



Learning Communities: Do they Improve Imposter Syndrome and Loneliness among Medical Students?

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ABSTRACT

Past research has linked imposter syndrome (IS), isolation, and locus of control (LOC) together. Learning communities (LCs) are created to directly and effectively combat loneliness, feelings of isolation, and promote students' wellbeing and success. We hypothesize: those who attend more LC events will score lower on IS scale and lower on social loneliness scale; that those who scored higher on IS and social loneliness are more likely to have an external LOC. To test our hypotheses, a survey was sent out to the Classes of 2021, 2022, 2023, and 2024 at Wayne State University School of Medicine, resulting in a sample size of 144 participants. The students' responses were recorded and analyzed. The survey included questions from the following topics: gender, age, class, number of LC and non-LC events attended, IS, loneliness, and LOC. Surprisingly, it was found that there was not a significant correlation between the number of LC events attended and IS, loneliness, and LOC. There was a slight positive correlation between loneliness scores and the number of non-LC social events attended. Furthermore, there were correlations between IS, loneliness, and LOC. In summary, this study affirms connections between gender, IS, and external locus of control. Furthermore, our study fails to establish connections between IS and loneliness. Lastly, the study fails to demonstrate LCs' ability to decrease feelings of loneliness and IS. Further studies on different types of LCs and how they contribute to the student body may shed some light on the gaps between LCs, IS, and loneliness.

Keywords: Learning Communities, Imposter Syndrome, Loneliness, Locus of Control, Medical Students



Learning Communities in Higher Education

In the 1970s, Learning Communities (LCs) began to emerge in U.S. Medical schools (Fleming *et al.* 2013) and according to Thompson, Gregg, & Niska (2004), professional LCs have become one of the most discussed ideas in education today. In 1999, the Carver College of Medicine established a framework of student-style LCs to promote the formation of peer connections and further develop leadership, learning and service. Survey analysis published from the university revealed improved formation of connections between students associated with participation in LC activities, more positive student perceptions of the overall learning environment, increased access to faculty and staff, and increased involvement in leadership and service activities (Rosenbaum *et al.* 2007).

Following the 1999 pilot group, by 2006 at least 18 U.S. and Canadian medical schools had incorporated some form of LC into their educational system. Of note, in 2006 Vanderbilt University School of Medicine initiated a robust LC system that involved components of wellness, career planning, professional development as well as academic support for its medical students. The program continued to expand over the coming years which led to further increased satisfaction among students and faculty. As one might expect, in recent years, LCs have become a popular emerging trend in medical education serving to create a foundation for professional and academic development (Fleming *et al.* 2013).

When looking at common structures of LCs in medical schools, most students are assigned at random to a community and remain in that same community for all four years of their medical education. Additionally, many universities have made LC participation mandatory. The overall structure of LCs generally involves professionalism training, leadership development, as well as service-learning components. One of the most common primary goals of LCs in U.S. and Canadian medical schools includes “fostering communication among students and faculty; promoting caring, trust, and teamwork; helping students establish academic support networks; and helping students establish social support networks” (Ferguson, 2009).

When thinking about why LCs and why now, it is helpful to take into consideration the proven benefits seen thus far. Upon investigating historical trends in the effectiveness of LCs in medical education, the findings of Lenning and Ebbers (1999) indicate that participating in a learning community is positively linked to engagement as well as student self-reported positive outcomes and overall satisfaction with college. Further, LCs have been shown to increase academic achievement, satisfaction, and involvement among students, the later two having the strongest connection with LCs (Andrade, 2007).

Loneliness & Isolation

When thinking about higher education and student’s experiences of loneliness and isolation, it is disheartening to discover just how prevalent these feelings tend to be in university settings. Past research has indicated that loneliness is widespread among college students (Cutrona, 1982, Rubenstein & Shaver, 1980; Russell, 1982; Russell, Peplau & Cutrona, 1980). Furthermore, in the systematic review by Hunt and colleagues (2017), loneliness and social isolation were linked to worsening mental and physical

health. Further studies support the idea that improvement of social isolation, therefore loneliness, improved mental wellbeing (Rohde *et al.* 2015; Hefner, 2009). Students who are feeling isolated and lonely in higher education may benefit from LC involvement as a way to make meaningful connections and form relationships with their peers.

