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**To cite this article:** M. S. Patterson, A. N. Francis, L. R. Gagnon & T. Prochnow (2025) I'll be there for you: The effects of exercise engagement on social support provision within undergraduate students' personal networks, *Journal of American College Health*, 73:2, 611-619, DOI: [10.1080/07448481.2023.2227730](https://doi.org/10.1080/07448481.2023.2227730)

**To link to this article:** <https://doi.org/10.1080/07448481.2023.2227730>



Published online: 12 Jul 2023.



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MAJOR ARTICLE



## I'll be there for you: The effects of exercise engagement on social support provision within undergraduate students' personal networks

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### ABSTRACT

**Objective:** To use social network analysis to examine exercise participation relative to health and wellness support provision within students' networks. **Participants:** 513 undergraduates from a large private university completed online surveys. **Methods:** Multilevel modeling assessed exercise engagement at the individual and dyadic level and support provision from network members.

**Results:** More support was perceived by first and second-year students and individuals who reported more exercise engagement. Significant others, roommates, siblings, female network members, and those who exercised often provided greater support. Greater support was reported when both the participant and their social tie were involved in the campus group-exercise program.

**Conclusion:** This study suggests individual and dyadic-level exercise was related to undergraduates feeling more supported. Findings support campus group exercise programs as opportunities to create reciprocal supportive ties for college students. Future research could further explore ways exercise and social support, particularly in group settings, affect health and well-being.

### ARTICLE HISTORY

Received 27 September 2022

Revised 20 April 2023

Accepted 11 June 2023

### KEYWORDS

group-exercise; college students; college health; social networks; egocentric network analysis

## Introduction

Social support—defined as “the perception or experience that one is cared for, esteemed, and part of a mutually supportive social network”<sup>1(p189)</sup>—is consistently linked to positive health and wellbeing.<sup>2,3</sup> Connections to other people can provide a multitude of benefits, including lowering the risk of mortality<sup>4,5</sup> by improving an individual's happiness,<sup>6</sup> as well as promoting overall physical,<sup>7</sup> mental,<sup>8,9</sup> and emotional health.<sup>10,11</sup> Conversely, social isolation can be linked to mortality,<sup>5,12–14</sup> and a lack of support can result in and exacerbate physical and mental ailments (e.g., coronary heart disease, depression).<sup>2,15,16</sup>

Social support is especially important for college students, who compared to the general population are: at higher risk for depression, anxiety, and stress;<sup>2</sup> often fail to meet physical activity guidelines;<sup>17</sup> tend to engage in elevated levels of substance use,<sup>18</sup> and on average consume nutrient-poor diets.<sup>19</sup> Further, college students are immersed in socially-saturated environments, meaning they are surrounded by and very involved in activities with peers and friends. As a result, college students tend to have naturally larger social networks and are, therefore, vulnerable to the influence of those to whom they are connected.<sup>20</sup> Further, college students experience social interaction and support online, especially in relation to the COVID-19 pandemic. The sudden uptick in social media becoming the sole method of contact with friends and loved ones had major

impacts, especially on younger generations, in social support provision.<sup>21</sup> Research suggests support networks are important to college students' mental health,<sup>2,22</sup> engagement in positive health behaviors including physical activity,<sup>23</sup> as well motivation to set and adhere to health and wellness goals.<sup>24</sup> As such, social support networks serve as key leverage points for health promotion among college students.

