater perceived stress (including academic-related stress) was related to less student engagement, though neither form of stress predicted less student engagement when included in the study’s regression models. Higher hardiness, as expected, was related to lower perceived stress (including academic and COVID-related stress) as well as greater student engagement. Additionally, there was evidence of a direct relationship in which hardiness contributes to student engagement. These results expand the literature on hardiness, suggesting that hardiness may predict beliefs, attitudes, and behaviors encapsulated in student engagement.

**Autonomy Support as a Predictor of Student Engagement**

Ultimately, these findings were able to address the research question of if, when taken together, autonomy support and hardiness would predict the beliefs, attitudes, and behaviors captured by student engagement. Several explanations can be proposed
regarding this result. From an SDT perspective, support of individuals’ basic psychological needs should promote motivation to engage in academic and social aspects of college life as students pursue educational goals (Deci & Ryan, 2017). Many instructors, and indeed, institutions as a whole, have seized upon the motivating potential of promoting students’ autonomy (see Deci & Ryan, 2017, Chapter 14; Moreira & Lee, 2020). It may be the case that participants experienced higher than average autonomy support from educators at their institutions compared to other institutions. Indeed, the majority of participants in the current study felt that, on average, their autonomy was supported to some extent.

Alternatively, there may have been an overrepresentation of students with loftier academic goals who were more likely to have their autonomy supported and were more engaged in college both socially and academically. A restricted range of participants may have resulted from a self-selection of students who opted to pursue their educational goals through pandemic-mandated virtual learning. It could be that those students who opted to attend college during this time were more dedicated to fulfilling their academic goals than those who withdrew or failed to enroll. This interpretation was supported by students’ high institutional commitment and moderate to high educational aspirations in the current study. Overall, 67% of the sample indicated plans to pursue an advanced degree and 91% indicated that graduation from their current institution was very important to them. Institutional commitment was also linked to autonomy support: students with greater commitment reported greater autonomy support than their less-committed counterparts (see Table 1). Although institutional commitment did not predict
student engagement in the current study, institutional commitment predicted student involvement and integration in college and persistence to graduation in a study by Milem and Berger (1997). As there was very little variation in institutional commitment in the sample population (i.e., the majority of participants indicated they were “very committed” to graduation from their institution), this could have limited the ability to find relationships between institutional commitment and autonomy support.

**Hardiness and Stress as Predictors of Student Engagement**

Another clear pattern gleaned from the data was the significance of stress and coping in college students’ lives. Students reported lower hardiness, less autonomy support, and poorer student engagement as various types of stress increased (i.e., general, academic, COVID-related). Given hardiness’ potential to buffer experiences of stress, it was no surprise that higher hardiness predicted greater student engagement when various stressors were accounted for. Indeed, more-hardy students reported lower general, academic, and COVID-related stress than their less-hardy counterparts. This buffering effect may have been particularly important for students experiencing high levels of perceived academic stress. Academic stressors (e.g., workload, perceived academic ability) have been suggested as a predominant source of college students’ stress contributing to overall stress beyond physical, social, or emotional factors (Bedewy & Gabriel, 2013; Robotham, 2008). As measured in this study, greater perceived academic stress related to less student engagement, lower GPA, and heavier course loads. Yet, in the final regression models, hardiness, not stress, predicted greater student engagement.
Acting as a buffer, hardiness may contribute to more favorable academic behaviors (e.g., greater engagement; higher GPA) through the promotion of adaptive coping strategies. From an SDT perspective, hardy students’ capacity to interpret stressors as challenging, yet personally augmenting, is consistent with an internalizing regulatory style (see Figure 1). Pressures to act that are perceived as external to the individual and unsupportive of individuals’ basic psychological needs may lead to tension, anxiety, stress, and strain (Ryan & Deci, 2017; Taylor, 2003; Vansteenkiste, 2004). Hardy individuals are those who appraise and interpret experiences of stress as a challenge to overcome, committing to the pursuit of their goals despite the presence of stress and its obstacles (Maddi, 2004; 2016). The cognitive strategies integrated into hardiness may allow students to find personal value in stress-inducing situations, shifting extrinsically perceived, stress-generating pressures toward a more self-determined state consistent with a sense of control, self-determination, and persistence. For example, a student who is taking a full course load in concert with other obligations might perceive additional engagement opportunities (such as joining a student-run organization) as an additional source of stress, yet commit to doing so as this might afford opportunities for networking which in turn enhance the students’ chances of pursuing an advanced degree.

