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To cite this article: Tyler Prochnow, Jeong-Hui Park & Megan S. Patterson (2025) Intramural sports social networks and implications for college student physical activity, sense of community, and retention, Journal of American College Health, 73:3, 1183-1189, DOI: [10.1080/07448481.2023.2239367](https://doi.org/10.1080/07448481.2023.2239367)

To link to this article: <https://doi.org/10.1080/07448481.2023.2239367>



Published online: 02 Aug 2023.



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MAJOR ARTICLE



Intramural sports social networks and implications for college student physical activity, sense of community, and retention

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ABSTRACT

Objective: This study examines associations between social networks developed through intramural sports and physical activity (PA), sense of community, and retention. **Participants:** College students participating in intramural sports at a large public university in the Southern United States ($n=250$). **Methods:** Students self-reported PA, sense of community, retention, and social networks developed through intramural sports in Fall 2022. Logistic and linear regression determined significant individual and network factors associated with PA, sense of community, and retention. **Results:** Participants were significantly more likely to meet PA recommendations (Nagelkerke $R^2=.24$) if they were younger, male, and reported more people in their networks were physically active often. Participants reported a greater sense of community ($R^2=.28$) and retention intention ($R^2=.26$) if they reported meeting PA recommendations, feeling closer to network members, and more relationships improving through intramurals. **Conclusion:** Results underline the importance of creating quality intramural experiences for college students.

ARTICLE HISTORY

Received 6 March 2023
Revised 11 July 2023
Accepted 16 July 2023

KEYWORDS

Social network analysis; social influence; exercise; student life

Introduction

College is an important time to establish health behaviors such as physical activity (PA) as it serves as a time of dramatic transition from late adolescence to adulthood.¹ In fact, researchers reported that health-related behaviors established in college have an impact on young adults' health habits throughout their entire life.^{2,3} Providing opportunities to engage with other students in PA, such as intramural sports programs, can promote students' sustainable health-related behaviors like participation in regular PA both in college as well as after graduation. For example, a study indicated that over 77% of former college students indicated that involvement in recreational sports during college positively influenced their current PA levels.⁴ However, a recent scoping review estimated that around 50% of college students do not currently meet PA guidelines (150 min of moderate PA per week).⁵

College, and the related experiences, can facilitate emotional and social development for young adults, along with intellectual learning.⁶ College students develop through social interactions as well as learning experiences with other students and faculty members at their institution.^{7,8} Specifically, relationships with peers and classmates on campus can be important to mental, physical, and social well-being,⁹ significantly impacting students' self-perceptions, interpersonal well-being, and social/emotional skills.¹⁰ Nonacademic activities on campus can have a positive influence on college students' campus life.¹¹ Huesman and

colleagues revealed a positive association between 5-year graduation and the use of campus recreation activities.¹² In addition, intramural sports program participation provides opportunities for college students to be physically active and interact with their peers and classmates away from structured academic classes.¹³ Intramurals and other recreational programs are ways for college students to connect and be physically active which can have numerous health and social benefits (eg weight control, reduced chronic illnesses and stress levels, increased mood states, and social bonds).^{12,14,15}

Retention

Student retention is a primary concern for educators, policy-makers, and administrators in postsecondary institutions.¹⁶ Extracurricular programs such as intramurals contributed to student retention, academic success, and student persistence.^{17–19} Specifically, participation in intramural sports has been shown to contribute to student retention in postsecondary institutions.^{20,21} Further, Kulp and colleagues found that experience in an intramural sports program is related to greater academic success and higher retention rates, and it can contribute to continued persistence in college.²² In addition, students who participated in intramural sports programs are more likely to remain in their institution when they were satisfied with the program, the service provided, and the solid social relationships formed within the program.²⁰

Sense of community

Some scholars reported that one of the most important parts of increasing student retention rate at institutions of higher education is students' feeling of belonging to their college community.^{11,23} A sense of community is related to feelings of connection or belonging and gauges how individuals feel about a group to which they belong.²⁴ College students participating in intramural recreational programs are more likely to report higher sense of community possibly due to improved communication skills, attitudes, and expanded social networks.^{7,25,26} Since participation in intramural sports contributes to knowledge that supports students' social, physical, and cognitive development,²⁷ it may positively affect students' overall satisfaction and sense of community with the college by promoting their interaction.