College students, on average, do not engage in enough exercise to experience health benefits,<sup>25</sup> with only about a third meeting the minimum physical activity guidelines set by the CDC.<sup>26,27</sup> Additionally, college students' exercise patterns tend to decline throughout their time in school, with a steep decline occurring between the last two months of their senior year in high school and the first two months of their first year of college,<sup>25</sup> and another significant decline occurring as they near graduation.<sup>25</sup> This is particularly problematic because college students who engage in regular exercise show greater resilience, emotional management, academic success, and lower rates of mental health struggles such as depression and anxiety.<sup>28</sup> Barriers to exercise engagement could include pressure to perform well academically, a decline in sport participation, as well as other hassles and perceived stresses in the life of a college student.<sup>17</sup> However, elevated levels of social support and social networks are consistently related to healthy exercise engagement among college students.<sup>29</sup>

Due to the consistent relationship between social support and exercise, there is a growing body of research focused on group-based exercise participation, where people engage in

exercise in social/group settings. Studies suggest group-exercise participation can result in improvement of general physical skills,<sup>30,31</sup> a strong sense of community,<sup>32–34</sup> as well as noticeable increases in motivation and adherence to exercise as compared to individual exercise.<sup>35</sup> For example, a study by Christensen et. al<sup>36</sup> found that due to mutual social support and support received from other participants and instructors/coaches within group-exercise classes, group-exercise participants report greater motivation and continued participation in the exercise as compared to independent exercisers. Similarly, in their study of college students, Patterson and colleagues<sup>22</sup> determined that group-exercise participation was related to lower trait anxiety versus individual exercise (e.g., running on a treadmill). And while a growing body of evidence supports the use of social support as a way to promote exercise and other health behaviors, research is needed to determine what kind of person, or what kind of environment, provides the most social support for health and well-being.

One approach to examining the effect of social connections on health behaviors, and what factors might relate to support provision within social networks, is social network analysis (SNA). SNA is a theory, as well as a set of methods, that suggests an individual's behavior is largely determined by their social networks and social context.<sup>37</sup> SNA has been used to examine the relationship between social ties and a myriad of health behaviors, including physical activity,<sup>38,39</sup> diet behaviors,<sup>40,41</sup> substance use,<sup>42–44</sup> mental health,<sup>22,45</sup> and interpersonal violence.<sup>46,47</sup> This research suggests that individual, dyadic, and network-wide factors potentially explain why individuals connect with the people they connect with.<sup>48,49</sup> Social Network Theory (SNT) emphasizes the importance of social connections and posits that the structure, function, strength, and content of networks together impact and influence human behavior. The structure of a network is determined by the architectural aspect of connections and patterns between members of the network. A network's function shows the movement of exchanges, services, or supports *via* connections between members. The strength of a network shows the intensity and duration of connections between members. Finally, a network's content is representative of the attitudes, beliefs, or opinions that have the potential to be transmitted across the network. According to SNT, it is the interactions of these four dimensions which influence an individual's behavior. SNA provides an opportune method to further understand social support provision within college student networks, and how social support and exercise are related within a college student's social network.

Given its critical importance to the health and well-being of college students, this study explores social support provision within college students' social networks, and how exercise engagement relates to perceived social support. The purpose of this study is to use SNA to examine the relationships between exercise and social support. More specifically, we aim to examine the association between exercise participation and perceived support provision received through members of their personal social networks.

1. Do students who register higher exercise scores report more support provision through their social networks?
2. Do students perceive more support provision from social contacts who exercise more often?

3. Does group-exercise participation increase the likelihood of having supportive network ties in one's egocentric network?
4. Are there factors beyond exercise related to health and wellness support provision within college student networks?

Based on previous SNA research, we hypothesize that: (1) students who report more individual exercise will perceive more support from their network members; (2) students will feel more supported by network members who engage in more exercise; (3) group exercise participation will be related to social support provision within networks; and (4) respondents will report more support provision from female network members compared to male network members.