As control plays a major role in how students perceive stressful situations, it is important to discuss how hardiness and autonomy support (another construct which emphasizes perceived control) interacted, theoretically and as represented in the data, in predicting student engagement.
The current study found no support for a potential interaction between hardiness and autonomy support on student engagement. A potential explanation for this may be that there is no extant interaction between hardiness and autonomy support across these particular academic outcomes. It is also possible that the effect was present, yet methodological limitations of the study reduced the ability to detect said effect.

Another consideration regarding autonomy support and hardiness may lie in their conceptual overlap along the dimension of control. While the interaction between hardiness and autonomy support did not predict student engagement, higher hardiness was related to greater autonomy support. This could be interpreted from an endogenous perspective, suggesting that hardy individuals are more likely to perceive interactions with faculty and peers as self-determined and autonomy-supportive. Similarly, it may be that hardy individuals are more likely to access opportunities where autonomy support is rendered, relating and conflating the two constructs and their effect on student engagement. While it may be the case that hardiness and autonomy support are related through control, perhaps it is another component of hardiness, commitment, that supports this perspective.

In a study of student academic success, commitment, or the dedication to being involved with people and events in the environment, demonstrated a direct linear relationship with academic success in college students; neither control nor challenge shared this relationship (Maddi, 1999; Sheard & Golby, 2007). It may be that
commitment facilitated students’ access to opportunities for autonomy support, but that this relationship was lost in measuring hardiness as a composite variable and confounded by conceptual overlap between the two constructs.

**Hardiness as a Mediator of Autonomy Support and Student Engagement**

Another consideration concerns the model within which the data were tested. Hardiness may function as an internal mechanism, explaining the relationship between autonomy support and student engagement; once again, these relationships were explained by students’ commitment to achieving their goal. Hardiness has been found to mediate the relationship between school belongingness (i.e., students perceived acceptance and value in their college setting), which captures aspects of students’ interest and engagement in college, and perceived academic stress (Abdollahi et al., 2020). Grit, a construct that is similar to hardiness that describes individuals’ passion and perseverance in meeting their long-term goals when facing adversity, has mediated the relationship between college students’ autonomy support and academic performance (Duckworth & Gross, 2014; Huéscar Hernández et al., 2020). Specifically, it was the dimension of perseverance (a similar conceptualization to commitment), rather than passion, that explained students’ autonomy support in predicting more favorable academic performance (Hodge et al., 2016; Huéscar Hernández et al., 2020).

Within the current study, students’ autonomy support, hardiness, and student engagement were interrelated, suggesting that an exploratory analysis of hardiness as an explanatory mechanism in the autonomy support-student engagement relationship was
appropriate. Results indicated that greater autonomy support remained a predictor of greater student engagement once hardiness was incorporated into the model. Higher hardiness also predicted greater student engagement; however, hardiness did not mediate the relationship between autonomy support and student engagement. Of note is that the partial mediation effect of hardiness was on the cusp of being statistically significant (i.e., $p = .050$, 95% CI [.003,.08]). It may be that with a larger sample size and greater statistical power, this effect would achieve statistical significance, providing evidence of hardiness as a partial mediator in the autonomy support-student engagement relationship and aligning the post hoc exploratory analysis with findings by Abdollahi et al. (2020).

