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**The Relationship between Pet Attachment and Stress in College Students during the
COVID-19 Pandemic**

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Undergraduate Honors Thesis
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Abstract

The COVID-19 pandemic has changed the lifestyles of college students over the past 3+ years. This study assessed the role of pet attachment as a stress-buffer in college students by (1) determining if there is a significant association between pet attachment and several mental health outcomes: perceived stress, COVID-19-related stress, depression symptoms, and impact of recent life events; and (2) examining whether pet attachment interacts with impact of recent life events to predict perceived stress, COVID-19-related stress, and depression symptoms. College students aged 18 or older who identified as pet owners and/or reported daily interactions with a pet they live with were eligible. The sample ($N = 112$) was primarily white (91.1%), non-Hispanic/Latino(a) (96.4%), single (95.5%), and female-identified at birth (89.3%). Participants completed the Lexington Attachment to Pets Scale (LAPS), Life Experiences Survey (LES), Perceived Stress Scale (PSS), Perceived Stress Questionnaire (PSQ), COVID-19 Student Stress Questionnaire (CSSQ), and Center for Epidemiologic Studies Depression Scale (CES-D). Pet attachment on the LAPS was not significantly correlated with LES, CES-D, PSS, PSQ, or CSSQ score. In hierarchical regression models, the interaction of LAPS and impact of life events (LES score) was significant in predicting CES-D, PSS, and PSQ score, after controlling for sex assigned at birth. For all three outcomes, students with relatively low pet attachment showed comparable depression and stress scores regardless of whether they endorsed more negative, average, or positive impact of recent life events. Compared to students with low pet attachment, students with relatively high pet attachment showed higher depression and stress scores with more negative impact of recent life events and lower depression and stress scores with more positive impact of recent life events. Results suggest that students with higher pet attachment styles were more strongly influenced by both positive and negative life events, with potential

mood enhancing and exacerbating effects, respectively. This study is limited by the cross-sectional design, homogenous sample, and lack of social support/attachment measures pertaining to humans.

Key words: pet attachment, life events, stress-buffering, college students, attachment theory

The Relationship between Pet Attachment and Stress in College Students during the COVID-19 Pandemic

From social distancing, to quarantine and isolation, to having to attend events remotely, the COVID-19 pandemic significantly altered opportunities for human interactions. Nieforth and O’Haire (2020) highlight the uncertainty that the pandemic caused in people’s everyday lives, including unemployment, sickness of a family member, and stay-at-home-orders. Because finding human interaction became difficult with the pandemic’s onset, some people tried to combat pandemic uncertainty with social support through their pets. Nieforth and O’Haire (2020) mentioned three theories as to why people turned to pets for comfort during the pandemic: the biophilia hypothesis (i.e., that humans innately seek to connect with nature and other forms of life), attachment theory (which will guide this project), and uncertainty management theory. Pets may have a preventive effect on developing posttraumatic stress symptoms and appear to lower perceived uncertainty in their owners (Nieforth & O’Haire, 2020). Potential mediators of these effects include the nonjudgmental support, positive regard, contact comfort, and safe haven provided by a pet (Nieforth & O’Haire, 2020).

Building on Nieforth and O’Haire’s (2020) review of the role of pets during the pandemic, the current project goes beyond efforts to document that people are turning to pets as a form of social support during the pandemic to examine whether *pet attachment* is associated with college students’ mental health during the pandemic (through administering a collection of surveys and questionnaires). This study surveyed University of Vermont (UVM) undergraduate students regarding their pet ownership status and frequency of pet interactions, pet attachment level, both general and COVID-specific stress, depression symptoms, and perceived impact of recent life events.

College populations are of particular importance for researchers studying the psychological effects of the COVID-19 pandemic. Wood et al. (2022) found adverse effects of the pandemic on college students' mental health, especially for Black and LGBTQ+ students, above and beyond the effects of already-established stressors for this population such as those relating to academics, relationships, finances, and change in lifestyle. Their study found the substantial majority (81.6%) of college student participants endorsed at least one of eight negative mental health symptoms included in the survey (e.g., hopelessness, depression, anxiety, or sadness). Wood et al. (2022) also noted that the transition to online learning interfered with healthy "lifestyles habits" such as exercise and socialization, both of which are "protective factors against mental health concerns" (p. 4). The current study investigates the role of attachment to pets as another protective factor, particularly as a stress-buffer.

Interest in pet ownership has increased world-wide during the COVID-19 pandemic. Ho and colleagues (2021) aimed to describe the international surge in public interest in adopting pets through epidemiological tracking of internet searches for the terms "pet adoption," "dog adoption," and "cat adoption." Worldwide relative search volume (RSV) data for the three search terms were analyzed from 2015-2020, with peak RSV values for all three occurring in April and May 2020, corresponding to the early phase of the pandemic. The RSV values for these three search terms in April and May 2020 were significantly greater than the average RSV for these terms over this 5-year period. The worldwide RSV ratio for the "dog adoption" and "cat adoption" search terms increased by up to 250% from 2019 to 2020, with the United States emerging as the second greatest contributor to this increase after Australia. However, only cat adoption appeared to maintain the high level of interest from July 2020 to December 2020, at which point interest in dog adoption started to decrease and reapproached the 5-year average

value in December 2020. Additionally, Ho et al. (2021) reiterated the assertion that pets can provide emotional support to people amidst the pandemic, citing affection between human and animal as a way to “minimize stress during an uncertain period and help alleviating *[sic]* depression and anxiety upon social isolation” (p. 3). This study hopes to expand on this finding by testing whether attachment to pets affects the mental health of college students, particularly their stress and depression.

Based on attachment theory, pet ownership may be associated with better mental health because pet owners form secure attachments with their pets. Meehan et al. (2017) review attachment theory, a human relationship theory, originating with John Bowlby’s suggestion that human newborns bond with a primary attachment figure, which Mary Ainsworth found could include other attachment figures as development progresses into adulthood. Ainsworth’s findings also suggest that the majority of children form secure attachments, characterized by four attachment behaviors, which are proximity seeking and maintenance, separation distress, safe haven, and secure base. In a survey of 161 companion animal owners, Meehan et al. (2017) confirmed companion animals as a distinct source of social support for owners. Based on an interview used to study attachment hierarchies, they also concluded that companion animals were included in participants’ attachment hierarchies (ranked fifth, above siblings) and acted as the primary attachment figure for 14% of owners. This work supports secure attachment relationships between human pet owners and their pets.

There is some evidence that cat owners attribute some mental health benefits to their pet during the pandemic. Jezierski et al. (2021) found that the majority of cat owners thought their cats’ behaviors did not change during the pandemic, while the 33% that did perceive a change, mainly characterized their cat’s behavior changes as positive, such as increased calmness and

playfulness. Furthermore, 84.6% of participants reported benefits of owning a cat during the pandemic (e.g., reduction in mental or emotional tension, desirable behavior change observed in their cat, or other), and two-thirds of participants reported mental and emotional benefits attributed to cat ownership during the pandemic. Therefore, this study established that cat owners reported positive effects from their relationship with their cat during the pandemic, particularly psychological ones. This project examines whether pet attachment more broadly defined (i.e., not just attachment to a cat) is associated with mental health in college students during the pandemic, such that students with greater attachment to their pet report better mental health, particularly stress and depression.