Social network characteristics

Based in the social ecological model, social identity theory, and theory of social networks, college students' social environments have a tremendous impact on their PA as well as their intention to remain at the university (retention) and sense of community.^{28–30} Sallis et al. suggests that PA and active living is a product of many overlapping layers of influence including aspects of social norms and social support for PA.²⁸ Further, the social identity theory posits that the sense of self can be based on peer groups or those groups which the individual feels close to or a sense of community with.²⁹ Similarly, theory of social networks suggests that the social structure college students are embedded in plays a role in how they behave and feel.³⁰ These theories indicate that there are characteristics residing within college student social networks which may play a significant role in their PA, retention, and sense of community.

To better understand social structure and connections, researchers have used social network analysis (SNA) to examine impacts on health and health behavior.^{31–33} SNA is a method of measuring the structural properties or the social network characteristics of social relationships. It has been used to analyze how people connect through PA and what those connections mean.³⁴ A systematic literature review on adults demonstrated that adults' PA is influenced by their social networks.³⁵ For example, SNA has been used to understand social norms as group level PA was significantly associated with an individual's PA levels.³⁶ A study demonstrated that adults with more favorable social network characteristics (eg exposure to more active friends or family members and more close relationships) were more likely to participate in PA through social mechanisms, including social support, social norms, and role modeling.³⁷

Further, it is hypothesized that these networks also play a significant role in retention and sense of community. However, to the best of our knowledge, no previous studies have examined the specific social network characteristics (eg relationships with alters, closeness, physically active through social connections) of college students who participated in intramural sports programs.

Purpose

This study aims to examine the association between social networks developed through intramural sports and PA, a sense of community, and retention (intention to remain at the university) for undergraduate and graduate students who participated in intramural sports programs. Additionally, the study is designed to better understand various properties of intramural sport social networks, including how often participants thought their social connections were physically active, whether they met that person playing intramurals, how close they felt to that person, and if they felt intramurals improved their relationship. This study fills a gap in exploring these social network characteristics in the context of intramurals.

Materials and methods

Participants and procedure

College students participating in intramural sports at a large public university in the Southern United States were recruited for this cross-sectional study to complete an online survey. An email was sent to all students who had participated in an intramural sport activity within the past year (roughly 10,000 possible students). Participants were informed about the study and provided online consent prior to viewing the survey. Participants were entered into a raffle for one of ten passes to participate in intramural sports free of charge for the following semester. To participate in the survey, students needed to be attending the university, over the age of 18, and must have participated in intramural sports at least once previously but were not required to be currently participating. The study was approved by the referent Institutional Review Board prior to the start of recruitment.

Measures

Participants were asked to self-report age, sex, race, ethnicity, grade classification, and whether they were a first-generation student.

Physical activity (PA)

PA in this study was self-reported using the International PA Questionnaire – Short Form (IPAQ-SF) which is considered a valid and reliable method of self-reporting PA for adults.³⁸ The IPAQ-SF asks participants to report the number of days in the last week in which they participated in vigorous PA, moderate PA, and walking separately.³⁸ Participants also report how many minutes they typically spent in each domain per day.³⁸ These inputs are then used to estimate a person's PA in MET minutes per week (Metabolic Equivalent of Task) as well as if they would meet PA recommendations.³⁸ For analysis purposes, PA was dichotomized as those who reported meeting PA recommendations and those who did not based on United States and international recommendation for adult PA (150 min of moderate PA or 75 min of vigorous PA per week).^{39,40}

Sense of community

Sense of community was assessed in this study using an adapted scale first published by Conn.⁴¹ Sense of community was measured using a four-item scale with response options of strongly disagree, disagree, agree, and strongly agree. Items included “I feel like I belong here,” “Being a student here fills an important need in my life,” “I feel proud to be a part of this community,” and “There is a strong sense of community at this school.” The Likert-type response scale ranged from strongly disagree (1) to strongly agree (4). Responses were then summed to obtain a scale score with larger scores indicating greater sense of community. This scale has not been validated but has previously been used to understand college student experience as well as online sense of community in young adults.^{41,42} The scale displayed good internal reliability in this sample ($\alpha=0.86$).⁴³