**Data Collection During the COVID-19 Pandemic**

Additionally, the data collected for this study must be considered within the context in which they were measured. The entirety of data collection occurred while college students (at both community college and university levels) were forced to adopt virtual learning formats in response to the COVID-19 pandemic. The extent to which the shift to virtual learning impacted students’ emotions, cognitive functioning, and behaviors is not yet known. Early evidence suggests that students are experiencing increased stress related to their academic performance, reduced social support, and a variety of psychological and physiological effects associated with heightened stress and anxiety (Son et al., 2020). Following the shift to online learning, college students reported that their biggest challenge was no longer in learning course material, but in staying engaged with their courses (Perets et al., 2020). It is quite possible that
engagement was reduced for the sample as a whole due to the shift to virtual-learning. Alternatively, rapid changes in class structure may have contributed to a shift in short-term course goals towards maintaining engagement (Perets et al., 2020).

While students reported a greater need for student-instructor interactions in order to maintain engagement, many instructors were faced with increased workload as they transitioned their courses to online format as well as a reduced ability to interact with their students (Barton, 2020; Perets et al., 2020). These findings suggest that student engagement opportunities were not only more important, but were initially curtailed by the emergency switch to a virtual learning format. This may have led to unique variability in the measurement of college students’ engagement as students reorganized their goals and priorities across academic and other life domains.

Furthermore, students’ stress likely increased across general and academic domains. While evidence examining hardiness as a buffer against the type of stress associated with the COVID-19 pandemic has yet to be tested, the widespread publicity and panic-driven social behaviors that followed government interventions were likely novel stressors for the entire population. Stress uniquely attributed to the COVID-19 pandemic was measured in the current study and a disproportionate amount of COVID-related stress was experienced by students of color compared to their White/European American counterparts. However, there were no ethnic differences in autonomy support, hardiness, or student engagement. This suggests that additional factors (e.g., family support) may contribute to coping and resilience behaviors for students who systematically experience higher forms of stress related to their ethnicity.
Finally, the role of basic psychological needs and autonomy support remains unclear in the shift to virtual learning. The results of the current study suggest that greater autonomy support strongly predicted student engagement beliefs, attitudes, and behaviors. It could be that, given the shift to virtual learning and an increased need for self-regulated learning strategies (Perets et al., 2020), students who were able to access autonomy-supportive contexts also felt more engaged with their institution, instructors, and peers. Likewise, students who chose to enroll in classes during mandatory distance learning might differ in levels of grit or hardiness, as well as in their ability to self-regulate, compared to students who did not enroll in classes. More research is needed to understand how pandemic-related changes affect college students’ behavior, motivation, goals, and engagement.

**Heterogeneity of Students’ Experiences of Stress, Coping, and Motivation**

It is important to note that students’ experiences of stress, resources, and coping capacity vary considerably within and between discrete student groups (e.g., first-generation students, students of color). As such, hardiness and autonomy support cannot be conceptualized as homogenous sources of coping and motivation for all students. It is important to recognize that student backgrounds and experiences play a crucial role in their perceptions of both the environment and cognitive-appraisals of stress. For example, in a sample of Mexican and Mexican-American college students, both parental support and coping style (e.g., active versus avoidant) moderated relationships between college students’ acculturative stress (i.e., stress experienced as individuals reconcile pressures to
adapt to unfamiliar cultural norms and practices) and anxiety and depressive symptoms (Crockett et al., 2007). In this study, students with greater parental support experienced less anxiety at higher levels of acculturative stress than those who perceived less parental support. Coping style also moderated this relationship with students who reported more active coping experiencing less anxiety and depressive symptoms at higher levels of acculturative stress. As active coping is a component of hardiness (e.g., challenge), it may be that hardiness and culturally-specific forms of strength contribute to resilient behavior in marginalized students who experienced higher COVID-related stress. Ultimately, more research is needed across diverse student groups to understand the relationship between COVID-19 and hardiness as well as its impact on college students’ engagement attitudes and behaviors.

Limitations

Several limitations were linked to the sample. As convenience sampling methods were used, generalizing the results beyond the sample population must be done with caution. The sample may also be a overrepresented by college students who are more motivated and who actively pursue engagement opportunities, thus limiting the study in capturing students who may have been at the lower end of the autonomy support and academic motivation spectrums. Additionally, due to the shift to distance-learning, recruitment of participants was facilitated entirely through virtual methods. This limited the researcher’s ability to reach student groups beyond psychology courses at both sampling sites. An item asking students to indicate their current college major was not
included in the demographics section; inclusion of this item would have yielded important contextual information about the students who participated.