Although the college population has received attention in studies focused on coping with COVID-19, this study combines research themes about human-animal attachment and bonding with that of college student stress in the context of the pandemic. This study explores the potential positive effects pet attachment has on undergraduates' mental health as measured by their perceived general and pandemic-related stress and depression symptoms during a particularly challenging life event (e.g., the COVID-19 pandemic). The study addresses the question, "Is there a relationship between pet attachment and mental health during the COVID-19 pandemic for undergraduate students at UVM who own or regularly interact with a pet?" The hypothesis is for a significant negative correlation between pet attachment and mental health during the pandemic, such that higher pet attachment scores are associated with better mental health outcomes, specifically lower depression, general and COVID-specific stress, and perceived impact of recent life events. The study addresses a second question, "Does pet attachment interact with recent life events to predict mental health outcomes?" Beyond a simple bivariate correlation between pet attachment and mental health (as in the first study aim), it is

important to take current life events into account as a moderating factor. The COVID-19 pandemic is a global stressor, but individuals differ in their exposure to and perceived impact of personal life events, which likely affects their mood. Major life events are accepted as a robust causal factor in the onset of major depression (Hammen, 2005). Major life events also play a role in the development of anxiety symptoms. For example, in a study of adolescent earthquake survivors, Jin and colleagues (2019) found a significant positive association between negative life events and post-traumatic stress disorder symptoms. Furthermore, the support people receive from personal networks acts as a buffer against stress originating from negative life events (Child et al., 2021). The hypothesis is that pet attachment interacts with the impact of recent life events to predict students' depression, perceived stress, and COVID-specific-stress. Among students with relatively low pet attachment, higher perceived negative impact of recent life events is hypothesized to be associated with greater depression and perceived stress as compared to students with relatively high pet attachment. This pattern would be consistent with a buffering effect of high pet attachment in the context of negative life events. Conversely, among students with relatively high pet attachment, higher perceived positive impact of recent life events is hypothesized to be associated with less depression and perceived stress compared to students with relatively low pet attachment. This pattern would be consistent with a mood enhancing effect of high pet attachment in the context of positive life events.

Methods

Participant Recruitment and Enrollment

This study was approved by the University of Vermont's Committees on Human Subjects Research before beginning data collection. University of Vermont students enrolled in psychological science courses, aged 18 and older, were recruited to receive class credit for

participation through the SONA-pool survey administration system. In the SONA system, the study was titled, “The Relationship between Pet Ownership and Stress in College Students during the COVID-19 Pandemic” and its purpose was described to respondents as seeking to gain an understanding of the influence that pets might have on undergraduate students’ stress during the COVID-19 pandemic. Interested participants self-scheduled time slots to review an information sheet describing the study, complete the eligibility screening (requiring students to be aged 18 or older), and then if interested and eligible, continue participation by filling out survey measures described below. In addition to the established surveys, participants provided information on demographic characteristics (e.g., gender, race, year in school, whether or not they own a pet). They also answered questions developed for this study about their pet ownership and interactions with pets (see Appendix A).

Although this study initially aimed to include a group of pet owners and a group of non-pet owners, only 21 students who responded to the survey indicated not owning a pet, making group comparisons based on pet ownership status not feasible. Of these 21 students who denied owning a pet, 13 were excluded from the analysis, including ten who indicated spending no time with a pet and three who indicated they spent very little or no time with a pet they lived with, but did not themselves own. The other eight students of the 21 non-pet owners were included in the analyzed sample because although they did not endorse owning a pet, they indicated spending time daily with a pet they live with (30 or more minutes). On the basis of these responses, a decision was made to focus the study on students who reported daily interactions with one or more pets they live with OR reported being a pet owner, resulting in a sample of 112 students for these analyses. Students were not excluded based on not living with a pet or not being the pet’s actual owner. Students only needed to demonstrate daily interaction with a pet they reside with

OR identify as a pet owner. Pets could include any type of animal. Participants were not excluded based on the type of pet they owned or interacted with daily (e.g., cat, dog, rodent, reptile). Frequency of pet interactions was assessed by the open response question, “How much time do you spend with your pet per day on average?” Therefore, the 8 non-pet owner students described above were included because indicated spending time every day with a pet.

Measures

Perceived Stress Scale. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983) is a 14-item self-report measure of appraised stress during the past month. The PSS was designed to globally appraise how unpredictable, uncontrollable, and overloaded participants feel in their lives without focusing on a specific life event (Ezzati et. al, 2014; Huang et. al, 2020). Some items refer to negative stressors (e.g., not being able to cope with all the things they have to do, being upset due to something that happened unexpectedly) whereas others refer to positive events (e.g., felt things were going their way, felt they were on top of things, felt able to control irritations in their life). For each item, participants rate how often they felt, thought, or behaved in accordance with the presented situation in the past month on a 5-point Likert scale ranging from 0 (never) to 4 (very often). Positive items are reverse-scored before adding the item scores to derive a total score. Overall, the higher the total score, the greater the perceived stress level. Based on a factor analysis, the PSS was broken down into two subscales based on negative and positive items, aiming at measuring the factors “perceived distress” and “coping capacity” respectively (Ezzati et. al, 2014). This scale shows good validity and good internal reliability (Cohen et al., 1983). The scale has good test-retest reliability with an interval up to 8 weeks after the baseline since stress appraisal as captured by the PSS is

influenced by “daily hassles, major events, and changes in the availability of coping resources” (Cohen et al., 1983, p. 393).

Perceived Stress Questionnaire. The Perceived Stress Questionnaire (PSQ; Levenstein et al., 1993) is a 30-item self-report measure of perceived psychological stress. Factor analysis supports a four-factor model for the PSQ, including worries, tension (as a stress reaction), lack of joy, and demands (external stressor) (Montero-Marín et al., 2014; Østerås et al., 2018).

According to Østerås and colleagues (2018), the PSQ was specifically designed to be used as a predictor of health and well-being in adolescents, including the course of diseases. It assesses cognitive perceptions contributing to stress level (e.g., how often they feel rested, tense, in a hurry, or there are too many demands being made on them). The measure has both “General” and “Recent” formats. This study used the general format which asks about the last year or two (whereas the recent format asks about the last month). For each statement, participants rate how often the given emotion or situation applies to themselves on a 4-point Likert scale from 1 (Almost never) to 4 (Usually). Positive items are reverse scored by subtracting their value from 5 before being totaled with all other item scores to generate a raw total score. Higher total PSQ scores indicate greater stress. This questionnaire has shown high internal consistency (whole-scale reliability) and test-retest reliability as well as construct validity (Levenstein et al., 1993). Although it was expected that PSS and PSQ scores would be positively correlated and there is overlap in item content, both measures were included in this study because the PSS captures state stress (past month) and the PSQ captures stress over a longer timeframe (past 2 years).