## Methods

### Egocentric network analysis

This study used egocentric network analysis, a specific type of SNA, to investigate sources of health and wellness support present in college students' personal networks. Egocentric network analysis works by eliciting information from a sample of egos (i.e., respondents) about themselves and their alters (i.e., social contacts). As such, egocentric network analysis provides a methodological approach to examining ways social relationships impact various health behaviors.<sup>37,48</sup> Data collected *via* egocentric network analysis only represent connections present within each ego's personal network and therefore returns a sample of independent egocentric networks.<sup>48</sup>

### Participants and procedure

Undergraduate students were recruited from general health classes at a private university in the southern United States. General health classes were used because they offered a largely representative campus population, as all students are required to take such courses regardless of major or prior interest in health. At the time of data collection, there were 996 students enrolled across all sections of health classes. Of the 996, 543 surveys were returned. Thirty students did not complete the network questions, resulting in a final analytic sample size of 513 undergraduate students.

Before data collection began, research personnel visited health classes where they informed all potential participants of the study's purpose, risks, benefits, and their ability to withdraw at any time during the study. Each student was then provided a survey link *via* Qualtrics software to complete an online survey. Students were given five extra credit points in their health class for completing the survey. Students who chose not to participate were given an alternative opportunity to earn five extra credit points. Once students accessed the Qualtrics link, they were reminded of the study purpose, risks, and benefits, and that participation was voluntary. The survey was not accessible until participants provided their informed consent *via* electronic signature. This study was approved by the Institutional Review Board prior to data collection.

## Measures

Students were asked to indicate their birth date, classification (e.g., first-year student, second-year student), gender, race, or ethnicity, and whether they were a member of the campus group-exercise program. Individual-level health data included questions measuring leisure-time exercise (LTE), and mental health. Egocentric network data were collected *via* name generator and name interpreter questions (more details below).

### Leisure-time exercise

The Godin-Shepard Leisure Time Exercise Questionnaire (Godin LTEQ) was used to collect LTE data. The Godin LTEQ is a 4-item scale measuring intensity and duration of physical activity during a typical 7-day period.<sup>50</sup> Students reported how many times they engaged in strenuous, moderate, and mild levels of exercise for more than 15 min in a given week (resulting in three separate reported scores for strenuous, moderate, and mild exercise), as well as if they exercised “often,” “sometimes,” or “rarely.” Based on the scale creators’ instructions, we calculated sum scores for strenuous, moderate, and mild activity by multiplying strenuous activity by 9, moderate activity by 5, and mild activity by 3. Then we added those products together into one LTE score. A combined moderate and strenuous activity score between 14 and 23 is associated with the individual receiving some health benefits due to exercise, and scores 24 and above suggest the individual gains substantial health benefits from exercise engagement.<sup>51</sup> Studies using the Godin LTEQ resulted in data with test-retest reliability coefficients ranging between .74 and .80.<sup>52,53</sup>

### Mental health

Mental health scores were assessed using the 21-item version of the Depression Anxiety Stress Scale (DASS).<sup>54</sup> The DASS uses a 4-point Likert scale (0=did not apply to me at all, 3=applied to me very much, or most of the time) to assess various statements related to depression, anxiety, and stress over the past week (e.g., “I found it difficult to work up the initiative to do things;” “I tended to over-react to situations;” “I was worried about situations in which I might panic and make a fool of myself”). Total depression, anxiety, and stress scores were created by summing the appropriate items and multiplying them by two, and a sum DASS score was calculated by totaling each respondent’s depression, anxiety, and stress scores. The higher someone’s score, the more severe their mental health symptoms.<sup>54</sup> Internal consistency of the DASS is typically high, with Cronbach’s  $\alpha$  scores ranging from .84 to .95.<sup>55,56</sup> Our sample data yielded a Cronbach’s  $\alpha$  of .91.

### Egocentric network data

To collect egocentric network data, each ego answered a name generator question where they provided the initials of up to five people they felt closest to at their institution (i.e., alters). Providing initials does not serve as an identifying mechanism for the researchers, but does help the respondent remember/identify their own alters as they answer questions. For each alters listed in the name generator question, egos

answered name interpreter questions where they provided information on relationship (friend, significant other, roommate, mentor); gender; frequency of communication (daily, weekly, monthly, less than monthly); how often that person exercises (often, sometimes, or rarely); and the degree to which the alter support egos’ health and wellness goals (1=strongly disagree; 5= strongly agree). Egocentric network questions were designed to measure Social Network Theory’s four dimensions of social networks and align with protocols outlined in Perry, Pescosolido, and Borgatti’s 2018 text.

