Indicators of poor health such as sedentary behavior, fast food consumption, obesity, and tobacco use tend to increase as adolescents transition into adulthood (Harris, Gordon-Larsen, Chantala, & Udry, 2006). Moreover, poor health behaviors during adolescence can increase the risk of chronic disease in adulthood (Daw, Margolis, & Wright, 2017; Kwan, Cairney, Faulkner, & Pullenayegum, 2012; Tabak, Piyal, Celen, Karakoc, & Ozen, 2009). Although there is some debate as to the exact ages that define adolescence, it is commonly thought to encompass ages 10 to 24 (Sawyer, Azzopardi, Wickremarathne, & Patton, 2018). This developmental period may be one of the best times to implement interventions to improve health and establish healthy habits that may persist across the lifespan. There are four primary reasons for this.

First, adolescence is a time period during which individuals are often given more freedom and independence; this may translate into more free time, access to spending money, and decision-making power (Bryan et al., 2016). For example, adolescents may be more likely to stop at a fast food restaurant on their way home from school compared with younger children. Second, relative to younger children, adolescents have the cognitive capacity to understand health information that is presented to them (Icenogle et al., 2019). This is due to their developing ability to consider future possibilities rather than solely what is happening in the current moment (Steinberg, 2002). For
example, adolescents can better comprehend the long-term consequences of smoking and unhealthy eating relative to younger children (Baranowski, Cullen, Nicklas, Thompson, & Baranowski, 2002). Third, adolescence is a time during which identity formation occurs, of which health values are a crucial component (Kroger, 2004). Lastly, the adolescent brain is developmentally plastic; it is malleable depending on life experiences (Steinberg, 2014). As such, it is important to establish healthy behaviors during adolescence while the brain is still plastic, before the adult brain becomes increasingly rigid. In sum, adolescence may be a critical period for establishing healthy behaviors because of adolescents’ increased freedom, cognitive ability to comprehend health concepts, formation of identity and behaviors, and brain plasticity.

In particular, emerging adulthood—a time in adolescence that spans ages 18 to 25—may be key to establishing healthy behaviors because it is a period in the lifespan during which the most identity exploration is likely to occur (Arnett, 2000). Moreover, common themes that are characteristic of emerging adulthood are accepting responsibility for oneself and making independent decisions (Arnett, 1997). Emerging adulthood is a time during which individuals often focus on developing into self-sufficient people, and the choices they make and habits they form have enduring ramifications for the rest of their lives (Arnett, 2000). As such, emerging adulthood may be an ideal time for implementing interventions to improve health behaviors.

Although adolescence in general and emerging adulthood in particular may be a key time for health behavior interventions, some interventions targeted at this population have yielded inconsistent success. For example, in a meta-analysis of more than 60 programs designed to prevent obesity in children and adolescents, only approximately 1 out of 5 programs yielded significant effects; moreover, the average effect in preventing weight gain was relatively small with $r = .04$ (Stice, et al., 2006). This may be due to a variety of factors including the duration of the intervention, the age of the participants, or the specific health behaviors that were targeted (Stice et al., 2006). Effective interventions may be fairly time-intensive and require an average duration of 40 hours (Stice et al., 2006). In addition, the particular behavior that is targeted by the intervention may influence effectiveness; effects tended to be larger for interventions focused on preventing obesity rather than focusing on other areas of health such as preventing eating disorders or increasing physical activity (Stice et al., 2006). Finally, how information is delivered in the intervention may influence effectiveness. For example, evidence regarding the relationship between obesity prevention programs and the prevalence of eating disorders among adolescents indicates that certain modes of delivering health information can be disadvantageous because adolescents may misinterpret obesity prevention messages by eliminating supposed “bad” or “unhealthy” foods, which may lead to the presence of an eating disorder (Sim, Lebow, & Billings, 2013). This suggests that the design, target, and messages promoted in the intervention are all important considerations in the development of health behavior interventions.

Although recent research has shed light on what not to do when advising adolescents about their health (e.g., using weight-based language; Golden, Schneider, & Wood, 2016), less research is available to suggest effective ways to guide them toward improving their health. In a report on improving the health behaviors of adolescents, the World Health Organization (2018) suggested that future research should consider how health-related interventions foster adolescents’ needs for autonomy, empowerment, engagement, and positive development. This is consistent with the literature from developmental psychology, which suggests that the specific period of emerging adulthood is when individuals typically grapple with tasks such as making independent decisions, taking responsibility for oneself, and developing self-sufficiency (Arnett, 2000).

Taken together, three main messages emerge in this area of research: (a) Emerging adulthood is a crucial period for establishing health behaviors given the sensitive period and the potential for future health implications; (b) the methods by which health interventions are implemented are important in addition to the content; and (c) the aforementioned implementation method of health interventions should consider emerging adults’ developmental needs for autonomy and empowerment. Thus, it is important for researchers and health professionals to ask the following question: How can the developmental need for autonomy and empowerment be acknowledged and utilized in successful health interventions for emerging adults? Although research specific to emerging adults is limited, research about general adolescent behavior and reactions to autonomy—or lack thereof—sheds some light on the topic.
Past work has suggested that adolescents react negatively to external criticism. In one study, healthy adolescents’ brains were scanned as they listened to recordings of their mothers criticizing them (Lee, Siegle, Dahl, Hoover, & Silk, 2015). In this context, researchers found that adolescents showed increased activity in brain areas that are often associated with “processing negative feedback, physical/social pain and negative emotions” (Lee et al., 2015, p. 907), indicating a negative response. Another study examined the relationship between parental criticism and somatic symptoms (e.g., headaches, vomiting, or nausea without a medical diagnosis) among parent-adolescent dyads (Horwitz et al., 2015). The results suggested that parental criticism is a contributing factor to adolescent somatic symptoms, likely because parental criticism disrupts adolescents’ stress responses (Horwitz et al., 2015). Taken together, these studies suggest that adolescents tend to react negatively to external criticism.