The COVID-19 Student Stress Questionnaire. The COVID-19 Student Stress Questionnaire (CSSQ; Zurlo et al., 2020) is a self-report measure of COVID-19 pandemic-related stress in university students. The 7-item measure assesses COVID-19 pandemic

stressors in three subscale categories: Relationships and Academic Life, Isolation, and Fear of Contagion. For each item, participants rate how stressful they found it in the context of the pandemic (e.g., social isolation, the risk of contagion, relationships with professors, studying) on a 5-point Likert scale from 0 (Not at all stressful) to 4 (Extremely stressful). A Global Stress score (0 to 28) is calculated by totaling the value of all 7 responses, where higher total CSSQ score indicates greater COVID-19 pandemic-related stress. This questionnaire has good convergent, discriminant, and construct validity, and has adequate internal consistency reliability (Zurlo et al., 2020).

Lexington Attachment to Pets Scale. The Lexington Attachment to Pets Scale (LAPS; Johnson, Garrity, & Stallones, 1992) is a self-report measure of pet attachment. The 23-item measure is used to assess the human-animal relationship through emotional attachment to dogs and cats. Participants answer questions that fit into three broader categories (General Attachment, People Substituting, and Animal Rights/Animal Welfare) and respond to statements using a 4-point Likert scale from 0 (strongly disagree) to 3 (strongly agree) (Zaparanick, 2008). The “General Attachment” category presents statements like “My pet understands me” or “My pet makes me feel happy,” attempting at quantifying the overall relationship between owner and pet. The “People Substituting” category presents statements like “I believe my pet is my best friend,” aiming at quantifying the personified role of the pet. The “Animal Rights/Animal Welfare” category presents statements like “I believe that pets should have the same rights and privileges as family members,” trying to quantify people’s ethical opinions on animal treatment and societal status (Zaparanick, 2008). For scoring, negative items (e.g., I am not very attached to my pet) are reverse-scored. Higher total LAPS score indicates greater level of attachment to

the pet. This scale has good construct validity and shows higher internal consistency than previous measures of pet attachment (Johnson, Garrity, & Stallones, 1992).

Center for Epidemiologic Studies Depression Scale. The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) is a self-report measure of depression symptoms. With this 20-item measure, participants indicate how often they felt or behaved as described in each item during the past week on a 4-point Likert scale from 0 [Rarely or none of the time (less than 1 day)] to 3 [Most or all of the time (5-7 days)]. Positive items are reverse-scored. Scores can range from 0 to 60, with higher scores indicating greater symptomatology. This scale has high internal consistency for both patient groups and for the general population and shows good test-retest reliability, construct validity, and discriminant validity (Radloff, 1977).

Life Experiences Survey. The Life Experience Survey (LES; Sarason, Johnson, & Siegel, 1978) is a self-report measure of the perceived impact (ranging from very negative to very positive) of specific life events the respondent has faced (e.g., major personal illness or injury, starting a new job, outstanding personal achievement, breakup with a partner). The LES contains items for the death of loved ones, relatives, and close friends but does not have an explicit item about death of a pet. This 60-item survey asks participants to check any life events that they have experienced in the recent past (in the last 0-6 months, 7 months to 1 year, or both) and to rate the impact of each endorsed life event on a 7-point Likert scale ranging from -3 (extremely negative) to +3 (extremely positive). Items 48, 49, and 50 allow for write-in life events specific to the participant, while the last 10 items are specific to college students (e.g., failing an important exam, dropping a course, changing academic institutions, financial issues affording tuition). The items indicated as having a positive impact are totaled separately from

those rated as having a negative effect, dubbed positive and negative LES change scores respectively. A total LES score is calculated by adding the positive and negative change scores. Therefore, LES total score > 0 indicates an overall perceived positive impact of life events, whereas LES total score < 0 indicates an overall perceived negative impact of life events, and the higher the absolute value of the LES total score, the larger the perceived impact of recent life events. LES total score was selected over negative LES change score for this study because it represents a balance between the perceived positive and negative impact of recent life events encountered by respondents. The LES is a moderately reliable measure when considering the negative and overall total change scores (Sarason et al., 1978). Sarason and colleagues (1978) report that the reliability of the scale was likely underestimated because people naturally experience a variety of positive and negative events during a given period of time, negatively affecting the test-retest reliability coefficients.

Data Analytic Plan

All analyses were run in SPSS (version 29). First, descriptive statistics (means and standard deviations) were computed for each variable for the sample as a whole: scores from the PSS, PSQ, CSSQ, CES-D, LAPS, and LES total change. Regarding race and ethnicity, participants were categorized as either “White, non-Hispanic/Latino(a)” or “Non-white and/or Hispanic/Latino(a)” due to small individual cell sizes.

Next, a series of bi-variate correlations were run to examine the relationship between three demographic factors (sex assigned at birth, race/ethnicity as defined above, and whether or not the student was a first year/sophomore or a junior/senior), the predictor variables (LES score and LAPS score), and each outcome variable (CES-D, PSS, PSQ, and CSSQ scores). Demographic factors that correlated significantly ($p < .05$) with one of the four outcome

variables were deemed as covariates and were included as predictors in the hierarchical regression models to follow. (This was the case for sex assigned at birth, as discussed in the results).

A series of hierarchical linear regressions were run with sex assigned at birth entered in Step 1, LAPS and total LES scores entered in Step 2, and the interaction term for LAPS X LES entered in Step 3. Separate regression models were run for each outcome: CES-D, PSS, PSQ, CSSQ score. The main effect predictor variables (LES and LAPS scores) were not mean-centered before generating the interaction term because there was low collinearity between them. In other words, LES total change score was not significantly correlated with LAPS score. Additionally, the LES scale has a meaningful zero point, which is another reason against mean-centering. However, even with mean centering, the results of the interaction analysis did not differ. Upon finding a significant LAPS X LES interaction, the interaction was probed utilizing PROCESS macro in SPSS (Hayes, 2022).

Results

Sample Characteristics and Descriptive Statistics for Study Measures.

Demographic information for the sample is presented in Table 1.

The overall sample ($N = 112$) was primarily female (89.3%), white (91.1%), non-Hispanic (96.4%), single or living together (100%), and either in their sophomore or junior year of undergraduate studies (35.7% and 42.9% respectively). Five participants identified as Asian, 2 as Black, and 3 as mixed race. The majority (92.9%; 104/112) identified as a pet-owner, while 7.1% (8/112) did not own a pet but interacted daily with one or more pets they live with. Dogs were the most frequently endorsed pet (69/112, 61.1%) followed by cats (35/112, 31.0%), other pets (3/112, 2.7%), rodents (2/112, 1.8%), reptiles (2/112, 1.8%), and birds (1/112, 0.9%).