Furthermore, the sample was predominately made up of White/European American, female, upper division undergraduates. White/European American participants have benefitted from well documented advantages in post-secondary institutions which facilitate students’ persistence and opportunities for academic engagement. Upper-division students might have systematically differed from lower division undergraduates in how, when, and why they engaged in the study. Regarding gender, there were several important differences across stress measures, a covariate that underpins hardiness strength as a moderator in the autonomy support-student engagement relationship; more proportionate participation of underrepresented genders may have altered relationships found in the current study.

Sample size also presented a limitation. While sensitivity analysis indicated adequate statistical power to test for significance of an effect size of .08 or greater (the non-significant effect size of the interaction of hardiness and autonomy support on student engagement was $\beta = .08$), a decision to dichotomize participant race/ethnicity into White/European American and students of color was made to reduce the number of variables included in the final model to achieve statistical power. As such, important cultural differences between ethnically diverse student groups were condensed, stripping away important variability. It is critical to emphasize that both White/European American students and students of color are heterogeneous groups with an enormous amount of individual variability. Sexual orientation was also dropped out of concern for statistical
power and in order to address assumptions for testing moderation, improving the statistical validity of the study. Exclusion of these important indicators of diversity limited the ability to understand how student engagement differed across marginalized student groups. A larger sample size would have allowed for inclusion of these variables and improved the interpretability of the results.

Finally, there were several methodological limitations. The study’s cross-sectional design limits the ability to discuss causal relationships between study variables. As such, inferences made about changes over time in study constructs are not appropriate. Additionally, the veracity of self-report data must be questioned. The focus on affective and cognitive dimensions of engagement may have contributed to more accurate measurement as participants more accurately report their feelings than when reporting events or behaviors retrospectively (Iturbide, personal communication, 2018). Despite the current study’s limitations, valuable insights can be drawn from these findings, particularly in guiding future research in autonomy-hardiness interactions.

**Future Directions**

Future research should utilize valid behavioral measures of student engagement that are not reliant upon self-report (e.g., assignment completion, attendance records, documented communications with instructors), thus overcoming theoretical assumptions that beliefs and attitudes regarding student engagement can predict behavioral intentions, and through this, engagement behaviors (Azjen, 1991). Additionally, future research can assess autonomy support and hardiness across the five-factors encapsulated in college
student engagement. This can shed additional light on how to best support students’ academic goal pursuit, as well as illuminate the need to further investigate different types of student engagement and shed additional light on how to best support students’ academic goal support.

Replication studies should also be conducted across larger, more diverse samples. Marginalized student groups face additional forms of stress, cultural bias across levels of the institution, and experiences of discrimination throughout their college careers (Greene et al., 2016; Pascarella et al., 2004). Efforts to recognize students’ intersectional identities (e.g., Hispanic/Latinx LGBTQ+ individuals) in relation to hardiness and autonomy support can lead to a greater understanding of systematic inequalities that influence academic goal pursuit.

As the data from the current study was collected during a unique period for college students in which they experienced dramatic changes to both their academic and nonacademic routines, replications of this research across college semesters that more accurately reflect conventional student experiences could serve as a valuable source of comparable data against the findings of the current study.

Additionally, future research can more fully explore hardiness as a motivational factor within the SDT framework. Quasi-experimental research in which individuals’ loci of control are manipulated could help explain if hardiness facilitates shifts along the motivation continuum, contributing to identification and internalization of externally controlled pressure to act and experiences of extrinsic motivation as more self-determined. Beyond the SDT framework, hardiness should be evaluated across distinct
forms of stress and different domains and contexts within the same sample; this could shed further light on hardiness’ conceptualizations as either a trait- or state-based construct. Finally, mechanisms which may underpin both hardiness and autonomy support (e.g., self-efficacy, personality traits, social factors, cultural differences, developmental experiences) need to be more fully integrated into future models to enhance understanding of the relationship between the two constructs. Optimally, longitudinal research would be the gold standard for investigating these relationships, contributing causal support for hardiness in stress-, coping-, and motivation-based research.