### Analytic strategy

Prior to analysis, we explored descriptive qualities of data to ensure assumptions of linear modeling were met. The dependent variable was negatively skewed (i.e., most respondents indicated a higher frequency of support among network members). As a result, we converted the dependent variable to a different, more normally distributed score by squaring values. To examine support provision within students’ egocentric networks, we conducted a multilevel model using the multilevel package<sup>57</sup> within R programming language and software.<sup>58</sup> Because social network theory suggests the importance of analytically focusing on dyadic connections, multilevel models that explain dyadic data are especially useful. Without multilevel modeling, only network properties at the aggregate level could be explored (i.e., average support across an entire network rather than specific support provision within social connections), and in this study, we were more interested in factors related to an individual connecting to someone who provides more support. And, due to its ability to account for variance between *and* within egocentric networks, multilevel modeling is an ideal analytic strategy when conducting egocentric network analyses.<sup>48,49</sup>

Based on intraclass correlation coefficients and likelihood ratio tests, we determined it most appropriate to compute a random-coefficient multilevel model<sup>48</sup> predicting an ego being connected to alters who support their health and wellness goals. Random-coefficient models assess Level 1 alters nested in Level 2 egos, and account for dependence by including a random intercept for each ego (i.e., each ego is impacted by its alters at varying rates, giving each ego a unique intercept). In addition, random-coefficient models add a unique slope for each ego based on some dyadic trait and allow for the exploration of interaction terms. In this case, because we were interested in understanding the relationship between exercise and support provision, we used a random-coefficient model and adjusted the slope based on how often they alter exercises.

Independent variables present in the model included: (a) ego’s Godin LTEQ score, ego’s DASS score, ego’s grade classification, ego’s sex, ego’s racial/ethnic identity, and whether ego was a member of the campus group-exercise program at Level 2; (b) each alter’s relationship to ego, gender, LTE score, and group-exercise membership status at Level 1; and (c) proportion of the network that exercises often (Level 2). A Level 1 and Level 2 interaction term was included in Model 1 (the interaction between ego and alter both being members of the campus group-exercise program). Initial models included

more interaction terms but were removed in final analyses due to statistical insignificance and to simplify models.<sup>48</sup>

## Results

### Descriptive statistics

In our sample, 48.9% of respondents were first and second-year students ( $n=251$ ). Close to three-quarters of the participants identify as female, 70.4% ( $n=361$ ), and this sample was largely white non-Hispanic. Just over one-third (37.4%;  $n=192$ ) of all participants were in the campus group-exercise program. The mean DASS score for this study was 11.3 ( $SD=9.44$ ) with scores ranging from 0 to 56. Additionally, the mean Godin LTEQ score was 36.55 ( $SD=22.68$ ) with scores ranging from 0 to 119; see Table 1 for all ego and network-level descriptive statistics.

The 513 respondents nominated a total of 1,924 alters through the egocentric network name generator. The majority of alters were friends (75.1%,  $n=1444$ ), with significant others (8.3%,  $n=159$ ) and roommates (8.1%,  $n=155$ ) making up the next most popular relationship type among alters. Alters were mostly identified as female (64%,  $n=1231$ ). There was a fairly even split in the frequency of alters' LTE, with 38.5% ( $n=740$ ) "always" participating in LTE, 38.8% ( $n=747$ ) "sometimes" participating in LTE, and 22.7% ( $n=437$ ) "never" participating in LTE according to the ego. The majority of alters did not participate in the group-exercise program on campus (88.6%,  $n=1704$ ).