When exploring the literature for any preexisting relationships established between LCs and loneliness as well as LCs and isolation several connections can be found in past research. Zhao and Kuh (2004) looked at 365 different 4-year college institutions and found a positive trend that participation in an LC improved academic engagement, attendance, performance, and overall greater satisfaction with their college experience.

When looking at medical students, specifically, and their unique niche experiences, Osterberg and colleagues (2016), concluded that LCs were linked to improved clinical skills development and performance as well as improved overall student wellness. In contrast to social groups which offer a break from daily academic demands, medical school LCs have been shown to be more effective in connecting and encouraging students to work together to support the entire community's professional development. Furthermore, LCs instilled a sense of wholeness in medical student's life by providing students with a means to feel more connected to their institution, faculty, and peers. The overall increased feeling of being "connected" is a form of minimizing social isolation. LCs that have mentoring, advising, social activities, and peer support work in tandem to improve student well-being and decreased isolation (Osterberg *et al.* 2016).

When next exploring gender and its relationship to loneliness, it is apparent that gender is an inconsistent variable. Several studies that used various versions of the UCLA Loneliness Scale identified no gender differences in terms of loneliness (as cited in Schultz & Moore, 1986). On the other hand, quantifiable differences were found between college men and women regarding their individual experiences of loneliness. Males scored significantly higher than females on the UCLA Loneliness Scale, however, males were less likely to label themselves as less lonely (Nikolaisen & Thorsen, 2014; Pinguart & Sorensen, 2001; Schultz & Moore, 1986; Borys & Perlman, 1985). Of note, the UCLA scale does not explicitly ask participants whether they perceive themselves as "lonely" but determines this indirectly (Manuela B. *et al.* 2021; Borys & Perlman, 1985). In summary, there is conflicting data on existing associations between loneliness and isolation with gender making it difficult to determine whether a definitive connection exists currently.

Imposter Syndrome

Imposter syndrome (IS) is when one has feelings of self-doubt propagating beliefs that their achievements are unjustified resulting in an unfounded fear of being discovered as a "fraud" or "imposter", thus resulting in feeling like an "intellectual phony" (Bravata, *et al.* 2020; Hawley, 2019; Clance & Imes, 1978). As such, IS is a phenomenon that a wide range of individuals can face including those who are well established and successful (Shelburne, 2020; Villwock, *et al.* 2016). Most relevant, IS has been shown to be highly "prevalent among all health professionals including trainees, advanced practice

providers, allied health professionals, and physicians” (Chandra, *et al.* 2019). Significantly, medical students who experience IS have been shown to have higher rates of burnout, reduced academic success, heightened psychological distress, lower self-esteem, decreased self-efficacy, and increased incidence of academic dishonesty (Villwock *et al.* 2016; Parkman, 2016). As such, many institutions are placing a greater importance on optimizing medical learning environments, with the goal of decreasing the prevalence of IS and sequentially minimizing rates of burnout in medical trainees (Villwock *et al.* 2016).

In congruence with our previous discussion on loneliness, past research has additionally shown a relationship between IS and loneliness. Individuals who experience IS oftentimes feel isolated and as if they are the “only one” who is experiencing the imposter phenomenon. This perception of being the “only one”, is a form of loneliness, and has previously been shown to provoke and worsen internal feelings of isolation. It is further proposed that having support groups and open dialogue may help normalize imposter feelings and target feelings of loneliness brought on by IS (Bravata *et al.* 2020).

When considering gender and IS, prior research is somewhat contradictory. One study which involved 2,612 medical students from Jefferson Medical College found that almost a quarter of male and half of female medical students reported experiencing IS. Thus, the percentage of females displaying IS was roughly double that of their male counterparts (Villwock *et al.* 2016). Likewise, the larger literature also has numerous additional examples of evidence supporting higher levels of IS in women as compared to men (as cited by Villwock *et al.* 2016). However, on the contrary, there is also a substantial number of instances in the literature where no significant variation in prevalence of IS has been identified between genders. In a systemic review on the prevalence, predictors, and treatment of IS, IS was found to be equally as common among both men and women as well as across age groups (Bravata *et al.* 2020). Likewise, Ikbali and Salim Musa (2018) studied medical students internationally and found that 48% of male and 44% of female participants scored as ‘imposters: via the Chance Impostor Phenomenon Scale, which is in concurrence with Chapman (2017). The importance of this being that conflicting evidence persists in the literature.