**Implications**

The current study made meaningful contributions to the literature on hardiness and SDT regarding student engagement and persistence. Hardiness’ role as a predictor of student engagement, as well as marginal support for hardiness as a partial mediator of the strong relationship between autonomy support and student engagement, informs the hardiness literature by extending support for hardiness as an important factor in student engagement beliefs and attitudes. Likewise, this study incorporates hardiness into an SDT framework, laying a path for future research that focuses on hardiness’ role as a component in students’ motivational processes.

While autonomy support is well researched in the SDT literature, there are no studies explicitly examining interactions between hardiness and autonomy support. This study informs SDT by providing a null result that can be used in future research. Finally,
models used to explain college student’s persistence through their involvement, integration, and engagement in college life are bolstered by the positive relationships found between autonomy support, hardiness, and student engagement. Through this, the results of this study could contribute to interventions designed to support students coping with stress while pursuing academic goals. One such intervention is hardiness training, an intervention program in which participants are taught to cognitively and emotionally examine and reorient appraisals of stressful and trying situations in ways that lead to active coping and problem-solving efforts (Maddi et al., 1998). Undergraduates completed a semester-long hardiness training course at a 4-year university scored higher on hardiness, GPA, active-coping, and social support both directly after the course and three years after the initial study (Maddi et al., 2009a). Hardiness’ trainability as a skill strongly suggests potential for intervention in higher education institutions to address college students’ motivation and persistence. Hardiness represents a possible pathway to resilience for college students who may experience disruptive levels of stress in transitioning to college and pursuing their educational goals.

Summarily, this study contributed to the literature on hardiness, SDT, and autonomy support, and how these relate to student engagement. Ultimately, supporting college students’ autonomous functioning as well as promoting adaptive coping strategies are potential pathways for promoting student engagement, which in turn could support students’ academic motivation, persistence, and perhaps their degree attainment.
Conclusion

Research examining the relationship between hardiness, autonomy support, and college students’ academic and social engagement is scant. The current study tested the relationship between these constructs in a convenience sample of community college and university students during involuntary distance-learning related to the COVID-19 pandemic. Results indicated that, when controlling for general, academic-, and COVID-related stress, greater autonomy support and higher hardiness predicted greater student engagement. Hardiness was proposed as a moderator of the autonomy support-student engagement relationship, however, there was no evidence to support this prediction. These results further inform the literature on hardiness, SDT, and theories addressing colleges students’ persistence in attaining a degree.


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Appendix A

Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988)

| 0 = Never | 1 = Almost Never | 2 = Sometimes | 3 = Fairly Often | 4 = Always |

Please indicate how frequently (in the last month) you have:

1. Been upset because of something that happened unexpectedly?
2. Felt that you were unable to control the important things in your life?
3. Felt nervous and “stressed”?
4. Felt confident about your ability to handle your personal problems?
5. Felt that things were going your way?
6. Found that you could not cope with all the things that you had to do?
7. Been able to control irritations in your life?
8. Felt that you were on top of things?
9. Been angered because of things that were outside of your control?
10. Felt difficulties were piling up so high that you could not overcome them?
Appendix B

*Perceived Academic Stress Scale (PAS; Bedewy & Gabriel, 2015)*

<table>
<thead>
<tr>
<th>1 = Strongly Disagree</th>
<th>2 = Disagree</th>
<th>3 = Neutral</th>
<th>4 = Agree</th>
<th>5 = Strongly Agree</th>
</tr>
</thead>
</table>

Please rate your perception about the following statements in contributing to academic stresses