“Other pets” included fish, an axolotl (a type of salamander), and rabbits (which are part of the order Lagomorpha rather than the order Rodentia). One participant did not report the type of animal they owned, but did designate they were a pet owner. 17.9% (20/112) of students reported their pet was an Emotional Support Animal (ESA), with one participant not reporting whether their cat was an ESA or not. Non-pet owners reported spending at least 30 minutes/day with the pet(s) they live with while owners reported spending anywhere from no daily time with their pet due to being away from their pet at university to 90% of the time they are awake.

Descriptive statistics for the study measures are presented in Table 2. Nearly half of the students (61/112, 54.5%) scored ≥ 16 on the CES-D, the cutpoint warranting further assessment for clinical depression. This proportion was much larger than that of the non-psychiatric population in Levenstein’s original study (15 or 19% depending on timepoint). Students’ mean scores were comparable to those previously reported on the PSQ (Montero-Marin et al. 2014 in a sample of dental students) and on the LAPS (Johnson et al., 2015 among white participants and participants aged 18-39). Students’ scores on the PSS were slightly elevated (about five points higher) compared to the student sample in the original work by Cohen and colleagues (1983). The mean score on the LES ($M = -4.3$) indicates that, on average, this sample of students perceived a more negative than positive impact from life events they experienced over the past year, although the standard deviation ($SD = 21.1$) supports wide individual variability around that.

Aim 1: Is there a significant association between pet attachment and the mental health outcomes: perceived stress, COVID-19-related stress, depression symptoms, and impact of recent life events?

Table 3 presents the bivariate correlations between potential covariates (sex, race and ethnicity, and year in school), the predictor variables (life experience as measured by LES total score and level of pet attachment as measured by LAPS score), and the outcome variables (CES-D, PSS, PSQ, and CSSQ total scores). Contrary to hypothesis, pet attachment as measured by the LAPS score was not significantly correlated with any of the mental health outcome variables, all $ps > .05$. The Pearson correlations between the LAPS and these outcome variables were very small, ranging from $r = .01$ on the CES-D to $.13$ on the PSQ.

There were significant correlations between sex assigned at birth and each of the four mental health outcomes variables, with higher scores among female-identified than male-identified participants. Although statistically significant, sex had very weak positive correlations with CES-D $\{r(110) = .26, p = .005\}$, PSS $\{r(110) = .22, p = .02\}$, PSQ $\{r(110) = .27, p = .004\}$, and CSSQ $\{r(110) = .26, p = .006\}$. Year in school (lower/upperclassmen) was found to be significantly, but very weakly, correlated with LES total score $\{r(110) = -.24, p = .01\}$ and with none of the four mental health outcome variables (all $ps > .05$). The race and ethnicity combined variable distinguishing white, non-Hispanic/Latino(a)-identifying persons from those who identified otherwise was not significantly correlated with any of the four mental health outcomes or with LES total score ($ps > .05$). Therefore, sex assigned at birth was the only demographic covariate included as a potential predictor in the hierarchical regressions for Aim 2.

As expected, the mental health outcomes were significantly correlated with each other, with the strongest correlation between the two general stress measures, PSS and PSQ $\{r(110) = .81, p < .001\}$. Perceived general stress was also significantly and positively associated with depression severity on the CES-D $\{r(110) = .80, p < .001$ with the PSQ and $r(110) = .76, p < .001$ with the PSS}.

Perceived impact of life events as assessed by LES total score was significantly and negatively correlated with CES-D $\{r(110) = -.33, p < .001\}$, PSS $\{r(110) = -.32, p < .001\}$, PSQ $\{r(110) = -.34, p < .001\}$, and CSSQ scores $\{r(110) = -.17, p = .07\}$, indicating that depression and stress decreased as the perceived positive impact of recent life events increased.

Aim 2: Does pet attachment interact with impact of recent life events to predict perceived stress, COVID-19-related stress, and depression symptoms?

Tables 4-7 show the results of the hierarchical regressions for all models, steps 1 through 3 for each outcome variable (CES-D, PSS, PSQ, and CSSQ). The final model was significantly predictive of scores on the CES-D, $(F(4, 107) = 10.13, p < .001)$, PSS $(F(4, 107) = 6.04, p < .001)$, PSQ $(F(4, 107) = 7.72, p < .001)$, and CSSQ $(F(4, 107) = 2.81, p = .03)$.

After introducing the interaction term into the final step of the hierarchical regression, the individual variables found to be significant predictors are as follows: Sex was significantly predictive of CES-D $(\beta = .263, t(107) = 3.19, p = .002, 95\% \text{ CI } [3.89, 16.67])$, PSS $(\beta = .217, t(107) = 2.48, p = .02, 95\% \text{ CI } [1.12, 10.07])$, PSQ $(\beta = .261, t(107) = 3.05, p = .003, 95\% \text{ CI } [5.18, 24.41])$, and CSSQ $(\beta = .254, t(107) = 2.75, p = .007, 95\% \text{ CI } [1.39, 8.51])$. Female-identified participants had higher levels of symptomatology on each measure relative to male-identified participants. LES total change score was significantly predictive of only CES-D, $(\beta = 1.43, t(107) = 3.05, p = .003, 95\% \text{ CI } [.289, 1.36])$ ¹. LAPS score was not significantly predictive of any of the mental health outcomes $(ps > .05)$.

The interaction of LES and LAPS was significantly predictive of CES-D $(\beta = -1.84, t(107) = -3.82, p < .001, 95\% \text{ CI } [-.04, -.01])$, PSS $(\beta = -1.04, t(107) = -2.07, p = .041, 95\% \text{ CI } [-.04, -.01])$.

¹ When examining the main effect of LES prior to the addition of the interaction term, the beta was negative, which is in line with previous research that more negative life events increase depression. Due to the nature of LES, it was inappropriate to mean center this variable. Therefore, the main effects should be interpreted as they are presented prior to introducing the interaction term.

[-.02, .00]), and PSQ ($\beta = -1.12$, $t(107) = -2.28$, $p = .025$, 95% CI [-.04, -.003]). The addition of the interaction term to the model explained an additional 10% of the variance in CES-D scores, 3% of the variance in PSS scores, 4% of the variance in PSQ scores, and 0.1% of the variance in CSSQ scores.