Locus of Control

Julian Rotter (1954) defines locus of control as a social learning theory of personality. This theoretical construct is derived from our perceptions of outcomes in our life. Whether that be a consequence of our own control (internal locus of control) or a consequence of an outside force (external locus of control) is up to one’s individual beliefs. It was later identified that an internal locus of control was linked to harder working individuals. This is because if an individual feels that they have control of their future outcomes, they are more willing to put in time and effort in order to reap the positive effects. Meanwhile, those with an external locus of control tend to have a weaker work ethic because they feel powerless to their circumstances, feeling that no matter what they do, nothing will change (Kovach, 2018; Keenan and McBain, 1979). Additionally, having an internal locus of control was linked to being less prone to burnout and enhanced engagement (Sharma & Sharma, 2015). Therefore, one’s locus of control is connected to motivation and potential achievement, especially academically (Gifford *et al.* 2006; Kovach, 2018).

When looking at gender and locus of control, there is significant variation in the literature. For instance, females were found to have identified with an external locus of control in some cases (Siddiquah, 2019; Callaghan & Papagerorigiou, 2015; Flori *et al.* 2006; Sherman, Higgs, & Williams, 1997; Levin *et al.* 1994), whereas females were also found to have an internal locus of control in other cases (McPherson & Martin, 2016). Furthermore, no significant correlations were found between gender and locus of control in other situations (Juslin, 2020; Wang & Su, 2013; Muhonen & Torkelson, 2004). Thus, based on past research, there is no clear consistency in gender's connection to locus of control. Environment, religiosity, age, and more likely play a role in our beliefs and perceptions of control.

Locus of control is also connected to one's ability to combat loneliness. Konvach (2018) shares that one who identifies with an internal locus, is more likely to take an initiative and be more active and involved socially, while one who has an external locus, may wait for an invitation to join a group or be involved socially, promoting feelings of loneliness. When looking at online communication, an external locus of control was related to loneliness once again (Ye & Lin, 2015). Specifically, those with external locus prefer online social interactions and have a lower "subjective well-being" (Ye & Lin, 2015; Karatas & Tagay, 2012; Flori *et al.* 2006). Hojat (1982) goes a step further and found that external locus of control was a predictor for loneliness.

Lastly, an external locus of control is connected to IS. Someone with IS fails to legitimize and internalize their accomplishments and thus feelings of self-doubt. When one has an external locus of control, they are doing something similar. They are placing the outcomes on outside forces and not internalizing them, thus IS and an external locus of control are associated. Furthermore, having an external locus place one's perceptions in a negative light leading to low self-esteem (Chandra *et al.* 2019; Clance & Imes, 1978).

WSUSOM Learning Communities

Wayne State University School of Medicine (WSUSOM) is one of the largest medical schools in the country with roughly 290 students in each graduating class. The "Learning Communities" were originally formed in 2018 as an organized way to better connect students with their peers. The overall goal of the formed LCs is to provide an effective means of fostering friendships, mentorship, and social support for medical students.

At the beginning of medical school, each class of roughly 270-300 students is randomly divided into 8 separate color groups. Thus, for each class cohort, each of the 8 designated color groups will consist of 33-38 new students. When combining all four years of active cohorts which includes both upper and lower classmen, each LC color group then individually consists of roughly 132-152 members. For each class there is a Learning Community Coordinator in charge of planning events for their specific color group. Events range from social, community-based, and educational events as well as events related to mentoring. Scheduled events can include just a single class cohort or can be larger and be available to all members of a particular color group to attend. Events are typically held monthly with the goal of fostering more personal and interconnected relationships that are otherwise difficult to form in a very large class size.