By contrast, recent research has suggested that adolescents react positively to autonomy-boosting environments that foster the development of emotional autonomy. For example, one adolescent health intervention harnessed common adolescent values (e.g., autonomy and social justice) by presenting preadolescents in the experimental condition with an article about the food industry (Bryan et al., 2016). The article depicted the food industry as manipulative by making junk food addictive and advertising to children who do not know how to distinguish between what is healthy or unhealthy. It went on to say that people could take a stand against the manipulative food manufacturing industry by engaging in healthy eating behaviors. By framing health behaviors as a way to assert autonomy—the latter of which is a hallmark task of adolescence (Allen, Hauser, Bell, & O’Connor, 1994)—the intervention was successful in improving the health profile of snacks and drinks that adolescents chose in an unrelated social context one day postintervention (Bryan et al., 2016). This implies that health behaviors may be one way by which adolescents exert feelings of autonomy (Bryan et al., 2016).

The polarity between the reactions of the adolescents in the studies discussed above—adolescents’ negative emotions evoked by hearing parental criticism and adolescents’ increase in healthy behaviors when told that behavioral choice was a way to assert autonomy—suggests that adolescents may react negatively to external advice and criticism, but positively to autonomy-boosting environments. The dichotomy can be understood by applying the concept of locus of control, which is the belief in the extent to which individuals can control their life outcomes (Rotter, 1966). Individuals with an internal locus of control believe they are in control of their life outcomes; individuals with an external locus of control believe outside forces are in control of their life outcomes (Rotter, 1966). In applying the concept of locus of control to the situations mentioned above, adolescents reacted negatively to a situation in which they had an external locus of control (i.e., their mothers were criticizing them) and reacted positively to a situation in which they had an internal locus of control (i.e., they had an opportunity to make autonomous choices about their health). Applying locus of control to adolescent behaviors and reactions prompts the following question: Are effective health interventions those that encourage adolescents to adopt an internal locus of control? To explore whether locus of control can be used to understand adolescent health behaviors and create an effective adolescent health intervention, locus of control specific to the domain of health can be examined.

Health locus of control (HLOC) is defined by individuals’ beliefs about who or what is in control of their health (Tabak et al., 2009). Similar to general locus of control (Rotter, 1966), HLOC can be classified into components including internal, powerful others, and chance HLOC (Wallston, Wallston, & DeVellis, 1978). One correlational study examined the relationship between adolescents’ health behaviors and their HLOC scores and found a positive association between internal HLOC and healthy behaviors, such as milk-drinking behavior (Tabak et al., 2009). Further, there was an inverse association between internal HLOC and risky health behaviors, such as eating fried foods (Tabak et al., 2009). Although promising, these findings were cross-sectional; thus, it is unclear whether HLOC and healthy behaviors are causally related.

To investigate this phenomenon and address gaps specified by the World Health Organization (2018), the present experiment was designed to target internal HLOC and investigate its effects on health behavior. More specifically, the current research examined whether a health behavior intervention that encouraged emerging adults to have an internal HLOC—one in which individuals believe they are in control of their health via the behavioral choices they make—can not only alter their HLOC scores (i.e., improve internal HLOC), but also influence their health behavior related to...
food and beverage intake. We built upon previous work (Bryan et al., 2016) by targeting emerging adults rather than preadolescents, removing social desirability from participants’ food choice, and using self-reflection to promote feelings of control and autonomy rather than mere reactions to external stimuli. Based on research suggesting that HLOC and health behaviors are correlated, as well as theoretical considerations suggesting that emerging adulthood is the prime time to conduct health interventions, we hypothesized that a novel intervention targeting HLOC would increase internal HLOC and lead to healthy food and beverage choice relative to a control group. Additional sensitivity and secondary analyses investigated whether results differed for food choice separate from beverage choice, as well as whether other components of HLOC (i.e., powerful others and chance) were impacted by the intervention. Because these latter analyses were not central to our research question, we did not have a priori hypotheses regarding them.

**Method**

**Participants**

Ninety-one emerging adults—ages 18 through 25 ($M = 19.36$ years, $SD = 1.31$)—who were proficient in reading and writing English participated in this study. Other eligibility criteria included being free of chronic diseases or dietary restrictions (e.g., food allergies, food intolerances, or strong food preferences) so as not to interfere with the behavioral outcome of the study (i.e., food and drink choice). Participants were recruited from Chapman University, primarily through introductory psychology courses or other psychology courses that offered extra credit for research participation. Participants ($N = 91$) received one research credit in exchange for their hour of participation. Most participants were White (60%); other participants were Asian (17.6%), Native Hawaiian/Pacific Islander (1.1%), or more than one race (13.2%). A small percentage of participants (7.7%) preferred not to disclose their race. Most participants were women (83.5%) and the rest were men (16.5%).

**Procedures**

Before conducting the study, approval was given by the Institutional Review Board at Chapman University (1617H111). The study was composed of two parts: a 15-minute online questionnaire completed approximately two weeks prior to a 45-minute laboratory visit. The purpose of the previsit online survey was to collect demographic information and a baseline measure of participants’ internal HLOC scores. The laboratory visit included a health behavior intervention via a 10-minute writing task, several questionnaires, and a choice of snacks. There were two primary outcomes of interest: Participants’ postintervention internal HLOC scores served as the psychological outcome and participants’ postintervention snack choice served as the behavioral outcome. Total participation—including the 15-minute online survey and the 45-minute laboratory visit—did not exceed one hour.

Upon signing up for a laboratory visit time slot, participants were sent a link to the previsit online survey. During the online survey, participants indicated their consent to participate in the study. Next, they provided demographic information including their age, gender, race/ethnicity, level of education, and English language proficiency. Then, participants completed one form of the Multidimensional Health Locus of Control (MHLC) scale, which provided a baseline measure of their internal HLOC score (i.e., our baseline score of interest), powerful others HLOC score, and chance HLOC score. Next, participants were prompted to answer questions about their daily habits (e.g., sleep, physical activity, eating, studying, working, and volunteering), which served as filler questions in order to disguise the primary psychological outcome. Upon completion of the online survey, participants were reminded about their scheduled laboratory visit and were instructed to avoid eating for two hours prior to their scheduled appointment.