Retention intention

Retention intention was included to see how likely the student was to consider leaving the university. Retention was measured with a set of four questions from Baker and Siryk's Student Adaptation to College Questionnaire.⁴⁴ The items included the following: “Lately I've been giving a lot of thought to transferring to another college,” “Overall, I would rather be home than here,” “Lately, I have been giving a lot of thought to dropping out of college altogether and for good,” and “I find myself giving considerable thought to taking time off from college and finishing at some later time.” The Likert-type response scale ranged from strongly disagree (1) to strongly agree (4) and were summed to get a scale score with higher scores indicating a higher likelihood of leaving the university. This scale has been previously used in many studies and validated.^{45,46} The scale displayed good internal reliability in this sample ($\alpha=0.86$).⁴³

Social network characteristics

Principles of personal network analysis (egocentric)^{47–50} were followed to elicit personal perceptions of their social connections through intramurals. Participants were asked to indicate up to five individuals (alters) with whom they played intramurals with the most. For each alter, participants were asked to report how often they thought that person was physically active (response options: never, sometimes, often), whether they met that person playing intramurals (response options: yes, no), how close they felt to that person (response options: not at all, very little, somewhat, to a great extent), and if they felt intramurals improved their relationship (response options: yes, no). While traditional measures of validity and reliability are difficult to assess with SNA as it requires specificity to the sample and to the connections theorized to be important in the given study. This measure was created with input from intramural leadership and past studies to provide face validity.^{35,51} Authors have conducted several similar studies examining social networks and PA behaviors.^{35,47,52} Table 1 provides specific questions and response options for this section.

Social network characteristic variables were calculated for each follow-up question. Closeness (a concept of social

Table 1. Social network characteristics survey questions and response options.

Question	Response Options
Did you meet this person playing intramural sports?	Yes; No
How often do you think this person is physically active?	Never; Sometimes; Often
How close do you feel with this person?	Not at all; Very Little; Somewhat; To a great extent
Has playing intramurals with this person improved your relationship?	Yes; No; I don't know

bonding) was derived by taking the average level of closeness reported for each alter. Social norms were examined through calculating a proportion for the percentage of alters who were reported as being physically active often. Intramural specific network characteristics were calculated for percent of the network met through intramurals and the percent of the network which the participant perceived their relationship to improve through intramurals. This form of personal network analysis is well established in the literature.^{47–50}

Data analysis

Descriptive statistics were calculated for demographic information, PA, sense of community, retention intention, and social network characteristics. Separate regression models were conducted for meeting PA recommendations, sense of community, and retention intention. A logistic regression model was used to determine individual characteristics (age, sex [referent: male], first-generation status) and network characteristics (average closeness, percent often physically active, percent met through intramurals, percent improved through intramurals) associated with students meeting PA recommendations. Likewise, linear regression models were used to determine associations between previously listed variables and sense of community and retention intention. All descriptive statistics and regression models were calculated using SPSS v. 28.⁵³

Results

Participants ($n=250$) in this study were a mean of 20.25 years old ($SD = 1.65$) and were 62.8% male ($n=157$). Most participants identified as White ($n=166$; 66.4%), 22.0% as Asian ($n=55$), 1.6% as Black or African American ($n=4$), 0.8% as American Indian or Alaska Native ($n=2$), and 6.0% as multiracial ($n=15$) while 19.2% identified as Hispanic or Latino/a/x ($n=48$). In this sample, 11.6% were Freshmen ($n=29$), 26.0% were Sophomores ($n=65$), 22.8% were Juniors ($n=57$), 28.4% were Seniors ($n=71$), and 11.2% were graduate students ($n=28$). In addition, 12.4% reported being a first-generation student ($n=31$). When asked about who they played intramurals with the most, participants reported 1,201 alters, 377 of which were met through intramurals. Participants also reported that 83.8% of alter relationships were improved through playing intramurals. See Table 2 for full sample characteristics.

Table 2. Sample characteristics ($n=250$).