Egos indicated the level of health and wellness support they received from each of their nominated alters. Mean support scores were 3.28 ( $SD=0.89$ , range 0-4) across all alters. On average, 52.2% of a respondent's egocentric network provided them with the highest level of health and wellness support (i.e., scored a 4 on the support scale), whereas only an

**Table 1.** Ego and network-level sample characteristics.

| Ego and network-level variable             | n   | %    | M     | SD    |
|--|-----|------|-------|-------|
| Grade classification                       |     |      |       |       |
| First year                                 | 116 | 22.6 |       |       |
| Second year                                | 135 | 26.3 |       |       |
| Third year                                 | 101 | 19.7 |       |       |
| Fourth year                                | 161 | 31.1 |       |       |
| Sex  |     |      |       |       |
| Female                                     | 361 | 70.4 |       |       |
| Male                                       | 137 | 26.7 |       |       |
| Prefer not to answer                       | 15  | 2.9  |       |       |
| Race/Ethnicity                             |     |      |       |       |
| White (non-Hispanic)                       | 359 | 69.8 |       |       |
| Hispanic                                   | 63  | 12.1 |       |       |
| Bi-/Multi-racial                           | 38  | 7.4  |       |       |
| Asian                                      | 25  | 7.4  |       |       |
| Black                                      | 23  | 4.5  |       |       |
| Alaskan Native/Pacific islander            | 1   | 0.2  |       |       |
| Group-exercise participation               |     |      |       |       |
| Yes  |     |      |       |       |
| No   | 321 | 62.6 |       |       |
| DASS score                                 |     |      | 11.3  | 9.44  |
| Godin LTEQ score                           |     |      | 36.55 | 22.68 |
| Proportion of network that exercised often |     |      | 38.83 | 25.12 |
| Average network support score              |     |      | 3.28  | 0.89  |

Note.  $N=513$ ; DASS=Depression Anxiety Stress Score; LTEQ=Leisure Time Exercise Questionnaire.

**Table 2.** Alter-level sample characteristics ( $n=1,924$ ).

| Alter-level variable         | n    | %    | M | SD |
|------------------------------|------|------|---|----|
| Alter relation               |      |      |   |    |
| Friend                       | 1444 | 75   |   |    |
| Significant other            | 159  | 8.3  |   |    |
| Roommate                     | 155  | 8.1  |   |    |
| Coworker/classmate           | 77   | 4    |   |    |
| Sibling                      | 59   | 3.1  |   |    |
| Mentor                       | 30   | 1.6  |   |    |
| Gender                       |      |      |   |    |
| Female                       | 1231 | 64   |   |    |
| Male                         | 693  | 36   |   |    |
| Alter LTE                    |      |      |   |    |
| "Always"                     | 740  | 38.5 |   |    |
| "Sometimes"                  | 747  | 38.8 |   |    |
| "Never"                      | 437  | 22.7 |   |    |
| Group-exercise participation |      |      |   |    |
| Yes                          | 220  | 11.4 |   |    |
| No                           | 1704 | 88.6 |   |    |

Note.  $N=1,924$ ; LTE=leisure time exercise.

average of 0.72% of egocentric networks provided the lowest level of support (i.e., a score of 0). In other words, on average, half of an ego's alters provided the highest level of support, while less than 1% provided no support at all; see Table 2 for all alter-level descriptive statistics.

### Multilevel model

Multilevel regression analyses assessed health and wellness support provision within college students' egocentric networks. Greater health and wellness support provision was related to ego's LTE scores ( $b=0.13$ ,  $p<.001$ ) and ego's grade classification ( $b=-0.05$ ,  $p=.02$ ). Egos reported more health and wellness support from alters who were significant others ( $b=0.33$ ,  $p<.001$ ), roommates ( $b=4.85$ ,  $p<.001$ ), siblings ( $b=1.97$ ,  $p=0.04$ ), who exercise more often ( $b=17.80$ ,  $p<.001$ ), and who were female ( $b=3.59$ ,  $p<.001$ ). Finally, egos reported more health and wellness support within relationships when the ego and alter were both members of the campus group-exercise program ( $b=2.55$ ,  $p=.01$ ). The main effects of ego's mental health scores, group-exercise membership (for egos and alters), ego's race/ethnicity, ego's gender, and the proportion of the network that exercise often were not statistically significant in our model. See Table 3 for a complete summary of the multilevel regression model.