Approximately two weeks following completion of the online questionnaire, participants visited the laboratory. Participants were first instructed to take 10–15 minutes to respond to a writing prompt on a computer. The computer randomly assigned participants to either an experimental condition where they wrote about a time during which they took control of their health decisions or a neutral control condition where they wrote about their day since waking up that morning. Next, participants filled out a different MHLC form to assess their internal (as well as powerful others and chance) HLOC scores postintervention. Upon completion of the MHLC scale, participants were instructed to enter a different laboratory room so that the experimenter could set up the next part of the study. In the other room, a variety of healthy and unhealthy snacks were available (i.e., nuts, chips, fresh fruit, cookies, water, and soda). As a cover story, participants were told that there were extra snacks from a recent laboratory party and that they
were welcome to eat whatever they wanted. Participants were also asked to take at least one item in the interest of keeping procedures consistent among all participants because some participants had already taken snack items. Next, participants were asked to return to the original computer room to fill out a series of filler questions on the computer. Participants were then given their compensation and told that they would receive debriefing materials via e-mail once data collection was complete.

**Experimental Manipulation**
Participants were randomly assigned to either an experimental condition \((n = 48)\), which asked them to write about a time during which they—rather than others—had taken control of their health, or a neutral control condition \((n = 43)\), which asked them to write about their day since waking. The experimental condition was designed to prompt participants to think about how much control they take over their health and invoke feelings about whether they are satisfied or not with the control they have over their health. Participants randomly assigned to the experimental condition were shown the following prompt derived from theoretical conceptualizations of internal HLOC (Wallston et al., 1978):

> Please take the next 10–15 minutes to write about 3–5 times when you took control of your health. Examples include skipping dessert at a restaurant even though your friends ordered it, setting your alarm 30 minutes earlier so that you could go for a run before class, choosing to go to sleep earlier instead of staying up to watch TV, or anything else you can think of. Describe the events leading up to your decision, and consider the benefits that resulted from your decision. The events that you write about can be from the past, present, or future. If you can’t think of a time when you have taken control of your health in the past, write about the steps that you might take to do so in the future. Also consider the barriers that you face when you try to take control of your health and how you overcome them. Lastly, consider how being in control of your health makes you feel. How might you have felt if you made an alternative decision that did not involve taking charge of your health? Don’t worry about using perfect grammar or spelling, but try to write continuously for at least 10 minutes.

Participants in the control condition engaged in a neutral writing task that did not invoke emotion or thoughts about one’s health behaviors (similar tasks have been used by past researchers such as Layous, Nelson, & Lyubomirsky, 2013):

> Please take the next 10–15 minutes to write about your day since you woke up this morning. You can include details such as what you did after you woke up, the places you went, the people you saw, the activities in which your participated, or anything else you can think of. Try to include as many details as possible from as much of the day as possible. Don’t worry about using perfect grammar or spelling, but try to write continuously for at least 10 minutes.

**Manipulation Check**
Immediately following the writing intervention, participants responded to several manipulation check questions designed to measure whether the intervention had successfully motivated those in the experimental condition to feel more in control of their health compared to those in the control condition. Participants were asked to indicate their agreement with the following statements on a sliding scale ranging from 1 (completely disagree) to 100 (completely agree): “I feel in control of my health,” “I feel in control of my activities and decisions,” “My activities today were positive,” “My activities today were negative,” “My activities today were typical of my usual routine,” and “I am able to manage my life.”

**Materials**
The psychological outcome of the study was determined by responses on the MHLC scale (two different forms were used in the present research). The MHLC scale measures beliefs about participants’ control over their health (Wallston et al., 1978). To our knowledge, this scale, developed in the mid-20th century, is the only measure of HLOC that is used in health psychology research to date. Each form of the MHLC scale assesses three subscales comprised of six items each: internal (i.e., the belief that one’s health is in her or his own control), powerful others (i.e., the belief that one’s health is in the control of powerful others in their lives), and chance (i.e., the belief that one’s health is controlled by luck or fate; Wallston et al., 1978). Each statement is rated with a 6-item Likert-type scale ranging from strongly agree to strongly disagree. Cronbach’s \(\alpha\) for the internal HLOC
Primary analyses involved independent-samples t tests to evaluate differences between the experimental and control conditions in the manipulation check items, internal HLOC scores, snack choice quantity, and snack choice type. Using G*Power 3.1 (Faul, Erdfelder, Lan, & Buchner, 2007), we conducted a priori power analyses for an independent samples t test. With a relatively small effect size (d = .3) and power of .80, a sample size of 352 would have been required. Given that this research project was led by an undergraduate student with time and resource constraints, the desired sample size was not achieved.

In addition to the independent-samples t tests, we conducted a mixed Analysis of Variance to determine whether condition interacted with time (pre, post) to impact internal HLOC scores. Sensitivity analyses were also conducted to see if food items in the unhealthy and healthy snack choice outcomes (rather than food and beverages combined) altered findings. These sensitivity analyses used independent-samples t tests. Secondary analyses explored whether the intervention impacted the MHLC subscales of powerful others and chance HLOC with independent-samples t tests. Analyses were conducted in SPSS with α = .05, two-tailed.

Results
Those in the experimental condition (M = 83.42, SD = 11.96) did not report feeling significantly more in control of their health than those in the control condition (M = 82.19, SD = 15.39), t(89) = .43, p = .67, d = 0.09. Similarly, there were no significant differences between those in the experimental and control condition for the other manipulation check items.