	N (%)	M (SD)
Age		20.25 (1.65)
Sex		
Male	157 (62.8%)	
Female	93 (37.2%)	
Race		
White	166 (66.4%)	
Asian	55 (22.0%)	
Black or African American	4 (1.6%)	
American Indian or Alaskan Native	2 (0.8%)	
Multiracial	15 (6.0%)	
Ethnicity		
Hispanic or Latino/a/x	48 (19.2%)	
Non-Hispanic or Latino/a/x	202 (80.8%)	
Classification		
Freshman	29 (11.6%)	
Sophomore	65 (26.0%)	
Junior	57 (22.8%)	
Senior	71 (28.4%)	
Graduate Student	28 (11.2%)	
First-Generation Student	31 (12.4%)	
Met PA Recommendations	149 (59.6%)	
Sense of Community		9.72 (2.14)
Retention Intention		2.22 (2.70)
Social Network Composition		
Total Alters	1,201 (-)	
Met through Intramurals	377 (31.4%)	
Relationship Improved	1,006 (83.8%)	

Table 3. Logistic regression results predicting whether college students reported meeting physical activity recommendations.

Variables	β	SE	Wald	p	Odds Ratio	95% CI	
						Lower	Upper
Individual							
Characteristics							
Age	−0.17	0.08	3.93	.04	0.83	0.70	0.99
Sex (Referent: Male)	−1.64	0.30	29.04	<.001	0.19	0.10	0.35
First-generation status	0.22	0.45	0.25	.61	1.25	0.51	3.06
Network							
Characteristics							
Average Closeness	0.23	0.24	0.90	.34	1.26	0.78	2.04
Percent Often Physically Active	0.90	0.41	4.66	.03	2.47	1.08	5.62
Percent Met through Intramurals	0.60	0.51	1.41	.23	1.83	0.67	5.01
Percent Improved through Intramurals	0.87	0.33	4.60	.01	2.36	1.83	3.87
Constant	3.51	1.72	3.91	.04	33.59		

Table 4. Linear regression model results predicting sense of community and retention intention.

Variables	Sense of Community			Retention		
	β	T-stat	p-value	β	T-stat	p-value
Individual Characteristics						
Age	-0.10	-1.62	.10	0.02	0.44	.65
Sex (Referent: Male)	-0.01	-0.12	.90	-0.08	-1.37	.17
First-generation status	-0.08	-1.32	.18	0.07	1.15	.25
Met physical activity recommendations	0.09	1.40	.16	0.14	2.23	.04
Network Characteristics						
Average Closeness	0.11	2.14	.04	0.14	2.22	.04
Percent Often Physically Active	0.10	1.46	.14	0.02	0.41	.67
Percent Met through Intramurals	0.01	0.16	.86	0.07	1.05	.29
Percent Improved through Intramurals	0.13	2.04	.04	0.13	2.20	.04

Logistic regression determined that participants were significantly ($p<.05$) less likely to meet PA recommendations (Nagelkerke $R^2=.24$) if they were older (OR = 0.83, $p=.04$) and female (OR = 0.19, $p<.001$), while being significantly more likely to meet recommendations if they reported a higher percent of their alters were physically active often (OR = 2.47, $p=.03$) and reported that more of their relationships had improved through intramurals (OR = 2.36, $p=.01$). See Table 3 for logistic regression results for meeting PA recommendations.

Linear regression determined that participants were significantly ($p<.05$) more likely to report a greater sense of community ($R^2=.28$) if they reported feeling closer to more alters ($\beta=.11$, $p=.04$) and that more of their relationships had improved through intramurals ($\beta=.13$, $p=.04$). Lastly, participants were significantly more likely to intend on remaining a student at the university ($R^2=.26$) if they reported meeting PA recommendations ($\beta=.14$, $p=.04$), feeling closer to more alters ($\beta=.14$, $p=.04$) and more of their relationships had improved through intramurals ($\beta=.13$, $p=.04$). Table 4 provides regression results for sense of community and retention intention.

Discussion

This study analyzed the social networks of students who participated in intramural sports programs and investigate its association with PA, retention, and sense of community. Specifically, this study investigated qualities of these social relationships, such as social norms of PA, how close they felt, and if they felt their relationship improved from participation in intramurals. College students who were younger, male, reported more PA in their networks, and reported more relationships that had improved through intramurals were more likely to meet PA recommendations. In addition, students who felt closer to their alters and reported more improved relationships through participation in the program reported higher sense of community and were more likely to intend on remaining at their college.