Finally, interaction analyses were conducted to understand how life events (LES total score) influenced the relationship between pet attachment (LAPS score) and the outcome variables (CES-D, PSS, and PSQ) with sex as a covariate. The interaction of LAPS and LES on CES-D controlling for sex is depicted in Figure 1. When level of pet attachment was relatively low (-1 SD from the sample mean on the LAPS), students' depression scores were comparable regardless of whether they endorsed a more negative (-1 SD below the sample mean on the LES), average (at the sample mean on the LES), or more positive (+1 SD above the sample mean on the LES) impact of recent life events. As illustrated in Figure 1, the differential effect of pet attachment on depression, depending on perceived impact of life events, is apparent at the sample mean for pet attachment and even more pronounced at one SD above that sample mean. At mean level of pet attachment (sample mean on the LAPS), students with more negative perceived impact of life events (-1 SD from mean LES) showed higher depression on the CES-D as compared to students at the mean LES score and showed even higher depression as compared to students with more positive perceived impact of life events (+1 SD from mean LES). This same pattern was evident for students with relatively high pet attachment (+1 SD from mean LAPS), with even larger differences in depression severity based on perceived impact of life events. Students with high attachment and more positive perceived impact of life events showed the lowest depression scores, whereas students with high pet attachment and more negative impact of life events showed the highest depression scores. Stated differently, there was no effect

of pet attachment on depression at average levels of impact of life events (sample mean LES score); there was a positive effect of pet attachment on depression when life events were perceived as having a more negative impact (-1 SD from mean LES), such that higher pet attachment was associated with higher depression; and there was a negative effect of pet attachment on depression when life events were perceived as having a more positive impact (+1 SD above mean LES), such that higher pet attachment was associated with lower depression.

The general pattern of results observed for the CES-D was replicated on the PSS and PSQ. These interactions are depicted in Figures 2 and 3.

Discussion

Aim 1

For the first aim of this study, we hypothesized that there would be a significant negative correlation between pet attachment and mental health during the pandemic, such that higher pet attachment scores are associated with better mental health outcomes, specifically lower depression, general and COVID-specific stress, and perceived impact of recent life events. This aim was tested with bivariate correlations between pet attachment (scores on the Lexington Attachment to Pets Scale; LAPS) and the four outcome variables: scores on measures of depression (Center for Epidemiologic Studies Depression Scale; CES-D), perceived stress (Perceived Stress Questionnaire; PSQ and Perceived Stress Scale; PSS), and COVID-specific stress (COVID-19 Student Stress Questionnaire; CSSQ). The LAPS was not significantly correlated with any of these outcomes, and the Pearson correlation coefficients were quite small. Pet attachment on the LAPS was also not significantly correlated with perceived impact of recent life events (total score on the Life Experiences Survey; LES). Therefore, contrary to hypothesis, this study found no evidence for a simple association between pet attachment and depression,

perceived stress, COVID-specific stress, and perceived impact of recent life events in this college student sample.

Smolkovic et al. (2012) describe previous work by Stallones and colleagues in 1990 who found that higher pet attachment was only associated with lower depression and loneliness when owners had a limited number of meaningful interpersonal relationships. Mahalski, Jones, and Maxwell (1988) replicated this finding in their study with cat owners (Smolkovic et al., 2012). It is possible that students with high pet attachment in the current study have meaningful relationships with other people, but unfortunately this was not measured in the study.

Perceived impact of life events (LES total score) was significantly and negatively correlated with CES-D, PSS, and PSQ scores, although the magnitude of correlation was relatively weak in each case. This finding indicates that as LES total score increased (towards more perceived positive impact of recent life events), depression and perceived stress decreased in this sample.

Aim 2

In regards to the second aim of this study, the a priori hypothesis was for a significant interaction between pet attachment and impact of recent life events. We hypothesized that higher perceived negative impact of recent life events would be associated with higher depression and stress scores, with a stronger association for students with relatively low pet attachment and a weaker association for students with relatively high pet attachment, consistent with of a buffering effect of high pet attachment in the context of negative life events. Conversely, we hypothesized higher perceived positive impact of recent life events would be associated with lower depression and stress scores, with a stronger association for students with relatively high pet attachment and

a weaker association for students with relatively low pet attachment, consistent with a mood enhancing effect of high pet attachment in the context of positive life events.

Hierarchical regressions models testing the main effects of pet attachment on the LAPS, impact of recent life events using LES total score, and their interaction, after controlling for sex assigned at birth were significantly predictive of CES-D, PSS, PSQ, and CSSQ; however, the interaction term may have introduced noise into the model for predicting CSSQ. For CSSQ, the final model introducing the interaction term decreased the predictive value as compared to the previous model with sex and the main effects of LES and LAPS (p increased from .01 to .03 from model 2 to model 3), although the final model was still statistically significant.

Regarding which variables contributed to the overall models' predictive ability, sex was a significant predictor in all hierarchical regression models. This suggests that a person's sex assigned at birth had a significant influence on their level of depression and stress (both recently-perceived, general, and COVID-related), such that female-identified participants had higher scores than male-identified participants. The interaction of LES and LAPS was significantly predictive of all outcomes except CSSQ, but individually at the level of main effects, LAPS was not significantly predictive, and LES was only significantly predictive of CES-D. Therefore, perceived impact of life events was predictive of depression severity, but was not predictive of stress. Instead, this study found that the interaction of perceived impact of recent life events and pet attachment predicted general stress, as well as depression in this sample.

Results showed partial support for our second hypothesis because the LAPS X LES interaction term was a significant predictor for depression and general stress, but not for COVID-19-related stress. However, the direction of the interaction effect was not entirely consistent with the a priori hypothesis. Referring to the illustration of pet attachment and impact of life events

shown in Figures 1-3, with more negative perceived impact of recent life events, depression and stress scores increased as pet attachment increased. With more positive perceived impact of life events, depression and stress scores decreased as pet attachment increased. At average levels of perceived impact of life events, level of pet attachment was unrelated to depression and stress. This observed pattern of results was consistent across the CES-D, PSS, and PSQ, but the strength of the associations between pet attachment and mental health depending on more negative vs. more positive perceived impact of life events was stronger (steeper slopes) on the CES-D than on the two general stress measures. Of note, “average” levels of perceived impact of life events correspond to the sample mean on the LES ($M = -4.3$), which indicates a more negative than positive overall impact of recent life events on average in the sample. The more negative valence of recent life events, on average, may be reflective of the fact that just over 40% (46/112, 41.1%) of the respondents reported the death of someone in their life within the past year (a family member, friend, or partner) on the LES.

These trends partially support the second hypothesis because depression and general stress scores increased with higher perceived negative impact of life events (depression level is consistently higher on the navy line in Figure 1 than on the purple and red lines). The study also found that higher perceived positive impact of life events was associated with lower depression and stress scores (depression level is consistently lower on the red line in Figure 1 than on the purple or navy lines). However, contrary to hypothesis, among students with relatively low pet attachment, depression and perceived stress scores were not differentially affected depending on whether they experienced more negative, average, or more positive life events. Per the a priori hypothesis, the highest depression and stress scores were expected in students with low pet attachment and more negative impact of recent life events. Instead, students with *high* pet

attachment and more negative impact of recent life events had the highest depression and stress scores. The pattern of results for more positive perceived impact of life events was consistent with the a priori hypothesis: Students with high pet attachment and more positive impact of recent life events had the lowest depression and stress scores, consistent with a potential mood enhancing effect of pet attachment on positive life experiences.