Internal Health Locus of Control Scores
There was not a significant difference in postintervention internal HLOC scores between those in the experimental condition (M = 4.39, SD = 0.62) and those in the control condition (M = 4.45, SD = 0.61), t(89) = -.44, p = .66, d = -0.09, nor was there a significant interaction between time (pre- to postintervention assessment of internal HLOC) and condition, F(1, 89) = 0.41, p = .52, η² = .005. These results suggest that the intervention did not affect participants’ self-reported internal HLOC.

Snack Choice Quantity
There was a statistically significant effect of the intervention on the quantity of unhealthy snacks selected such that those in the experimental condition (M = 0.35, SD = 0.57) selected significantly fewer unhealthy snacks than those in the control condition (M = 0.63, SD = 0.73), t(89) = -2.02, p < .05, d = -0.43 (see Figure 1a). There was not a significant effect of the intervention on quantity of healthy snacks selected between those in the experimental condition (M = 1.40, SD = 0.94) and those in the control condition (M = 1.09, SD = 1.02), t(89) = 1.48, p = .14, d = 0.32 (see Figure 1b). These data suggest that, although the intervention did not affect the quantity of healthy food and drinks selected by participants, it did successfully motivate participants in the experimental condition to select fewer unhealthy food and drinks than participants in the control condition.
Snack Choice Type
Participants in the experimental condition ($M = 0.35, SD = 0.57$) were not significantly more likely to select unhealthy types of snacks compared with participants in the control condition ($M = 0.60, SD = 0.66$), $t(89) = -1.95, p = .054, d = -0.41$ (see Figure 2a). However, those in the experimental condition ($M = 1.29, SD = 0.82$) were significantly more likely to select healthy types of snacks than those in the control condition ($M = 0.93, SD = 0.74$), $t(89) = 2.20, p = .03, d = 0.46$ (see Figure 2b). These findings suggest that the intervention successfully motivated participants in the experimental condition to select healthier types of food and drinks more often compared with participants in the control condition.

Sensitivity Analyses
To investigate whether there was a discrepancy between participants’ food and drink choices and whether they were healthy or unhealthy, and also to account for those participants who came to the laboratory visit with a personal water bottle, a sensitivity analysis that excluded beverages was conducted. When only including food in the analysis (i.e., excluding water and soda from the quantity of items selected), there was not a statistically significant difference between the experimental ($M = 0.88, SD = 0.82$) and the control condition ($M = 0.70, SD = 0.86$) on healthy food choices, $t(89) = 1.01, p = .32, d = 0.22$. Moreover, those in the experimental condition ($M = 0.33, SD = 0.52$) did not select fewer unhealthy food items than those in the control condition ($M = 0.56, SD = 0.63$), $t(89) = -1.87, p = .07, d = -0.40$. Thus, participants in the experimental and control conditions did not differ significantly in the number of healthy food items or unhealthy food items that they took. Notably, effect size estimates for food only items were slightly weaker than effect size estimates for food and beverage items combined, suggesting that beverages are an important piece to consider.

Secondary Analyses
To examine whether the intervention had an effect on the other subscales of the MHLC scale, we conducted secondary analyses with powerful others and chance HLOC. Analyses suggest that there was no significant postintervention difference between the experimental ($M = 3.32, SD = 0.58$) and control groups ($M = 3.20, SD = 0.58$) on the powerful others subscale, $t(89) = .88, p = .38, d = 0.19$. Moreover, there was not a significant interaction between condition and time (i.e., pre- to postintervention) on the powerful others subscale, $F(1, 89) = 2.76, p = .10, \eta_p^2 = .03$. This suggests that following the intervention, those in the experimental condition were no more likely than those in the control condition to report feeling as though others were in control of their health outcomes.

There were statistically significant differences between the experimental and control groups on the postintervention chance subscale of the MHLC, such that those in the experimental condition ($M = 3.19, SD = 0.62$) scored higher than those in the control condition ($M = 2.74, SD = 0.74$), $t(89) = 3.10, p = .003, d = 0.65$. There was also a significant interaction between condition and time for the chance subscale of the MHLC questionnaire, $F(1, 89) = 6.34, p = .01, \eta_p^2 = .07$. Although those in the experimental and control conditions scored approximately equally on the preintervention chance subscale (as would be expected with random assignment), those in the experimental condition were more likely to report feeling as though chance factors controlled their health outcomes postintervention than those in the control condition.
Discussion
This study sought to investigate whether encouraging emerging adults to consider ways in which they—rather than others—are in control of their health can motivate them to make healthier choices, particularly related to food intake. Findings suggest that the intervention motivated participants to choose healthier types of food and fewer unhealthy items. In other words, emerging adults who were prompted to write about autonomous experiences from their past, present, or future were more likely to eat less unhealthy food (i.e., chips, cookies, and soda) relative to emerging adults in a control condition.

However, the intervention did not affect participants’ self-reported internal HLOC scores. There are several potential explanations for this. For example, the relatively small sample size might not have been adequately powered to detect changes in HLOC scores. It is also possible that HLOC is not something of which participants are consciously aware. Lastly, given the lack of research attempting to manipulate HLOC, it is possible that HLOC is more trait-like than state-like, making it difficult to manipulate this quality through a one-time, relatively short intervention. To our knowledge, this is the first study to attempt to modify HLOC, thus it is unclear in the existing literature whether it is feasible or realistic to manipulate HLOC. There are also several possibilities that may explain the counterintuitive findings that participants in the experimental condition—which was designed to boost internal HLOC—reported higher levels of change HLOC than participants in the control condition. These may include the amount of attention that participants paid to the scales and participant comprehension of the scale items.