## Discussion

The purpose of this study was to use SNA to examine how exercise participation potentially impacted the health and wellness support that undergraduate students perceive from members of their personal networks. We found that exercise at the ego and alter level was positively associated with more support provision within personal networks, and we also found high levels of support experienced within dyads where ego and alter were both involved in the campus group-exercise program. These findings provide evidence that exercise and social support are linked and that campus initiatives such as group-exercise programs can be an opportune way for students to experience both opportunities for exercise

**Table 3.** Random coefficient multilevel model assessing exercise engagement relative to social support provision among college students.

| Predictor   | Estimate | Standard Error | t     | p     |
|---|----------|----------------|-------|-------|
| Ego DASS score  | -0.00    | 0.00           | -1.04 | 0.30  |
| Ego LTE score   | 0.13*    | 0.04           | 3.52  | <.001 |
| Ego group-exercise membership                                 | 0.07     | 0.06           | 1.32  | 0.19  |
| Ego classification  | -0.05*   | 0.02           | -2.31 | 0.02  |
| Race (ref: white Non-Hispanic)                                |          |                |       |       |
| Black non-Hispanic  | 0.20     | 0.14           | 1.43  | 0.15  |
| Hispanic or Latino  | -0.07    | 0.08           | -0.96 | 0.34  |
| Asian or Pacific Islander                                     | 0.71     | 0.58           | 1.24  | 0.22  |
| Native American or Alaskan Native or                          | -0.08    | 0.12           | -0.70 | 0.49  |
| Native Hawaiian   |          |                |       |       |
| Biracial or multiracial                                       | -0.06    | 0.11           | -0.56 | 0.58  |
| Ego sex (ref: female)   | -0.00    | 0.00           | -0.34 | 0.73  |
| Alter relationship (ref: friend)                              |          |                |       |       |
| Significant other   | 0.33*    | 0.06           | 5.74  | <.001 |
| Roommate  | 0.50*    | 0.10           | 4.85  | <.001 |
| Coworker or classmate   | 0.02     | 0.13           | 0.18  | 0.86  |
| Sibling   | 0.21*    | 0.10           | 1.97  | 0.04  |
| Mentor  | -0.04    | 0.04           | -1.02 | 0.31  |
| Alter exercise  | 0.45*    | 0.03           | 17.80 | <.001 |
| Alter sex (ref: female)                                       | 0.12*    | 0.03           | 3.59  | <.001 |
| Alter group exercise membership                               | -0.10    | 0.06           | -1.74 | 0.08  |
| Proportion of network that exercises often                    | 0.00     | 0.00           | 0.41  | 0.68  |
| Ego group exercise membership*Alter group exercise membership | 0.21*    | 0.08           | 2.55  | 0.01  |

Note: N=513 egos, 1,924 alters; Estimate=unstandardized beta; DASS=Depression Anxiety Stress Scale; LTE=leisure time exercise.

\*= statistical significance at the .05 level.

engagement and support for their health and wellness. Below we answer the research questions we posed in the introduction section, aligning our findings with the current literature.

### Individual exercise and support provision

Our study found that egos who registered higher LTE scores reported more support provision through their networks. Copious literature suggests the importance of social support for LTE—that positive social support often yields greater physical activity.<sup>59–61</sup> As such, we were not surprised to find egos who registered higher LTE scores also reported greater levels of support within their networks. It is likely that these egos are already receiving the support they need, thus explaining their higher activity levels. Additionally, research suggests exercise engagement can increase a person's self-confidence,<sup>62</sup> mood,<sup>63,64</sup> and self-esteem,<sup>65</sup> all of which likely impact not only an ego's perception of support present in their networks,<sup>66</sup> but also their propensity for creating and sustaining supportive relationships.<sup>67</sup> Future research should further explore how social support and ego's exercise levels interact, and how the two impact one another over time.