The Current Study

As previously discussed, feelings of loneliness, isolation and IS are widespread throughout medical school institutions. All of which plays a role in significantly hindering a student's ability to succeed. According to Otto and colleagues (2015), for LCs to be successful they must be carefully planned and implemented. Thus, being that WSUSOM has one of the largest medical school class sizes in the country, there has been initiative to establish a system of LCs to hopefully directly and effectively combat loneliness, feelings of isolation, and IS to better promote student's wellbeing, engagement, and success.

It has been four years since the initial formation of the WSUSOM LCs. Though there is growing interest in LCs, most programs are in their infancy states and evidence of their impact is unclear (Tinto, 2003). Likewise, to date, the impact and effectiveness of WSUSOM LCs remains unclear. As such, the importance of this study is to evaluate the overall effectiveness of the LCs at WSUSOM, that is, are they working? Our goal is to determine whether involvement in WSUSOM LCs is associated with an identifiable reduction in medical student's feelings of loneliness, isolation, and IS. We, therefore, predict that medical students who are active and engage with their LCs by attending an increased number of LC-sponsored events will be more likely to experience greater social support and decreased feelings of loneliness and isolation, as well as, decreased occurrences and severity of the impostor syndrome phenomenon.

Of additional importance, the conflicting evidence in the literature on possible associations between loneliness and isolation with gender is great. It is unclear whether a true association exists or not. We, thus, further aim to evaluate whether we identify any significant association between loneliness and isolation with gender. Likewise, when considering gender and IS, prior research is also somewhat contradictory. Some data supports there being no gender differences whereas other data supports the notion that females tend to experience IS more frequently. As such, we will dive deeper into this potential association. Prior research has also demonstrated a relationship between IS, loneliness, and locus of control. We will additionally evaluate our data to see if our findings support or contradict previous research.

In summary, we hypothesize that students:

- Who attend more Learning Community events will score lower on imposter syndrome scale.
- Who attend more Learning Community events will score lower on social loneliness scale.
- Who have scored higher on imposter syndrome will have an external locus of control.
- Who have scored higher on social loneliness will have an external locus of control.

METHODS

Participants: 144 participants were recruited from Wayne State University School of Medicine by e-mail using a Qualtrics link. The participants consisted of 42.7% males (61) and 57.3% females (82)

from all LCs between the ages of 22 and 31 with a mean of 24.8 ($SD = 2.21$). Of the 144 participants, majority are set to graduate with the class of 2024 ($N = 68$; 47.2%). The average number of LC events attended was 1-3 events ($N = 81$; 56.3%).

Measures: A demographic survey was conducted among participants, where they were asked to report their age, starting year, gender, average amount of LC events they attended, amount of non-required Wayne events they attended for social reasons, amount of non-required Wayne events they attended for educational reasons.

Next, the Chance IP Scale (1986) was given to participants. This scale was used to measure whether individuals have imposter characteristics and to the extent to which they do. The IP scale is a 20-item-5-point Likert scale ranging from “not at all true” (1) to “very true” (5). With a score of 40 or less indicating few imposter characteristics; a score of 41 and 60 denotes moderate imposter experiences; and a score between 61 and 80 meaning intense imposter experiences. Items on this scale include: “At times, I feel my success has been due to some kind of luck.” and “Sometimes I’m afraid others will discover how much knowledge or ability I really lack.”

Next, the UCLA Loneliness Scale (1978) was given to participants. This scale was used to measure whether individuals subjectively have feelings of loneliness and social isolation. The UCLAL oneliness scale is a 20-item-4-point Likert scale ranging from “I often feel this way” (1) to “I never feel this way” (4). With a score of 25 to 30 reflecting a high level of loneliness; and a score of 30 or higher indicating a very high level of loneliness. Items on this scale include: “My social relationships are superficial.” and “People are around me but not with me.”

Lastly, the Rotter’s Locus of Control (1966), shortened version was given to participants. This scale was used to measure whether individuals had an external or internal locus of control. The scale is a 10-item-2-point scale, where participants select the statement that best represents their beliefs. Where the higher an individual scores, the more they have an external locus of control; and the lower an individual scores, the more they have an internal locus of control. Items on this scale include: “In the long run people get the respect they deserve in this world.” and “Without the right breaks one cannot be an effective leader.”