Nonetheless, these results contribute to the growing body of research about the relationship between HLOC and health behaviors. These results are also in line with past research. For example, the present findings are consistent with a study comprised of a nationally representative German sample in which adults who scored higher on the internal HLOC scale reported engaging in more health-related behaviors (Grotz, Hapke, Lampert, & Baumeister, 2011). Moreover, a meta-analysis of 76 studies with adults—some of which were cross-sectional—showed that stronger internal HLOC orientations were associated with two health-promoting behaviors, specifically exercise and diet (Cheng, Cheung, & Lo, 2016). Interestingly, internal HLOC orientations were not significantly associated with health-compromising behaviors such as smoking or drinking alcohol (Cheng et al., 2016). In addition, internal HLOC orientations were associated with mental and physical quality of life, as well as lower levels of anxiety and depression (Cheng et al., 2016). Although this previous research supports associations between HLOC and better health, it speaks solely to the correlational relationship between HLOC and health. The current study, however, sought to investigate a causal relationship between the two factors.

A study by Bryan et al. (2016) was one of the first studies to utilize an experimental design to examine the role of autonomy in encouraging health behaviors among adolescents. Their findings suggested promising results: young adolescents chose significantly healthier foods and drinks when researchers framed healthy eating as a way to assert the universal adolescent value of autonomy in a social context (Bryan et al., 2016). The current research expanded upon previous findings by testing the theory with emerging adults, who tend to be the oldest and most autonomy-focused adolescents. Further, it eliminated the social appeal factor because participants in the current research selected and consumed their food and drinks in a private context, rather than surrounded by peers. The current research also differs from the study by Bryan et al. (2016) by using a self-reflective writing prompt, rather than a response to a persuasively written article.

Implications
Findings from the current research suggest that the desire for autonomy may be a tool in motivating emerging adults to exhibit healthy behaviors, particularly those related to food choice. Although this area of research is relatively new and requires additional research, these results may inform the development of future health interventions targeted at this population, which is important due to the inconsistent and relatively small effects of previous health interventions (Stice et al., 2006). More specifically, utilizing the desire for autonomy may increase the effectiveness of a variety of health interventions, including large-scale school or community health programs (e.g., Bryan et al., 2016) or even the practices or recommendations of individual healthcare providers (Dickey & Deatrick, 2000; Kim & White, 2018).

Although there was a significant effect of the intervention on participants’ food and drink choices, the mechanism by which the intervention
affected such choices remains unclear. We predicted that internal locus of control would foster healthy behavioral choices, but the null findings for self-reported internal HLOC suggest that other mechanisms are at work. It could be that the experimental rather than control condition drew participants’ attention to their health such that they were primed to make healthy choices (cf. Papies, Potjes, Keesman, Schwinghammer, & van Koningsbruggen, 2014). It could also be that the experimental condition was more emotionally arousing than the control condition; emotions are known to influence health-related behaviors and decisions (Ferrer & Mendes, 2018). Finally, whereas the control condition focused participants’ attention on the immediate past, the experimental condition encouraged participants to focus on either past, present, or future actions. Evidence has suggested that the time perspective a person uses may be associated with health-related behaviors (Henson, Carey, Carey, & Maisto, 2006), which could have come into play in the current study.

Future research should examine whether the improved behavior choices can be replicated and should closely examine the mechanism by which this change may occur.

**Strengths and Limitations**

To our knowledge, this study was the first to experimentally test whether encouraging emerging adults to think about ways in which they are in control of their health could motivate healthier behaviors. The experimental design of this study was an asset because several studies in the existing literature utilize cross-sectional designs or before-after designs rather than comparing randomly assigned treatment and control groups (Grotz et al., 2011; Salam, Das, Lassi, & Bhutta, 2016). Although there were no significant effects of the intervention on self-reported internal HLOC scores, there were significant effects on participants’ food and drink choices. As such, one strength of this study was the ability to target a measurable health behavior that has important implications for subsequent health (although the underlying mechanism remains to be determined).

Another strength of this study is that the intervention was relatively simple; it required minimal time and few resources. As such, it could easily be implemented into school curricula or school-related health programs without the need for ample time or resources, making it an accessible and feasible option. Unlike other health behavior interventions, the one used in the current research contains self-reflection rather than direct instruction or advice, which may be important among adolescents who tend to react negatively to criticism from authority figures (Lee et al., 2015) or who may misconstrue traditional health or nutritional advice (Golden et al., 2016).

This study has several limitations. First, the small sample size (N = 91) might have limited the statistical power needed to detect differences in participants’ self-reported internal HLOC scores. The reliability for the HLOC subscales was also relatively weak. Additionally, the uneven distribution of female (n = 76) and male (n = 15) participants might have affected results, considering the potentially different responses that women and men may have to health interventions. Results of one meta-analysis of health interventions suggest a larger effect size for female-only samples than mixed-sex or male-only samples (Stice et al., 2006). In addition, most participants were White, and small numbers of people from other racial/ethnic backgrounds prevented comparisons across subgroups. Moreover, this design did not measure food and drink choice at different time points following the intervention. Because follow-up data was not collected in the short- or long-term, it is unclear how long the effects of this intervention might last.

It is also important to acknowledge that neither the internal HLOC scores nor the manipulation check items differed significantly by condition, which is to say that participants who were asked to think and write about being in control of their health did not report feeling more autonomous. There are several possible explanations for this phenomenon, including but not limited to the reliability of self-report questionnaires and the discrepancy between participants’ behavior and their self-report responses. Alternatively, it is possible that the experimental writing task drew participants’ attention to their health, regardless of whether or not it induced feelings of autonomy, self-control, or empowerment.

It is also possible that participants could have intentionally made unhealthy choices, either due to or in spite of an increased sense of autonomy. Future research that examines the potential causal relationship between increased autonomy and behavioral choices could shed light on whether it is desirable for emerging adults to have an increased sense of autonomy in the health domain. An additional, related limitation is the potential differentiation in how participants appraised the...
various food and drink options available in the laboratory. For example, although the food and drink options were selected as options that could easily be classified as healthy or unhealthy by the researchers, it is possible that participants’ criteria regarding what is healthy were different. Factors such as attitudes toward food, perceived desirability, and caloric load of the available foods may have impacted participants’ choices. Future research could ask participants to evaluate their attitudes toward the food and drinks available in the laboratory prior to making a snack choice.