### Exercise among network member and support provision

Similar to Research Question 1 results, this study suggests that alters who exercised more often provided ego with more health and wellness support than alters who exercised less often. In addition to the established relationship between exercise and social support demonstrated in previous work,<sup>59</sup> this finding could also be explained by modeling and influence from alters.<sup>68,69</sup> Those who exercise more often may be sought after as a source of health and wellness support given

their engagement in healthy behaviors. Previous SNA work suggests that exercise engagement is related to higher social activity and popularity, which increases the likelihood that within social networks, more physically active individuals could be more socially engaged with their peers.<sup>70</sup> Also, according to Bandura's<sup>71</sup> Social Cognitive Theory: (1) modeling has an impact on individual behavior, particularly when the model is similar to the ego,<sup>72</sup> and (2) reciprocal determinism leads to an ongoing interaction between social support, modeling, and individual behavior.<sup>59,61</sup> In other words, peers who are more physically active likely influence the ego to follow suit, and the consistent interaction between individual behavior, modeling, and social support could explain why an alter's exercise behavior is linked to increased social support provision perceived by the ego.

### Group exercise participation and support provision

Interestingly, in this sample, the main effects of group-exercise membership were not significantly associated with support provision. In other words, an ego was no more or less likely to report health and wellness support if they were in the group-exercise program on campus, and alters were no more likely to be sources of support if they were identified by the ego as a group-exercise member. However, when *both* the ego and the alter were members of the campus group-exercise program, the ego was likely to report higher levels of health and wellness support within that dyadic relationship. This finding suggests it is not merely being a member of the group-exercise program that yields support, but the social connections experienced within the program that are likely important.

Previous SNA studies have demonstrated that the connections created within group-exercise environments can improve physical and emotional health.<sup>73,74</sup> For example, in their work examining social connections with CrossFit programs, Patterson and colleagues found that the social connections created within the program were associated with higher preference and tolerance for high-intensity exercise,<sup>75</sup> greater exercise self-efficacy,<sup>72</sup> and lower tendencies to compulsively exercise (i.e., harmful exercise<sup>76</sup>), affirming the importance of the connections created between participants. Other studies have also suggested that creating connections while engaging in group-based exercise can boost feelings of support, belonging, and an overall sense of community,<sup>33,77,78</sup> and that perceptions of social support tend to be positively associated with attendance behavior in exercise settings.<sup>79</sup>

### Other factors and support provision

Aside from ego's LTE, alter's LTE, and mutual group-exercise participation, ego's grade classification, alter's gender, and alter's relationship to ego were related to perceived health and wellness support within college student egocentric networks. Specifically, first- and second-year students reported more support through their ties, female alters were more likely to provide health and wellness support for egos than male alters, and compared to friends, significant others, roommates, and siblings were likely to provide more support to the ego.

Grade classification having an inverse relationship with health and wellness support was surprising. Generally, we would expect students who have been in university longer (i.e., third and fourth-year students) to have built deeper and more supportive social connections in college than first and second-year students. One potential explanation for this relationship is the emphasis on programming and social integration for first-year students. Literature suggests much of student affairs-related programming targets newer students,<sup>80,81</sup> which might leave students who have been in school longer feeling less supported. First- and second-year students are also more likely to participate in campus initiatives, such as group-exercise programs, where they may experience health and wellness support.<sup>80</sup> This finding does align with data that suggests health behaviors, including exercise participation, tend to decline as students advance through their studies.<sup>25</sup> This decline could be related to reduced support received throughout undergraduate studies. More research is needed to longitudinally observe and assess social support for students from year to year through school, and whether efforts to boost health and wellness support for upperclassmen are needed and effective.