Procedure. The students were sent a Qualtrics link and were asked to complete a questionnaire that included demographic questions, the imposter syndrome scale, social loneliness scale, and locus of control scale. Before opening the link to the survey, participants were informed that their responses would be used in this study to gather information on the effectiveness of LCs and that by selecting the link, they are providing their informed consent to participate in this study.

After participants agreed to participate in the study, they were given instructions on how to proceed. Following the completion of the study, the students were debriefed and thanked online.

RESULTS

Descriptive Statistics

Descriptive statistics, including means and standard deviations, are presented in Table 1. Table 1 shows the average score of each scale, events attended at WSUSOM, age, starting year, and gender.

T-Tests

Non-LC based social events attended, locus of control, and imposter syndrome scores were analyzed based on participant’s gender. The analyses, as seen in Table 2 and 3, indicated that females ($M = 1.55$ $SD = 1.27$) were significantly attended more non-LC social events than males ($M = 1.10$ $SD = 1.14$), $t(df = 141) = -2.20$, $p < .05$. Furthermore, females ($M = 5.31$ $SD = 1.38$) were more likely to score higher on the locus of control scale, than males ($M = 4.57$ $SD = 1.70$), $t(df = 127) = -2.74$, $p =$

Table 1: Descriptive Statistics

	Age	Gender	Starting year	LC events attended	Social events attended	Educational events attended	Events total	Locus of control	Imposter syndrome	Loneliness
N	136	143	144	144	144	143	143	120	142	142
Missing	9	2	1	1	1	2	2	15	3	3
Mean	24.8	1.57	2019	1.15	1.38	2.03	4.56	4.98	59.4	60.0
Median	24.0	2	2019	1.00	2	2	4.00	5.00	59.0	60.0
St deviation	2.21	0.50	1.35	0.86	1.25	1.26	2.51	1.57	14.4	14.3
Min	22	1	2015	0.00	0	0	0.00	1	20	27
Max	31	2	2024	4.00	4	4	10.0	8	90	80

Please note that the category for events attended are: 0: 0 events attended, 1: 1-3 events attended, 2: 4-6 events attended, 3: 7-9 events attended, and 4: 10+ events attended.

Table 2: Independent Samples T-Test by Gender

	Statistic	df	p	
Age	Welch’s t	0.195	133	0.845
Starting year	Welch’s t	0.356	134	0.723
LC events attended	Welch’s t	1.121	104	0.261
Social events attended	Welch’s t	-2.231	136	0.027
Educational events attended	Welch’s t	-0.174	134	0.862
Events total	Welch’s t	-0.782	132	0.436
Locus of control	Welch’s t	-2.679	109	0.009
Imposter syndrome	Welch’s t	-1.787	131	0.076
Loneliness	Welch’s t	0.769	124	0.443

Table 3: Descriptives by Gender

	Gender	N	Mean	Median	SD	SE
Age	Male	57	24.81	24.00	2.38	0.302
	Female	78	24.73	24.50	2.19	0.248
Starting year	Male	61	2018.98	2020.00	1.31	0.168
	Female	82	2018.90	2019.00	1.20	0.155
LC events attended	Male	61	1.25	1.00	1.01	0.129
	Female	82	1.07	1.00	0.73	0.081
Social events attended	Male	61	1.10	1.00	1.14	0.145
	Female	82	1.55	1.00	1.27	0.140
Educational events attended	Male	60	2.00	2.00	1.18	0.152
	Female	82	2.04	2.00	1.32	0.146
Events total	Male	60	4.33	4.00	2.37	0.306
	Female	82	4.66	4.00	2.55	0.282
Locus of control	Male	58	4.57	4.00	1.70	0.223
	Female	71	5.31	5.00	1.38	0.164
Imposter syndrome	Male	60	56.85	55.50	13.93	1.798
	Female	81	61.19	62.00	14.65	1.627
Loneliness	Male	60	60.95	62.50	14.65	1.891
	Female	81	59.06	59.00	14.10	1.566

.007. Lastly, the correlation between gender and imposter syndrome scale was slightly insignificant; indicating that females are more likely to score higher on the imposter syndrome ($M = 61.19$ $SD = 14.65$), while males are more likely to score lower on the imposter syndrome scale ($M = 56.85$ $SD = 13.93$), $t(df = 139) = -1.77$, $p = .078$.