Lastly, it is important to consider the possibility that participants in the experimental condition were simply primed to think about their health, leading to healthier food choices, while participants in the control condition were not. Participants in the experimental condition were asked to write about times during which they had taken control of their health and were encouraged to write about the feelings and emotions related to those instances. By contrast, participants in the neutral control condition were asked to write about their day, and were instructed to avoid writing about emotions or feelings. To eliminate this limitation, future research may include a similar study with three conditions: a writing task about times during which participants have taken control of their health, one about times during which they have not had control of their health, and a neutral control condition in which participants do not write about their health at all. These limitations warrant additional research.

Future Research
The results of this study suggest the need for future research regarding ways in which encouraging individuals to have an internal HLOC or bringing attention to their health choices may motivate health behaviors. First, future research may examine whether encouraging emerging adults to have an internal HLOC may motivate other health-related behaviors such as sleep, exercise, or stress management. Other health domains that may be particularly relevant for emerging adults—and therefore domains in which autonomy interventions may be useful—include sexual health, micronutrient supplementation, substance abuse, and vaccination (Salam et al., 2016). Future research should also explore whether encouraging individuals to have an internal HLOC may motivate health behaviors among other age groups, such as children or older adults, as well as whether interventions are equally effective for both men and women and for people from diverse racial/ethnic backgrounds. Moreover, while the intervention in this study was a relatively brief (i.e., 10-minute) one-time writing task, future studies may examine whether a repeated or longer intervention may yield stronger or longer-lasting effects.

Lastly, additional research is needed to explore the mechanism by which the intervention in the current study encouraged participants to make healthier food and drink choices. Future studies with additional conditions are necessary to discern whether the intervention motivated participants to feel autonomous or simply directed participants’ attention to their health. This may include an exploration into other relevant theories such as Self-Determination Theory—the basic tenet of which is that one’s motivation is related to the degree to which it is autonomous or externally regulated—which has shown associations with beneficial health outcomes in the context of interventions that encourage autonomy and intrinsic motivation (Silva et al., 2010).

Concluding Remarks
In sum, the current research involved a novel approach to improving the health of emerging adults by emphasizing the developmentally relevant value of autonomy to encourage health behaviors. To our knowledge, this is the first study to directly target internal HLOC as a means of improving health behaviors. Investigations regarding how to improve the health of emerging adults are particularly relevant due to the important psychological and emotional changes that occur during this developmental time (Arnett, 2000), concurrent with increased exposure to unhealthy foods and marketing campaigns that advertise such food products (World Health Organization, 2018). Moreover, establishing healthy behaviors such as a diet rich in fruit and vegetables is particularly important during this developmental stage because it has the potential to improve adolescents’ current health, future health during adulthood, and even the health of their future children (World Health Organization, 2018). Given what is already known about the developmental needs and characteristics of the emerging adult population, as well as the preliminary findings of this study, future research should continue to explore how autonomy, empowerment, and internal HLOC can be used to encourage healthier behaviors among emerging adults and others.
Autonomy During Emerging Adulthood

Kwan, M. Y., Cairney, J., Faulkner, G. E., & Pullenayagum, E. E. (2002). Physical activity and other health-risk behaviors during the transition into early adulthood: A longitudinal cohort study. *American Journal of Preventive Medicine*, 42, 14–20. http://dx.doi.org/10.1016/j.amepre.2001.08.026

Layous, K., Nelson, S. K., & Lyubomirsky, S. (2013). What is the optimal way to deliver a positive activity intervention? The case of writing about one's best possible selves. *Journal of Happiness Studies*, 14, 635–654. http://dx.doi.org/10.1007/s10902-012-9346-2

Lee, K. H., Siegle, G. J., Dahl, R. E., Hooley, J. M., & Silk, J. S. (2015). Neural responses to maternal criticism in healthy youth. *Social Cognitive and Affective Neuroscience*, 10, 902–912. https://doi.org/10.1093/scan/nsu133

Papies, E. K., Potjes, I., Keessens, M., Schuvinghammer, S., & van Koningsbruggen, G. M. (2014). Using health primes to reduce unhealthy snack purchases among overweight consumers in a grocery store. *International Journal of Obesity*, 38, 597–602. https://doi.org/10.1038/ijo.2013.138

Rutter, J. B. (1966). Generalized expectations for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, 80, 1–28. http://dx.doi.org/10.1037/h0092976

Salam, R. A., Das, J. K., Lassi, Z. S., & Bhutta, Z. A. (2016). Adolescent health interventions: Conclusions, evidence gaps, and research priorities. *Journal of Adolescent Health*, 59(4), S58–S92. https://doi.org/10.1016/j.jadohealth.2016.05.006

Sawyer, S. M., Ackroyd, D. P. S., Wickremarathne, D. & Patton, G. C. (2018). The age of adolescence. *Lancet Child & Adolescent Health*, 2, 223–228. https://doi.org/10.1016/S2352-4645(18)30022-1

Silva, M. N., Vieira, P. N., Coutinho, S. R., Minderico, C. S., Matos, M. G., Sardinha, L. B., & Teixeira, P. I. (2010). Using self-determination theory to promote physical activity and weight control: A randomized controlled trial in women. *Journal of Behavioral Medicine*, 33, 110–112. https://doi.org/10.1007/s10864-010-9366-x

Sim, L. A., Lebow, J., & Billings, M. (2013). Eating disorders in adolescents with a history of obesity. *Pediatrics*, 132, e1026–e1030. https://doi.org/10.1542/peds.2012-3940

Steinberg, L. D. (2002). Adolescence. Boston, MA: McGraw-Hill.

Steinberg, L. (2004). Age of opportunity: Lessons from the new science of adolescence. Boston, MA: Houghton Mifflin Harcourt.