These results suggest that students with higher pet attachment styles may be more strongly influenced by both positive and negative life events, with mood enhancing and exacerbating effects, respectively. That begs the question: What is it about strong pet attachment that might confer greater mood reactivity to negative and positive life events? Assuming that students who are highly attached to their pets turn to their pets when they experience negative and positive life events, the pet may enhance a human's good mood by showing excitement or approach behaviors and may worsen a human's bad mood by withdrawing or supporting rumination behaviors in the human (e.g., thinking about how badly they feel as they stroke their pet). Rather than transactions in human/pet interactions, it is possible that high pet attachment is correlated with another construct that explains these associations, such as over-relying on the pet over humans for social support when experiencing positive and negative mood in response to life events, such that another person is not available to aid in problem-solving when mood is worst.

This study is a cross-sectional study, with single assessment, precluding any conclusions about direction of relationships. It remains possible that more extreme mood fluctuations in response to negative and positive impact of life recent events fosters higher pet attachment, perhaps as more emotionally labile students turn to their pets for comfort and joy in these contexts.

Strengths, Limitations, and Future Directions

To the author's knowledge, this is the first study to combine topics on human-animal bond, college student stress, and mental health during the pandemic. Previous research had incorporated only two of these three topics at a time, such as Nieforth and O'Haire's study that found people are turning to pets for support during the uncertainty of the pandemic (2020). This study expands upon the literature by including the college student population as well as valid measures of depression, stress, and life events to understand the relationship between pet attachment and mental health outcomes during the pandemic.

There are several limitations of this study. First, the sample size is relatively small (112 students) and the resulting sample was quite homogenous, consisting primarily of a white, non-Hispanic/Latino(a), female-identified individuals. Additionally, beyond asking if participants were aged 18 or older, we did not ask participants to report their age and the study did not assess other factors that may have influenced their depression or stress [e.g., level of physical activity/exercise, current and past history of mood and anxiety disorders, antidepressant and anxiolytic medication status, whether or not they engage in psychotherapy or mental health services (and if so, how long)]. As a major limitation, the study did not include a measure of attachment to human figures or perceived social support derived from human interactions. It remains possible that students with relatively higher pet attachment had relatively lower attachment to humans and/or derived lower social support from their human relationships compared to students with relatively lower pet attachment. Alternatively, it is possible that higher pet attachment may be associated with higher attachment, in general, as was reported in older women (Krausse-Parello, 2012). The study was conducted in the Fall 2022 semester, after the University of Vermont had returned to fully in-person instruction and had no masking requirements. Ideally, the study would have been conducted early in the pandemic (e.g., in

Spring 2020 after UVM went fully remote or in Fall 2020 when most courses were remote and masking/social distancing policies were in place). Furthermore, the study sample did not include enough non-pet owners to conduct the comparison of pet owners and non-pet owners as originally intended. There may have been confusion or multiple interpretations of the word “owner” in the survey, and this term should be clearly defined in future work. For example, the researcher interpreted “pet owner” as somebody who is responsible for the regular care of their pet, whereas a participant may have interpreted “pet owner” as the person who is legally/officially documented as the “purchaser” of the pet. Here, we included participants who endorsed interacting daily with a pet they live with and/or identified as a pet owner. Beyond this study’s open response question (i.e., “How much time do you spend with your pet per day on average?”), future studies should better assess the frequency and quality of pet/student interactions.

As an important limitation, this data was collected cross-sectionally (i.e., at a single snapshot in time) and is silent on directionality of effects. These results could indicate that strong pet attachment confers greater mood reactivity to negative and positive life events, that greater mood reactivity to negative and positive life events fosters stronger pet attachment, or that some third variable is responsible for the relationship between higher pet attachment and greater mood reactivity to life events. It is possible that pet attachment is a dynamic rather than a stable, trait-like construct. Future longitudinal studies should repeatedly assess pet attachment, depression, stress, and life events over time in students, including time during the academic semester and over winter and summer breaks when students may be able to spend more time with pets that live at their permanent residence with parents or guardians. Repeated assessments can inform whether pet attachment is a relatively stable construct that predicts mood reactivity to positive

and negative life events, whether a change in pet attachment precedes and predicts a later change in mood, and whether a change in mood precedes and predicts a later change in pet attachment.

Future research should attempt to compare pet owners and non-pet owners, as was the original intent of this study, as well as include a more diverse, representative sample of not only college students, but potentially other age groups (e.g., younger kids, geriatric population). Future studies should include measures of human attachment and control for this construct to more specifically examine pet attachment above and beyond human attachment as a predictor of mental health. Finally, it may be important to modify the LES to specifically include an item asking about pet death, as one participant wrote that event in. Additionally, mood measures should include measures of positive, as well as negative, affect to capture positive emotions in response to positive life events, aside from feeling less depressed or stressed. Future research should also investigate if pet attachment is associated with overall interpersonal attachment. Currently there is some literature that indicates these forms of attachment are not associated with each other (Smolkovic et al., 2012) while others have indicated that they *are* associated (Krause-Parello, 2012).

Global events as impactful as the Covid-19 pandemic do not happen frequently, and it may be meaningful to study pet attachment in the context of other events that impact the public negatively on a large scale such as natural disasters (especially for people who are separated from their pets due to displacement) or acts of terrorism (such as school shootings).

Table 1*Demographic characteristics of the study sample (N = 112)*

| Variable | No. (%) |
|--|----------------|
| Sex Assigned at Birth | |
| Male | 12(10.7) |
| Female | 100(89.3) |
| Gender | |
| Male | 13(11.6) |
| Female | 90(81.3) |
| Non-binary | 8(7.1) |
| Not reported | 1 (0.9) |
| Race | |
| American Indian | 0(0.0) |
| Asian | 5(4.5) |
| Black | 2(1.8) |
| Native Hawaiian or Other Pacific Islander | 0(0.0) |
| White | 102(91.1) |
| Mixed or Other Race | 3(2.7) |
| Ethnicity | |
| Hispanic/Latino(a) | 4(3.6) |
| Non-Hispanic/Latino(a) | 108(96.4) |

**White/Non-Hispanic vs. Ethnic
and/or Racial Minority**

White and Non-
Hispanic/Latino(a) 99(88.4)

Non-White and/or
Hispanic/Latino(a) 13(11.6)

Marital status

Married 0(0.0)

Divorced 0(0.0)

Widowed 0(0.0)

Single 107(95.5)

Living together 5(4.5)

Year in School

First-Year 1(0.9)

Sophomore 40(35.7)

Junior 48(42.9)

Senior 23(20.5)

Underclassmen (First-Years and
Sophomores) 41(36.6)

Upperclassmen (Juniors and
Seniors) 71(63.4)

Table 2*Descriptive statistics for study measures*

| Measure | Mean (<i>M</i>) | Standard Deviation (<i>SD</i>) |
|---------|-------------------|----------------------------------|
| LAPS | 49.5 | 9.8 |
| LES | -4.3 | 21.1 |
| CSSQ | 10.0 | 6.0 |
| PSS | 28.8 | 8.0 |
| PSQ | 76.7 | 17.6 |
| CES-D | 20.2 | 12.1 |

Note: LES = Life Experiences Survey total score, CSSQ = COVID-19 Student Stress Questionnaire, LAPS = Lexington Attachment to Pets Scale, PSS = Perceived Stress Scale, PSQ = Perceived Stress Questionnaire, CES-D = Center for Epidemiologic Studies Depression Scale.