ANOVA

ANOVA testing was done to determine connections between number of events attended, locus of control, imposter syndrome, and loneliness scores. The results, represented by Table 4, indicate that there was a significant main effect by locus of control score on imposter syndrome score, $F(1, 130) = 4.69$, $p = .032$, and gender, $F(1, 130) = 5.53$, $p = .020$. Furthermore, as indicated by Table 5, there was a significant main effect by loneliness score on non-LC social events attended, $F(1, 142) = 5.44$, $p = .021$ and on non-LC educational events attended, $F(1, 142) = 5.77$, $p = .018$. Mainly, there was an especially significant main effect by loneliness score on imposter syndrome score, $F(1, 142) = 37.21$, $p < .001$. Thus, indicating a connection between loneliness and imposter syndrome.

Table 4: ANOVA- Locus of Control

	Sum of Squares	df	Mean Square	F	p
Gender	12.64	1	12.64	5.53	0.020*
LC Events Attended	0.69	1	0.69	0.30	0.585
Social Events Attended	0.07	1	0.07	0.03	0.864
Educational Events Attended	7.70	1	7.70	5.53	0.069
Imposter Syndrome	10.73	1	10.73	4.69	0.032*
Loneliness	3.99	1	3.99	1.74	0.189

Table 5: ANOVA- Loneliness

	Sum of Squares	df	Mean Square	F	p
Gender	68.40	1	68.40	0.48	0.490
LC Events Attended	98.10	1	98.10	0.69	0.409
Social Events Attended	776.20	1	776.20	5.44	0.021*
Educational Events Attended	823.70	1	823.70	5.77	0.018*
Imposter Syndrome	5310.60	1	5310.60	37.21	<0.001***
Locus of Control	249.00	1	249.00	1.74	0.189

Correlation Matrix

Lastly, a correlational analysis was performed on the scores of: locus of control, imposter syndrome, and loneliness, as well as the number of total, LC, non-LC social, and non-LC educational events attended. These results are represented in Table 6.

Locus of control and imposter syndrome scores were positively correlated, $r(126) = .21, p = .017$. Indicating that the higher individuals scored on locus of control scale, the higher they scored on the imposter syndrome scale.

Imposter syndrome scores was also extremely negatively correlated with the loneliness score, $r(138) = -.049, p < .001$. Meaning that those who scored lower on the imposter syndrome score, scored higher on the loneliness scale.

The number of non-LC social events attended by participants was slightly positively correlated with loneliness, $r(140) = .19, p = .027$, and greatly positively correlated with non-LC educational events attended, $r(141) = .45, p < .001$, and total events attended, $r(141) = .84, p < .001$. Where the more non-LC social events attended the higher participants scored on the loneliness scale, the more non-LC educational events they attended, and the more events in total that they attended.

Non-LC educational events attended was also significantly correlated with the total events participants attended, $r(141) = .77, p < .001$, where the more non-LC educational events attended, the more events in total participants attended at WSUSOM.

Table 6: Correlation Matrix

		LC Events Attended	Social Events Attended	Educational Events Attended	Events Total	Locus of Control	Imposter Syndrome	Loneliness
LC Events Attended	Pearson's r	—						
	P-value	—						
	N	—						
Social Events Attended	Pearson's r	0.330***	—					
	P-value	<0.001	—					
	N	144	—					
Education- al Events Attended	Pearson's r	0.111	0.451***	—				
	P-value	0.185	<0.001	—				
	N	143	143	—				
Events Total	Pearson's r	0.567***	0.840***	0.767***	—			
	P-value	<0.001	<0.001	<0.001	—			
	N	143	143	143	—			
Locus of Control	Pearson's r	0.057	0.023	-0.171	-0.054	—		
	P-value	0.516	0.796	0.053	0.544	—		
	N	130	130	129	129	—		
Imposter Syndrome	Pearson's r	0.038	-0.047	-0.004	-0.012	0.212*	—	
	P-value	0.652	0.580	0.958	0.891	0.017	—	
	N	142	142	141	141	128	—	
Loneliness	Pearson's r	0.103	0.186*	-0.105	0.076	0.031	-0.492***	—
	P-value	0.224	0.027	0.216	0.370	0.729	<0.001	—
	N	142	142	141	141	129	129	—

The amount of LC events attended was remarkably positively correlated with the amount of non-LC social events attended, $r(142) = .33, p < .001$, and events total attended by participants, $r(141) = .57, p < .001$. However, the number of LC events attended had no correlation with non-LC educational events attended by participants, $r(141) = .11, p = .185$.