Stice, E., Shaw, H., & Marti, C. N. (2006). A meta-analytic review of obesity prevention programs for children and adolescents: The skinny on interventions that work. *Psychological Bulletin*, 132, 667–691. https://doi.org/10.1037/0033-2909.132.5.667

Tabak, R. S., Pylay, B., Çelen, Ü., Karakoç, Ş. & Ozen, Y. (2009). The relationship between adolescents’ locus of control and healthy dietary behaviours and its implications for school psychologists and other health related professionals: Results from a Turkish study. *School Psychology International*, 30, 626–643. https://doi.org/10.1177/0143034309107080

Wallston, K. A., Wallston, B. S., & DeVillis, R. (1978). Development of the multidimensional health locus of control (MHLC) scales. *Health Education Monographs*, 6, 160–170. https://doi.org/10.1093/0033-2909/108000107

World Health Organization. (2018). *Guideline: Implementing effective actions for improving adolescent nutrition*. Retrieved from http://apps.who.int/iris/bitstream/handle/10665/262097/9789241513708-eng.pdf;jsessionid=8D913FDF0304C546658B5F13CF76F35?sequence=1

Author Note. Moriah B. Geller, Chapman University, and Julia K. Boehm, Chapman University. Moriah Geller graduated from the Crean College of Health and Behavioral Sciences at Chapman University with a bachelor of arts degree in psychology. This research was conducted to meet the requirements of a senior research project. It was supervised by Julia Boehm, Assistant Professor of Psychology in the Crean College of Health and Behavioral Sciences at Chapman University. Special thanks to *Psi Chi Journal* reviewers for their support. Correspondence concerning this article should be addressed to Moriah Geller. E-mail: geller107@mail.chapman.edu.
Psi Chi Journal of Psychological Research 2019 Reviewers

We sincerely appreciate the hard work on the part of the following individuals who each completed at least one review in 2019. Without the assistance of such dedicated professionals, Psi Chi Journal would not be able to function. —Debi Brannan (Editor)

Leslie D. Cramblet Alvarez
Adams State University

Kathryn B. Anderson
Our Lady of the Lake University

Maria Anderson
Farmingdale State College

Glena Lynn Andrews
George Fox University

Trey Asbury
Texas Woman’s University

Lara K. Ault
Saint Leo University

Ruth L. Ault
Davidson College

Danielle Balaghi
Michigan School of Psychology

Angela Banitt Duncan
Washburn University

Daniel W. Barrett
Western Connecticut State University

Mark E. Basham
Regis University

Susan E. Becker
Colorado Mesa University

Michelle Beddow
Saginaw Valley State University

Barbara Blatchley
Agnes Scott College

Stefanie S. Boswell
University of the Incarnate Word

Karen Brakke
Spelman College

Kosha D. Bramesfeld
University of Toronto Scarborough

Scott R. Brandhorst
Southeast Missouri State University

Sheila Brownlow
Catawba College

Brittany Canfield
California Southern University

Mary Jo Carnot
Chadron State College

Bradley James Caskey
Birmingham-Southern College

Shawn R. Charlton
University of Central Arkansas

Maria Carla Chiarella
University of North Carolina at Charlotte

Daniel Corts
Augustana College

Sarah Cronin
Bemidji State University

Grace Deason
University of Wisconsin - La Crosse

Teddi S. Deka
Missouri Western State University

Fabiana DesRosiers
Dominican College

Kristen Ann Diliberto-Macaluso
Berry College

Martin J. Downing
Lehman College

Gregory S. Drury
Stephen F. Austin State University

Leslie G. Eaton
State University of New York at Cortland

Ryan C. Ebersole
Albany Medical Center

Warren Fass
University of Pittsburgh, Bradford

Shlomit Flasher-Grinberg
Saint Francis University

Tifani Fletcher
West Liberty University

Azennet A. Garza Caballero
Wilder State University

Rebecca Gilbertson
University of Minnesota Duluth

Jonathan J. Hammersley
Western Illinois University

Thomas Fredrick Harlow
University of Maryland Global Campus

Elizabeth A. Harwood
River University

Karen Yvette Holmes
Norfolk State University

Mary T. Howell-Carter
Farmingdale State College

Robert Hymes
University of Michigan-Dearborn

Fanli Jia
Seton Hall University

David C. Johnson
Manchester University

Nancy Davis Johnson
Queens University of Charlotte

Marla Johnston
Farmingdale State College

Nancy J. Karlin
University of Northern Colorado

Emily Keener
Slippery Rock University

Jackie Kibler
Northwest Missouri State University

Camille Tessitore King
Stetson University

Casey Knifsend
California State University, Sacramento

Penny Koonz
Marshall University

David S. Kreiner
University of Central Missouri

Stella G. Lopez
University of Texas at San Antonio

Charles A. Lyons
Eastern Oregon University

Pam Marek
Kennesaw State University

Tammy McClain
West Liberty University

Julie Guay McIntyre
Russell Sage College

Albee Therese Ongsuo
Mendoza

Walter Murphy
Texas A&M University-Central Texas

Susan L. O’Donnell
George Fox University

Valerie Perez
Wesley College

Marilyn Petro
Nebraska Wesleyan University

Lindsay A. Phillips
Albright College

Trace M. Powell
Western Oregon University

William Ragan
Walden University

Jessica D. Rhodes
Westminster College

Lisa Rosen
Texas Woman’s University

Raylene Ross
University of South Carolina

Michael Russell
Washburn University

David A. Saarnio
Arkansas State University

J. Austin Williamson
Augustana College

Katie Ann R. Skogsberg
Centre College

Fernanda Sofia Woolcott
Princeton University

Tammy L. Sonnentag
Xavier University

Shana Southard-Dobbs
Lauder University

Crystal N. Stiltenpohl
University of Southern Indiana

Rebecca M. Stoddart
Saint Mary’s College

Christopher Terry
Elmira College

Leonell Torres-Pagan
University of Puerto Rico

Janet P. Trammell
Poppin University

Kimberli R.H. Treadwell
University of Connecticut

Dunja Trunk
Bloomfield College

Scott VanderStoep
Hope College

Allison A. Vaught
San Diego State University

Taylor Wadian
University of Cincinnati Blue Ash College

Rebekah Wanic
University of San Diego

Kathleen West
University of North Carolina Charlotte

Wayne Wilkinson
Arkansas State University

J. A. Shilling
Augustana College

William D. Woody
University of Northern Colorado

Bill Woźniak
University of Nebraska at Kearney

Robert R. Wright
 Brigham Young University–Idaho

Xiaomeng (Mona) Xu
Idaho State University

Jason R. Young
Hunter College

Evan L. Zucker
Loyola University New Orleans
Master of Arts in Psychology
A Master’s degree in psychology can lead to a new or more rewarding career in health & human services or a doctorate.