The current study showed that students who reported their alters were active were more likely to meet with PA recommendations themselves. Further, students who reported improved relationships through intramural were also more likely to participate in PA. This indicates the presence of social norms and consistent with a previous study reporting that network members' PA in the group is significant

associated with an individual's PA levels, although participants were older population.³⁶ Additionally, the strengthening of relationships through intramurals may also indicate a form of social bonding which can enhance the influence of social norms in a group.^{54,55} Only participating in intramural sports programs cannot guarantee the level of connection or sustainability of students' activities, however, improving their social networks and high levels of social bonding through intramural sports programs can play an important role in meeting PA recommendations.

Furthermore, social network characteristics were also associated with a sense of community. Specifically, participants feeling closer to those they played intramurals with, as well as having more of the relationships improved through intramurals reported greater sense of community. One study reported that intramural sports programs required students to interact with other students constantly affecting their social bonding and sense of belonging.⁵⁶ In addition, Moffitt and colleagues demonstrated that students who participated in intramurals had more frequent interactions with their peers, improved emotional health, and showed a higher sense of belonging in their college and communities.⁵⁷ In other words, students can have an enhanced healthy sense of community and close connections through intramural programs. Therefore, increasing opportunities to participate in intramural sports programs could have beneficial impacts on individuals specifically by helping them feel more connected to their community.

Lastly, students who felt closer to their alters through intramurals, had more relationships that improved through intramurals, and met PA recommendations reported that they were more willing to remain at their college. This result is consistent with several studies' outcomes determining that extracurricular programs such as intramurals contributed to student retention, academic success, and student persistence.^{17–19} The reason may be that participation in intramural sports programs has improved various social factors such as students' sense of belonging,^{13,58} and positive relationships between peers have led to success in their college life.⁵⁹ This means that college institutions will need to make continuous efforts to improve the quality of programs that can increase student satisfaction and provide sufficient administrative support. Further, quality programming that emphasizes the improvement of relationships through intramurals may be most effective in not only improving individual PA behavior and sense of community, but overall retention as well.

Implications for research and practice

We discovered that connecting with people through intramurals may help college students stay or become physically active, strengthen their relationships, and report a stronger sense of community. Moreover, improvements in these connections were associated with students' willingness to stay at the institution. These findings further highlight the significance of providing high-quality intramural experiences for college students, since intramural sports and student life staff encourage students to participate in extracurricular activities on campus. Moreover, these experiences should involve

relationship building and team building/bonding activities as well as leadership development to encourage these relationships to grow through participation in recreational activities. For student life staff, providing quality experiences that create and improve social connections may be the key to leveraging social networks in intramurals. Simultaneously, for researchers looking to evaluate or promote PA among college students it is essential to understand the social influences of campus recreation programs such as intramurals.

Limitations

There are several limitations to this study to consider. First, the cross-sectional nature of this study does not allow for the differentiation between causal mechanisms. Specifically, this study is not able to differentiate whether the networks are a product of being more physically active or if the network composition increases PA. Next, while the study did use previously validated self-report measures of PA, there is always a level of bias and error to consider with self-report as compared to objectively measured PA. Future research may wish to include varying networks to investigate these phenomena on a broader scale and across different groups. Finally, without a comparison group, it cannot be determined if students who select into intramurals naturally are more inclined to a stronger sense of community or intent to remain at their institution. Future studies that use an experimental design could more concretely determine the effect of intramural participation on key outcomes, such as retention intention.

Conclusions

Despite these limitations, this study supports the positive influence intramural social networks can play in college students' lives. Specifically, connections to others through intramurals may help college students meet PA guidelines, improve their relationships, and report a greater sense of community. Furthermore, it is notable that improvements in these relationships were related to students being more willing to remain in the university. These results underline the importance of creating quality intramural experiences for college students.

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 United States of America and received approval from the Institutional Review Board of Texas A&M University.

Funding

No funding to acknowledge.

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Data availability statement

Data can be provided upon appropriate request.

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