DISCUSSION

The present study investigated the relationship of Wayne State University School of Medicine learning communities with imposter syndrome, loneliness, and locus of control. Through an online survey, students were asked about the number of events they have attended through their learning community, outside of their learning community. Then the medical students were asked to complete the Clance Imposter Syndrome Scale, UCLA's Loneliness Scale, and Rotter's Locus of Control Scale.

Gender

Results suggest that gender was connected to attending non-LC social events, locus of control, and imposter syndrome, however, there was no connection between gender and loneliness identified.

For instance, females were more likely to attend non-LC social events than males. This can be explained by the concept of social rewards. Oxytocin and dopamine stimulation gained after social interactions lead to social rewards (Borland, *et al.* 2019). Women were found to have an increased social reward for lower “doses” of social interactions (Borland *et al.* 2019). This means that if the event is short, females experience a reward, but as an event lengthens, the reward starts to diminish. Most events at WSUSOM are not lengthy. Future research on the exact amount of time of social interaction which leads to the drop in reward needs to be done. Furthermore, it was not asked about the length of each social event.

Females were also more likely to score higher on the locus of control scale, thus indicating that females have an external locus of control. Past literature has likewise indicated that females tend to have an external locus of control (Siddiquah, 2019; Callaghan & Papagerorigiou, 2015; Flori *et al.* 2006; Sherman, Higgs, & Williams, 1997; Levin *et al.* 1994). One hypothesis for this finding is that the societal expectations placed on women, results in a higher reward value on external validation. This concept, in a way, parallels having an external locus of control point of view where the emphasis is placed on external factors.

Moreover, females were also slightly more likely to score higher on the imposter syndrome scale, therefore, females may be more likely to have imposter feelings. Past research supports the notion that females are more likely to harbor imposter feelings (as cited in Villwock, 2016). If females are more likely to have an external locus of control, which our study confirmed, then it makes sense that they have higher feelings of IS. IS and external locus of control have the same underlying principle in that it isn't our own doing that leads to our results and consequences, thus fostering feelings of unworthiness, fraudulence, and pretender (Chandra, *et al.* 2019; Clance & Imes, 1978).

Lastly, there was no correlation between gender and the loneliness scale, which is backed up by several studies (as cited in Schultz & Moore, 1986). Males and females both experience feelings of loneliness. Whether males outwardly express their feelings of loneliness has been up to discussion (Nikolaisen & Thorsen, 2014; Pinquart & Sorensen, 2001; Schultz & Moore, 1986; Borys & Perlman, 1985).

Locus of Control, Imposter Syndrome, and Loneliness

Further analysis shows correlations between IS and locus of control, as well as, IS and loneliness. However, no correlation was found between locus of control and loneliness. This maybe because we used a shortened version of Rotter's (1966) Locus of Control Scale. The score may have skewed some of the results.

Imposter syndrome score and locus of control score were positively correlated. This means that those who scored as having an external locus of control were more likely to have feelings of being an imposter. As explained previously, the idea behind imposter syndrome and external locus of control is connected; our outcomes are not determined by our actions and efforts, rather by external forces (Chandra *et al.* 2019; Clance & Imes, 1978).