1. I am confident that I will be a successful student.
2. I am confident that I will be successful in my future career.
3. I can make academic decisions easily.
4. The time allocated to classes and academic work is enough.
5. I have enough time to relax after work.
6. My teachers are critical of my academic performance.
7. I fear failing courses this year.
8. I think that my worry about examinations is weakness of character.
9. Teachers have unrealistic expectations of me.
10. The size of the curriculum (workload) is excessive.
11. I believe that the amount of work assignment is too much.
12. I am unable to catch up if getting behind the work.
13. The unrealistic expectations of my parents stress me out.
14. Competition with my peers for grades is quite intense.
15. The examination questions are usually difficult.
16. Examination time is short to complete the answers.
17. Examination times are very stressful to me.
18. Even if I pass my exams, I am worried about getting a job
Appendix C

COVID-Related Stress Scale (CSS; Taylor et al., 2020)

<table>
<thead>
<tr>
<th>0 = Not at all worried</th>
<th>2 = Barely worried</th>
<th>3 = Moderately worried</th>
<th>4 = Very worried</th>
<th>5 = Extremely worried</th>
</tr>
</thead>
</table>

The following questions ask you about your perceptions and feelings related to the COVID-19 (coronavirus) pandemic. Please indicate your level of worry for each of the following statements:

1. I am worried about catching the virus.
2. I am worried that I can’t keep my family safe from the virus.
3. I am worried that our healthcare system won’t be able to protect my loved ones.
4. I am worried that our healthcare system won’t be able to keep me safe from the virus.
5. I am worried that basic hygiene (e.g., handwashing) is not enough to keep me safe from the virus.
6. I am worried that social distancing is not enough to keep me safe from the virus.
7. I am worried that if I touched something in a public space (e.g., handrail, door handle), I would catch the virus.
8. I am worried that if someone coughed or sneezed near me, I would catch the virus.
9. I am worried that people around me will infect me with the virus.
10. I am worried about taking change in cash transactions.
11. I am worried that I might catch the virus from handling money or using a debit machine.
12. I am worried that my mail has been contaminated by mail handlers.
Appendix D

Personality Views Survey III-R (PVS III-R; Maddi et al., 2006)

<table>
<thead>
<tr>
<th>0 = Not true</th>
<th>1 = A little true</th>
<th>2 = Mostly true</th>
<th>3 = Very true</th>
</tr>
</thead>
</table>

The following questions ask you about some of your beliefs and attitudes. Please indicate how true of you that you believe each statement to be:

1. By working hard, you can always achieve your goal.
2. I don't like to make changes in my everyday schedule.
3. I really look forward to my work.
4. I am not equipped to handle the unexpected problems of life.
5. Most of what happens in life is just meant to be.
6. When I make plans, I'm certain I can make them work.
7. No matter how hard I try, my efforts usually accomplish little.
8. I like a lot of variety in my work.
9. Most of the time, people listen carefully to what I have to say.
10. Thinking of yourself as a free person just leads to frustration.
11. Trying your best at what you do usually pays off in the end.
12. My mistakes are usually very different to correct.
13. It bothers me when my daily routine gets interrupted.
14. I often wake up eager to take up life wherever it left off.
15. Lots of times, I really don't know my own mind.
16. Changes in routine provoke me to learn.
17. Most days, life is really interesting and exciting for me.
18. It’s hard to imagine anyone getting excited about working.
Appendix E

*Adapted Learning Climate Questionnaire (LCQ; Williams & Deci, 1996)*

<table>
<thead>
<tr>
<th>1 = Strongly disagree</th>
<th>2 = Disagree</th>
<th>3 = Slightly disagree</th>
<th>4 = Neutral</th>
<th>5 = Slightly agree</th>
<th>6 = Mostly agree</th>
<th>7 = Strongly agree</th>
</tr>
</thead>
</table>

The following questions ask you about your perceptions and experiences with faculty at your university. Please indicate your level of agreement with each statement:

1. I feel that my instructors provide me choices and options.
2. I feel understood by my instructors.
3. I am able to be open with my instructors during class.
4. My instructors conveyed confidence in my ability to do well in the course.
5. I feel that my instructors accept me.
6. My instructors made sure I really understood the goals of the course and what I need to do.
7. My instructors encouraged me to ask questions.
8. I feel a lot of trust in my instructors.
9. My instructors answer my questions fully and carefully.
10. My instructors listen to how I would like to do things.
11. My instructors handle people's emotions very well.
12. I feel that my instructors care about me as a person.
13. I don't feel very good about the way my instructors talk to me.
14. My instructors try to understand how I see things before suggesting a new way to do things.
15. I feel able to share my feelings with my instructors.
Appendix F

Student Engagement Instrument–College (SEI–C; Waldrop et al., 2019)

<table>
<thead>
<tr>
<th>1 = Strongly disagree</th>
<th>1 = Disagree</th>
<th>3 = Agree</th>
<th>4 = Strongly agree</th>
</tr>
</thead>
</table>
1. My family/guardian(s) are there for me when I need them.  
2. After finishing my school work, I check it over to see if it’s correct.  
3. My professors are there for me when I need them.  
4. Other students here like me the way I am.  
5. Faculty and staff listen to the students.  
6. Other students at the college/university care about me.  
7. Students at my college/university are there for me when I need them.  
8. My education will create many future opportunities for me.  
9. Most of what is important to know you learn in school.  
10. The college/university rules are fair.  
11. Going to school after high school is important.  
12. When something good happens at school, my family/guardian(s) want to know about it.  
13. Most professors at my college/university are interested in me as a person, not just as a student.  
14. Students here respect what I have to say.  
15. When I do school work, I check to see whether I understand what I’m doing.  
16. Overall, my professors are open and honest with me.  
17. I plan to graduate from college/university.  
18. School is important for achieving my future goals.  
19. When I have problems at school my family/guardian(s) are willing to help me.  
20. Overall, faculty and staff at my college/university treat students fairly.  
21. I enjoy talking to the professors here.  
22. I enjoy talking to the students here.  
23. I have some friends at school.  
24. When I do well in school it’s because I work hard.  
25. The tests in my classes do a good job of measuring what I’m able to do.  
26. I feel safe at my college/university.  
27. I feel like I have a say about what happens to me at my college/university.  
28. My family/guardian(s) want me to keep trying when things are tough at school.
29. I am hopeful about my future.
30. At my college/university, professors care about students.
31. Learning is fun because I get better at something.
32. What I’m learning in my classes will be important in my future.
33. The grades in my classes do a good job of measuring what I’m able to do.
Appendix G

Email for Contacting Professors/Instructors

Hello _____________,

My name is Kevin Cherry and I am a graduate student in the Academic Research program at Humboldt State University (HSU). I am writing to ask for your help in recruiting participants for a study on factors related to college student engagement. I have received IRB approval (IRB #: IRB 20-021) from HSU and plan to collect data from (PLACE DATES HERE). I will be collecting participants through SONA systems at HSU, as well as other methods, using a link to an online survey. In some cases, courses allow students to get extra course credit for participating in psychological research, and I would like to ask that you consider doing the same for your course. Individuals’ ability to participate is not contingent upon receiving extra credit, so please only offer this if you are comfortable doing so. I would also like to ask if we may send a research assistant to your course in the near future to announce this study to your students. This would only take 3- to 5- minutes of time and would entail a research assistant reading a script (similar to the one below) and answering any questions students may have about participation in the study. Alternatively, if you are unable to accommodate this request, I would like to ask if you would post the announcement below to your course website.

I very much appreciate your time and consideration in this matter. Please feel free to contact me at [personal phone number redacted] or Kevin.Cherry@humboldt.edu to follow up to this email, as well as with any questions or concerns. Once again, thank you!

For posting on your course website:
The COLLEGE STUDENT ENGAGEMENT STUDY is seeking participants!
This online survey looks at personality, perceptions, and experiences and how they relate to student experiences in college. Your participation helps us learn about how students may succeed in their college career. The survey will take about 15-30 minutes to complete.
To sign up:
Visit SONA and sign up for the study there OR contact Kevin Cherry at Kevin.Cherry@humboldt.edu to make an appointment.