Table 3

Correlations between demographic characteristics (sex assigned at birth, race and ethnicity, and year in school), predictor variables (LES and LAPS total scores), and study outcome variables (CES-D, PSS, PSQ, and CSSQ)

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|------------------------------------|------|------|------|------|------|------|------|------|----|
| 1. Sex ^a | -- | | | | | | | | |
| 2. Race and Ethnicity ^b | .15 | -- | | | | | | | |
| 3. Year in School ^c | .10 | -.10 | -- | | | | | | |
| 4. CES-D | .26 | -.11 | .13 | -- | | | | | |
| 5. CSSQ | .26 | .03 | .14 | .41 | -- | | | | |
| 6. PSQ | .27 | .01 | .12 | .80 | .36 | -- | | | |
| 7. LAPS | .07 | .04 | .04 | .04 | .01 | .13 | -- | | |
| 8. PSS | .22 | -.03 | .13 | .76 | .36 | .81 | .08 | -- | |
| 9. LES | -.03 | .08 | -.24 | -.33 | -.17 | -.34 | -.15 | -.32 | -- |

Note: Italics = $p < .05$. CES-D = Center for Epidemiologic Studies Depression Scale, CSSQ = COVID-19 Student Stress Questionnaire, PSQ = Perceived Stress Questionnaire, LAPS = Lexington Attachment to Pets Scale, PSS = Perceived Stress Scale, LES = Life Experiences Survey.

^aSex was coded as 1 = Male, 2 = Female

^b0 = Non-White and/or Hispanic/Latino(a), 1 = White and Non-Hispanic/Latino(a)

^c0 = Lowerclassman (first year/sophomore), 1 = Upperclassman (junior/senior)

Table 4

Individual variables as predictors of Center for Epidemiologic Studies-Depression Scale (CES-D) score

| Variable | Beta | S.E. | t | p | R² | Δ R² |
|-----------------|-------------|-------------|----------|----------|----------------------|------------------------|
| Step 1 | | | | | .07 | .07 |
| Sex | .26 | 3.59 | 2.86 | .005* | | |
| Step 2 | | | | | .18 | .11 |
| Sex | .26 | 3.42 | 2.93 | .004* | | |
| LES | -.33 | .05 | -3.74 | <.001* | | |
| LAPS | -.03 | .11 | -.35 | .73 | | |
| Step 3 | | | | | .28 | .10 |
| Sex | .26 | 3.22 | 3.19 | .002* | | |
| LES | 1.43 | .27 | 3.05 | .003* | | |
| LAPS | -.15 | .11 | -1.72 | .09 | | |
| LAPS X LES | -1.81 | .006 | -3.82 | <.001* | | |

*denotes a significant *p*-value, *p* < .05

Table 5

Individual variables as predictors of Perceived Stress Scale (PSS) score

| Variable | Beta | S.E. | t | p | R² | Δ R² |
|-----------------|-------------|-------------|----------|----------|----------------------|------------------------|
| Step 1 | | | | | .05 | .05 |
| Sex | .22 | 2.40 | 2.40 | .02* | | |
| Step 2 | | | | | .15 | .10 |
| Sex | .21 | 2.29 | 2.40 | .02* | | |
| LES | -.32 | .03 | -3.52 | <.001* | | |
| LAPS | .02 | .07 | .21 | .84 | | |
| Step 3 | | | | | .18 | .03 |
| Sex | .22 | 2.26 | 2.48 | .02* | | |
| LES | .70 | .19 | 1.40 | .16 | | |
| LAPS | -.05 | .08 | -.55 | .58 | | |
| LAPS X LES | -1.04 | .004 | -2.07 | .04* | | |

*denotes a significant *p*-value, *p* < .05

Table 6*Individual variables as predictors of Perceived Stress Questionnaire (PSQ) score*

| Variable | Beta | S.E. | t | p | R² | Δ R² |
|-----------------|-------------|-------------|----------|----------|----------------------|------------------------|
| Step 1 | | | | | .07 | .07 |
| Sex | .27 | 5.21 | 2.94 | .004* | | |
| Step 2 | | | | | .19 | .11 |
| Sex | .26 | 4.94 | 2.94 | .004* | | |
| LES | -.32 | .07 | -3.66 | <.001* | | |
| LAPS | .07 | .16 | .74 | .46 | | |
| Step 3 | | | | | .22 | .04 |
| Sex | .26 | 4.85 | 3.05 | .003* | | |
| LES | .77 | .41 | 1.58 | .12 | | |
| LAPS | -.01 | .17 | -.12 | .91 | | |
| LAPS X LES | -1.12 | .009 | -2.28 | .03* | | |

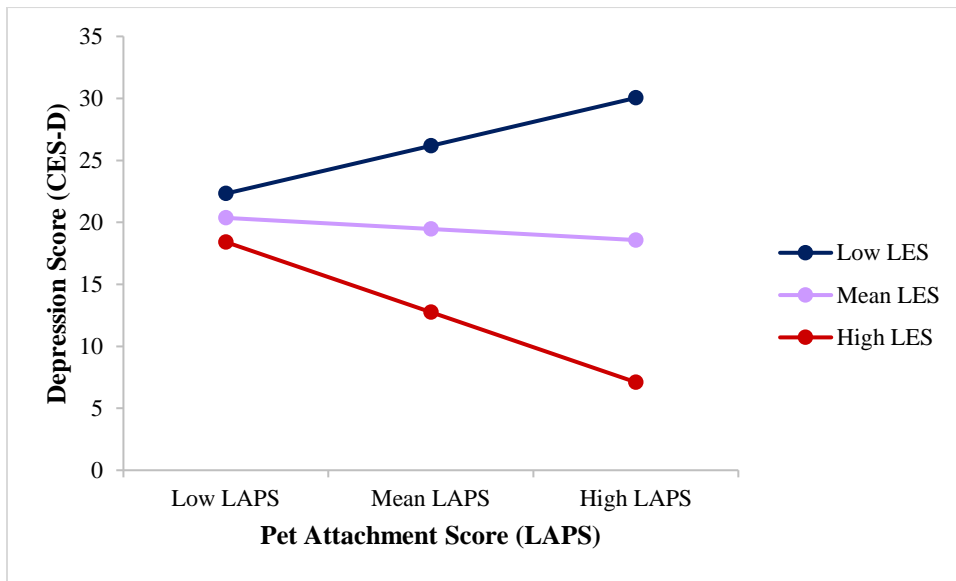
*denotes a significant *p*-value, *p* < .05**Table 7***Individual variables as predictors of COVID-19 Student Stress Questionnaire (CSSQ) score*

| Variable | Beta | S.E. | t | p | R² | Δ R² |
|-----------------|-------------|-------------|----------|----------|----------------------|------------------------|
| Step 1 | | | | | .07 | .07 |
| Sex | .257 | 1.794 | 2.787 | .006* | | |
| Step 2 | | | | | .09 | .03 |
| Sex | .255 | 1.787 | 2.773 | .007* | | |
| LES | -.170 | .027 | -1.841 | .068 | | |
| LAPS | -.032 | .057 | -.348 | .729 | | |
| Step 3 | | | | | .10 | .001 |
| Sex | .254 | 1.796 | 2.754 | .007* | | |
| LES | -.316 | .150 | -.603 | .548 | | |
| LAPS | -.022 | .062 | -.221 | .825 | | |
| LAPS X LES | .150 | .003 | .282 | .778 | | |