Imposter syndrome was negatively correlated with loneliness. Therefore, the higher one scored on the loneliness scale, meaning having increased feelings of loneliness, the lower they scored on IS scale, indicating less feelings of imposter. Thus, our study found that those who are lonely are less likely to experience IS. This contradicts past literature which described cooccurring feelings of IS with loneliness and isolation. Specifically, past research has shown that those who experience IS oftentimes feel as if they are the “only one” and feel isolated in their experience (Bravata *et al.* 2020). Our study, however, found the opposite, those who are lonely are less likely to experience IS. One possible explanation for this is that feeling “alone” and like the “only one” may not be fully representative of feeling complete loneliness in life. For example, someone who feels like the “only one” who is experiencing a particular phenomenon may still feel like they have a wide support system composed of friends, family, colleagues, etc., to help feel connected to society. Furthermore, WSU has a substantial portion of commuters, that being said, those students have family nearby to support them. One other possible explanation for our findings is that individuals who are experiencing loneliness may spend more time self-reflecting, thus being self-aware. In contrast, someone who is not lonely would spend less time self-reflecting and have decreased self-awareness. Self-awareness may prevent feelings of IS through understanding oneself and their achievements resulting in less self-doubt. More research needs to be done in this area in order to give a more definitive explanation.

Events

Loneliness scores correlated positively with the number of non-LC social events medical students attended. In that, those who scored higher on the loneliness scale, essentially having greater feelings of loneliness, attended more social events. This is somewhat contradictory to a different study which found no significant correlation between changes in social participation with changes in loneliness (Ruiz, 2021). One possible explanation, especially if the student holds an internal locus of control, is that those who feel lonely are more likely to attend social events in order to seek social participation through multiple avenues in hopes of minimizing their feelings of loneliness, whereas individuals who do not feel lonely may feel their time may be better spent elsewhere. Furthermore, WSUSOM students are assigned at random into LC communities, therefore, if someone is lonely, they may be more likely to choose a non-LC event to attend that better aligns with their personal interests. Lastly, one other explanation as to why students may have attended non-LC events more so than LC events, specifically, is that at the time of this study the COVID-19 pandemic was ongoing. LC events were forced to be held exclusively virtual for more than a year's time. Students may, thus, have wanted to attend other non-LC sponsored events that were able to offer in-person experiences that LCs were unable to offer. It may be warranted for future studies to further explore the significance of social vs nonsocial events as well as LC vs non-LC events.

There were no significant correlations between LC events attended and imposter syndrome scores, loneliness scores, and locus of control scores. This maybe because LCs are still new and establishing their footing. Furthermore, during the COVID-19 pandemic, many social and educational events were being held online. Specifically, LC events, as sponsored by the school, were required to be held online,

as mentioned earlier. Therefore, many students may not have wanted to attend another virtual event due to Zoom/screen fatigue and opted to relax at home instead decreasing their LC involvement. As such, the study fails to affirm that LCs decrease feelings of loneliness and imposter syndrome.

Strengths and Limitations

Although the results of this study are not as hypothesized, the results back up past research on connections between gender and imposter syndrome, loneliness, and external locus of control. However, the study fails to affirm that LCs decrease feelings of loneliness and imposter syndrome. This study is important because it is one that sought to assess the effectiveness of learning communities at WSUSOM in regards to imposter syndrome and loneliness.

Our study has limitations as well. One major limitation is that a shortened version of the Rotter's Locus of Control Scale was used. This may skew the scores of the scale to be a bit more extreme as only a few items were assessed. Furthermore, we had a small sample size and participants were not very motivated to complete the study. Lastly, the majority of the students were in medical school during the COVID-19 pandemic. Therefore, attending events was done online and students may not have wanted to sit in front of their screens any longer than necessary. Therefore, with the full Rotter's scale, a larger motivated sample size, and individuals who did not attend medical school during the pandemic, a repeat of this study may yield more significant results.

Implications for Future Research

The relationship between learning communities, imposter syndrome, loneliness, and locus of control has impacted future research in the sense that learning communities may be a waste of time. Although feelings of loneliness and aloneness may have a great impact on imposter syndrome, learning communities are not the most effective way to tackle feelings of loneliness and aloneness. It may be that students forged their own friendships and communities within a graduate school outside of the forced community that the school enlists them in. With a broader sample size, more research on this topic, we can further deem if learning communities are a necessity to one's learning and wellbeing. We also may be able to come up with effective conduits to firmly establish the importance of not only student perspective but reflectively study our faculties beliefs and growth in these areas.

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