Best,
Kevin Cherry
Appendix H

Informed Consent Document

CONSENT TO ACT AS RESEARCH PARTICIPANT
College Student Engagement Study

Department of Psychology, Humboldt State University Contact: INSERT CONTACT INFO HERE

I hereby agree to have the following person(s) carry out the following procedures on me for research purposes: INSERT CONTACT INFO HERE.

Purpose of Project: The purpose of these procedures is to investigate the link between personality, stress, perceptions of college, and types of student engagement at Humboldt State University (HSU) and College of the Redwoods (CR). To participate in this study, you must be an HSU or CR student over the age of 18 who is pursuing an advanced degree (e.g., A.A., B.A., etc.) and who has been enrolled at your respective institution for at least one semester.

Procedure: These procedures will be conducted online, powered by Qualtrics. You will be asked to complete a questionnaire that will take about 30 minutes to complete.

Compensation: You will be compensated with course credit through SONA, if applicable. Otherwise, there is no compensation for participating in this study.

I understand that the procedures described involve the following possible risks and/or discomforts and that they have the possible benefits:

Risks: The survey will ask you a series of statements about personality, stress, perceptions of college, and types of engagement at HSU and CR. Some of the questions may be uncomfortable for some people to answer. You may choose not to answer a question(s). Additionally, your responses will be confidential. If you are an HSU student who is accessing the survey through SONA, you will use identifying information including your e-mail address to login and access the survey. If you are a CR student, your email may be collected to allow us to contact you with instructions and a link to the survey. In either case, your identifying information will be kept confidential and will not be retained after the completion of the research study.
Benefits: You will receive no immediate benefit from participation. We hope to learn more about what helps students to succeed in college.

Consent to Participate: Your participation is voluntary and you may decline to enter this study or may withdraw from it at any time without jeopardy. Additionally, the investigator may terminate your participation in the study at any time.

If you agree to voluntarily participate in this research as described and are at least 18 years old, please select the option "Yes, I am 18 years of age or older and I agree to participate in this study". If you do not want to participate please select the option "No, I do not want to participate in this study".

Please print this informed consent form now and retain it for your future reference. Thank you for your participation in this research.

Opportunity to Ask Questions: If you have any questions regarding your rights as a human subject and participant in this study, you may contact the Institutional Review Board for the Protection of Human Subjects at irb@humboldt.edu or INSERT CONTACT INFO HERE. They will be able to answer any question you have about this study.
Appendix I

Debriefing Document

College Student Engagement Study

Thank you for your participation in this study on student’s involvement and engagement with college life. This survey examined how personal factors, experiences of stress, and perceptions about the campus relate to how students think, feel, and act as they get involved at college. Your participation helps us to understand what students may need to be successful in their college career.

We understand that you may wish to speak with someone concerning stressors brought to light by this study. Therefore, we are providing you with contact information for HSU’s Counseling & Psychological Services (CAPS).

During the academic year, the CAPS office is open Monday through Friday as follows¹: CAPS receptionists are available by phone 8 a.m. to 5 p.m. CAPS at SHC (main office) can be reached at 707-826-3236. CAPS at BSS can be reached at 707-826-3921. CAPS is open for services (such as therapy, consultations, and crisis services): MWF 8:45 a.m. - 4:15 p.m. and TTh 9:45 a.m. - 4:15 p.m. This information can also be found at https://counseling.humboldt.edu/

Please share INSERT SURVEY INFO HERE information with other HSU and CR students that are at least 18 years of age who might be interested in participating in this study. We request that you not discuss the content with them until after they have had the opportunity to participate. Prior knowledge of questions asked during the study can invalidate the results. We appreciate your cooperation in this matter.

Thank you again for your participation. If you have any questions regarding this study, please feel free to contact us at:

INSERT CONTACT INFO HERE

¹ Events that alter the accessibility to campus resources, such as campus closures due to unpredicted events, may invalidate this information. Any updated availability of service should be found on the CAPS website: https://counseling.humboldt.edu