*denotes a significant *p*-value, *p* < 0.05

Figure 1

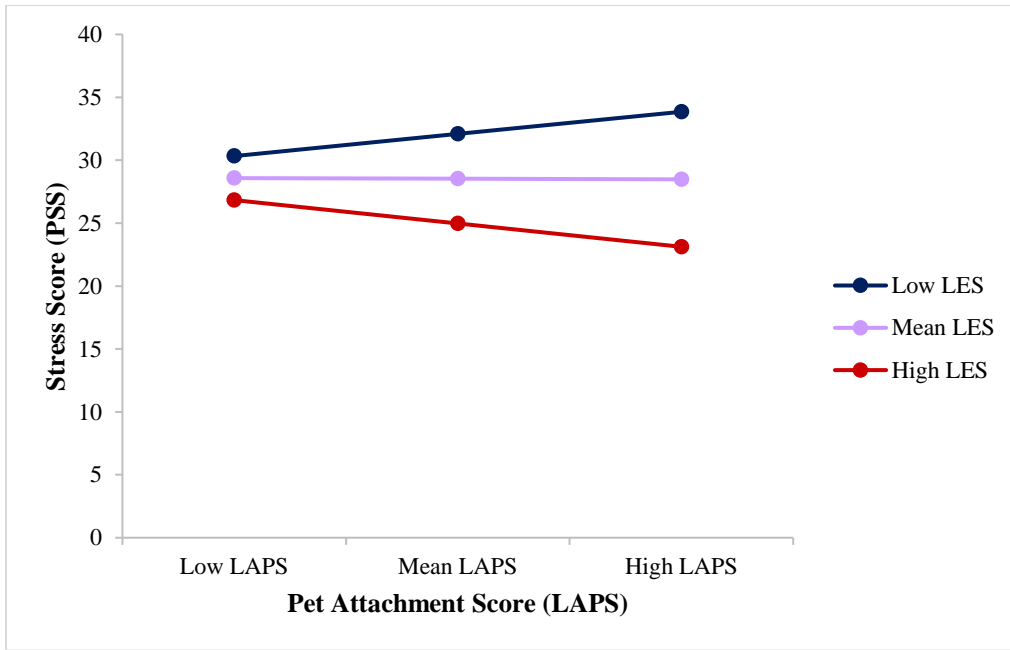
The interactive effect of LES and LAPS scores on CES-D score



Note: Low, mean, and high refer to scoring -1 SD below the sample mean, at the sample mean, and +1 SD above the sample mean, respectively. Low LES (LES total score of -25.4) indicates more negative perceived impact of recent life events, whereas high LES (LES total score of +16.8) indicates more positive perceived impact of recent life events.

Figure 2

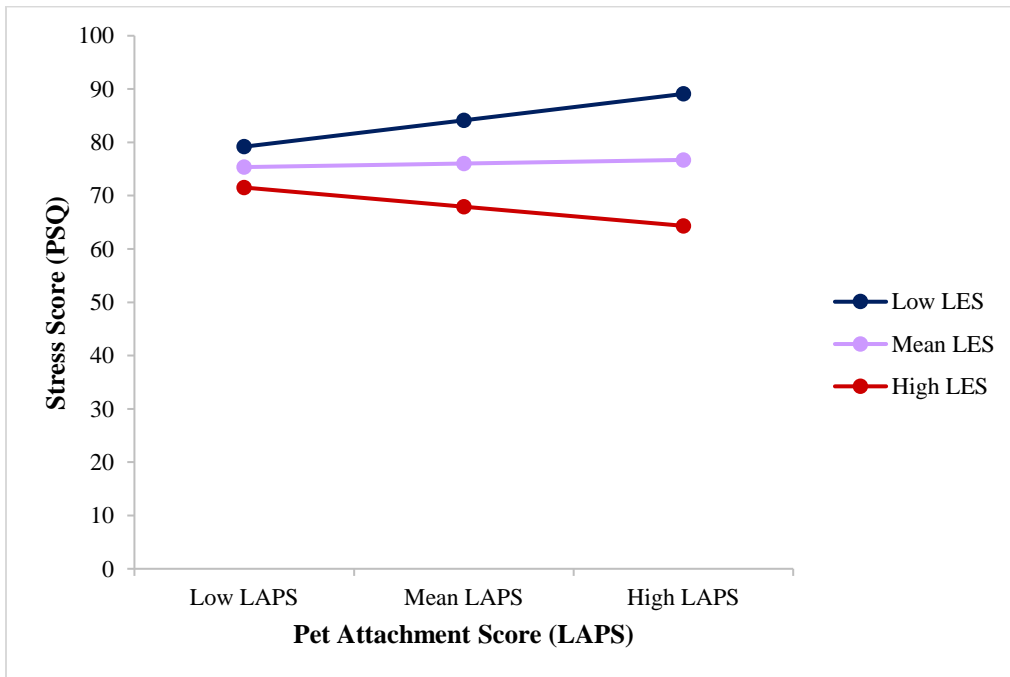
The interactive effect of LES and LAPS scores on PSS score



Note: See the note in Figure 1 regarding the interpretation of low, mean, and high.

Figure 3

The interactive effect of LES and LAPS scores on PSQ score



Note: See the note in Figure 1 regarding the interpretation of low, mean, and high.

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Appendix A

Generic Pet Questions

**If you have multiple pets, please rate the one you connect most with where applicable*

Please "Submit" to move on to the next survey if you do not have a pet.

1. What type of pet do you have?

Dog

Bird

Cat

Other (please specify):

Rodent

Reptile

2. Are you the owner of this pet?

Yes

No

3. How old is your pet currently? _____

4. How old was your pet when you got them? _____

5. How did you obtain your pet?

Rescue/adopted from a shelter

Breeder

Pet store

From a friend or family member

Other (please specify): _____

6. Is your pet considered an emotional support animal (ESA) or companion animal?

Yes

No

7. How much time do you spend with your pet per day on average? _____

8. Select the option that best describes your pet:

- Indoor pet only
- Primarily indoor pet
- Outdoor pet only
- Primarily outdoor pet
- Equally indoor and outdoor pet
- Other (please specify): _____

9. How many total pets do you live with?

- 1
- 2
- 3
- 4+