Features flexible program scheduling, CCSU’s MA in Psychology offers three tracks
General Psychology
Highly flexible and tailored to students’ particular interests, the graduate program in General Psychology prepares graduates for careers in human services or further graduate study.

Community Psychology
The program in Community Psychology prepares students to be active practitioners in prevention and community-based research. You can take the lead in developing and implementing interventions against the onset of substance abuse, interpersonal violence, and depression.

Health Psychology
The only program of its kind in New England, the program in Health Psychology enables students to deeply understand biological, behavioral, and social factors in health and illness and to develop interventions fostering health.

To learn more and apply: www.ccsu.edu/grad
PSI CHI Advertising Contract: Psi Chi Journal

OUR JOURNAL
Advertising in Psi Chi Journal allows you to connect with established psychology researchers and mentors, as well as undergraduates and graduate students striving to build a career in one of the many areas of research. People regularly visit our journal online to:
- view current and past issues,
- submit their research for publication,
- learn about reviewing for Psi Chi Journal, and
- share invited editorials as teaching tools in the classroom.

All issues and advertisements are permanently free online to both members and nonmembers alike. During the 2017–18 fiscal year, psiChi.org received almost 1.5 million page views, ensuring that high-achieving students and professionals will see your content for years to come.

To further enhance the visibility of our journal, latest issues and calls for submissions are regularly featured in Psi Chi Digest e-mails (177,000+ subscribers) and on our four social media platforms:
- Facebook (22,500+ followers)
- Twitter (4,700+ followers)
- LinkedIn (10,200+ followers)
- Instagram (1,000+ followers)

Articles are also indexed in PsycINFO, EBSCO, and Crossref databases—essential tools that researchers use to search for millions of psychology-related articles. This makes Psi Chi Journal a key place to communicate your message with our Professional Organization’s three quarters of a million lifetime members and far beyond.

AD SPECIFICATIONS
Digital format: PDF, EPS, and TIFF
Resolution: 300 dpi | B&W line art—1,200 dpi
Black & white ads (no RGB or 4-color process)
PDF settings: Press quality, embed all fonts

DEADLINE/BILLING
Payment due upon receipt of invoice.

CONTACT
Submit contract by e-mail to
Susan Iles
Advertising Sales
Psi Chi Central Office
E-mail: susan.iles@psiChi.org
Phone: 423-771-9964

See past issues of Psi Chi Journal of Psychological Research at http://www.psiChi.org/journal_past

All advertisements must be scholarly and professional in nature, and Psi Chi reserves the right to reject (or cancel) any ads that are not in the best interest of the Organization or consistent with the Society’s mission.

SPRING 2020

PSI CHI
JOURNAL OF
PSYCHOLOGICAL
RESEARCH

COPYRIGHT 2020 BY PSI CHI, THE INTERNATIONAL HONOR SOCIETY IN PSYCHOLOGY (VOL. 25, NO. 1/ISSN 2325-7342)
LOOKING FOR COLLABORATIVE RESEARCH EXPERIENCE?

Join the Psi Chi CROWD!

Students and faculty within the United States and beyond are invited to participate in the CROWD, which is Psi Chi’s annual, guided cross-cultural research project. Specific benefits of joining the CROWD include:

- a reduced burden of having to solicit large numbers of participants,
- increased diversity of student samples,
- accessible materials and protocols for participating researchers, and
- a convenient platform to engage students in the scientific research process.

Contributing to the CROWD provides unique data collection and publication experiences that can be used to strengthen any student’s CV.

For more information, visit https://www.psichi.org/Res_Opps or contact the NICE Chair, Megan Irgens, at nicechair@psichi.org.
**Publish Your Research in *Psi Chi Journal***

Undergraduate, graduate, and faculty submissions are welcome year round. Only one author (either first author or coauthor) is required to be a Psi Chi member. All submissions are free. Reasons to submit include

- a unique, doctoral-level, peer-review process
- indexing in PsycINFO, EBSCO, and Crossref databases
- free access of all articles at psichi.org
- our efficient online submissions portal

View Submission Guidelines and submit your research at [www.psichi.org/?page=JN_Submissions](http://www.psichi.org/?page=JN_Submissions)

---

**Become a Journal Reviewer**

Doctoral-level faculty in psychology and related fields who are passionate about educating others on conducting and reporting quality empirical research are invited to become reviewers for *Psi Chi Journal*. Our editorial team is uniquely dedicated to mentorship and promoting professional development of our authors—Please join us!

To become a reviewer, visit [www.psichi.org/page/JN_BecomeAReviewer](http://www.psichi.org/page/JN_BecomeAReviewer)

---

**Resources for Student Research**

Looking for solid examples of student manuscripts and educational editorials about conducting psychological research? Download as many free articles to share in your classrooms as you would like.

Search past issues, or articles by subject area or author at [www.psichi.org/journal_past](http://www.psichi.org/journal_past)

---

**Add Our Journal to Your Library**

Ask your librarian to store *Psi Chi Journal* issues in a database at your local institution. Librarians may also e-mail to request notifications when new issues are released.

Contact *PsiChiJournal@psichi.org* for more information.