It was unsurprising that female alters were more likely to be support providers, as most research on social support, particularly relative to health and wellness, suggests similar patterns. Women are typically more likely to provide emotional and tangible support for health and wellness.<sup>82-84</sup>

Finally, alter's relationship to ego was associated with varying perceptions of support. Notably, significant others, roommates, and siblings provided more support to the ego as compared to friends. Each of these relationships represents a higher closeness or intimacy with ego than friends and could be members of ego's network who either spend the most time with ego (e.g., roommate vs. friend from class) or is a family member (e.g., sibling), which might explain why ego feels more support from these alters. The SCT supports that different sources of support (i.e., support from friends versus support from family or service providers) can have varying effects on behavior,<sup>85</sup> and our findings align with previous work that found family and friend support provision was differentially related to exercise behavior in college students.<sup>86</sup>

### **Strengths and limitations**

This work was an important addition to the body of research exploring social support networks for college students, specifically concerning how exercise participation might impact support provision between network members. Our use of egocentric network analysis and multilevel modeling shifted analytical focus away from individual-level factors and onto the social connections between egos and their alters, an important step in better understanding the dynamic relationship between exercise engagement and social support.

Despite its strengths, it is important to note this study's limitations when drawing conclusions. First, this study was cross-sectional, and therefore limiting in terms of causal inference. It would be inappropriate to assume directionality or temporality between variables given the design of our

study.<sup>87</sup> Further, while we attempted to collect a large and representative sample of college students, we used a non-probability convenience sampling method, greatly limiting the generalizability of our findings. Similar studies on other samples could confirm whether the patterns found in our data persist in other samples of college students. And finally, although we used instruments that have yielded valid and reliable data in the past, we relied on self-report to measure health behaviors and social networks, potentially biasing a person's report of their own health/well-being and/or those of their network members.

### **Implications for future research and practice**

Despite its limitations, we do feel this study has important implications for future research and practice. First, our finding supports not just having a campus group exercise program, but also fostering connections between people involved in the program. Making efforts to foster social connections in any sort of campus engagement activity could result in increased and beneficial social support among college students. In that vein, this study also reveals the potential for health and wellness peer leader programs, where peers support one another in health and wellness goals. Additionally, this study suggests a continued effort to promote exercise among college students is an important effort that could result in greater perceptions of social support. Not only does an individual's exercise habits matter, but our study found that the exercise habits of an individual's social ties were also important.

Future research on the relationship between exercise and social support, particularly as it occurs in group-exercise environments, could reveal potential opportunities to improve health and well-being among college students and other populations. Understanding this relationship longitudinally is an important next step in research. Teasing whether exercise fuels support, support fuels exercise, or both could inform future interventions and programs. In the college student population specifically, more research on how support provision ebbs and flows over the course of a student's college career is important for both short- and long-term health. Further, measuring various types of support (i.e., emotional, tangible, instructional support) would be important in more clearly understanding how support and exercise are related, particularly given not all support is positive, and not all types of support are equally associated with exercise.<sup>88,89</sup> Finally, assessing online connection and its impact on support, especially in light of the COVID-19 pandemic, would be important in better understand support provision within college student networks. Finally, this study supports the future use of SNA to explore the importance of social connections on college student health and well-being.

### **Conclusion**

This study suggests an association between exercise engagement and social support provision among college students. Specifically, results show that an ego's participation in exercise, alters' participation in exercise, and mutual engagement

within group-exercise programs are each associated with increased health and wellness support within college student social networks.

### Conflict of interest disclosure

The authors have no conflicts of interest to report. The authors confirm that the research presented in this article met the ethical guidelines, including adherence to the legal requirements, of the United States of America, and received approval from the Institutional Review Board of Baylor University.

### Funding

No funding was used to support this research and/or the preparation of the manuscript.

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