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Assessing Level of Physical Activity Among University Students in Rwanda and the Associated Factors

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ABSTRACT

Background: Physical activity (PA) is vital for physical and mental health, yet its prevalence among university students in low- and middle-income countries, including Rwanda, remains underexplored. This study assessed PA levels and associated socio-demographic and institutional factors among university students in Rwanda.

Methods: A cross-sectional survey using the International Physical Activity Questionnaire–Short Form (IPAQ-SF) was distributed online to students enrolled in Rwandan universities. Descriptive statistics summarized PA levels, and multivariate logistic regression identified associated factors.

Results: Among 418 participants, 58.1% met criteria for health-enhancing physical activity (HEPA), 16.5% had minimal activity, and 25.4% were inactive. Male students were significantly more likely to engage in HEPA than females (OR = 2.57, p = 0.001), and students from public universities had higher odds of meeting HEPA thresholds than those in private institutions (OR = 2.30, p = 0.003). Key motivators included stress relief, improved fitness, and enjoyment, while barriers included lack of time, limited access to facilities, low motivation, and insufficient awareness. Open-ended responses emphasized the need for institutional support, peer encouragement, and accessible fitness spaces, especially for female students.

Conclusion: Although most students engage in PA, a substantial proportion remains inactive. Gender and university type significantly influence PA levels. To promote equitable engagement, universities should implement gender-sensitive programs, invest in

infrastructure, and raise awareness of PA benefits. Future research should explore cultural and psychosocial drivers to inform targeted interventions.
Keywords: Lifestyle medicine, physical activity, university students, rwanda

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1. Introduction

- ***Background***

Physical inactivity or sedentarism – the fourth leading cause of death world-wise – is becoming a pandemic (Kohl et al., 2012). Despite the irrefutable evidence for the benefits of physical activity (PA) since the 1950s, and the increased emphasis on its promotion, the burden of sedentarism continues to rise (Kohl et al., 2012). For instance, in the US, 68.5% of adults were overweight, and 39.8% were obese (Ogden et al., 2013; Hales et al., 2017), causing increased risk of developing coronary heart disease, type 2 diabetes mellitus, and a wide range of cancers, in turn, reducing the quality of life and increasing mortality (Berra et al., 2015). According to World Health Organization (WHO) disease country profiles in 2018, NCDs accounted for 44% of deaths in Rwanda (World Health Organization, 2018a). Rwanda marked the second rise change in the trend of NCD mortalities in Sub-Saharan Africa, rising from 19.3% in 2000 to 44% (Duah et al., 2020).

WHO defines PA as any bodily movement produced by the skeletal muscles that requires increased energy expenditure above resting requirements and involves household tasks, leisure time activity, and structured physical activity (World Health Organization, 2018b). Evidence has shown PA could reduce 20 – 30% risk of acquiring more than 25 chronic diseases; and such reduction could be more than 50%, when physical fitness is objectively measured (Kokkinos, 2012). International physical activity guidelines generally recommend 150 minutes per week of moderate to vigorous-intensity PA (World Health Organization, 2022). WHO recommended its member states to have an identifiable plan, strategy, or policy to address physical inactivity.

Despite 73% of the member countries reported to have identifiable plan, strategy or policy to address physical inactivity, only 55% were operational (Kohl et al., 2012). With the rising trends of sedentarism and lack of operational

strategies and policies to address it, the health-related results of physical inactivity will continue to rise.

Healthcare professionals represent a major opportunity to promote PA to the public. Study has shown that medical professionals who practice PA are more likely to encourage their patients to practice PA (Lobelo & de Quevedo, 2016). However, most healthcare professionals in Africa have inadequate PA levels themselves and therefore are less likely to encourage their patients to do PA (Kunene & Taukobong, 2015; Iwuala et al., 2015). Studies have also shown most healthcare students do not practice PA (Blake et al., 2017; Stanford et al., 2012; Wattanapisit et al., 2016; Saranya et al., 2016). Only one research previously conducted in Rwanda was in 2004, assessed perceived benefits and barriers to PA among tertiary institutions was in 2004 (Tumusiime, 2004) . Since 2004, Rwanda's educational system has highly evolved with the use of information technology (IT) in education, building of more infrastructure and introduction of more universities covering a wide range of academics (Baxter, 2012). There was no other recent study in this area. Results from this study can inform plans, strategies and policies aimed to improve PA among university students and henceforth the overall health of Rwandans.

2. Methods

- ***Setting***

As of 2022, Rwanda's population is 13,246,394 people (National Institute of Statistics of Rwanda, 2023). In 2018, there were 89,160 students enrolled in 40 tertiary education institutions, with 70% in public universities (National Institute of Statistics of Rwanda, 2018).

- ***Design and sample***

A cross-sectional study utilizing a non-probability snowball sampling method was used. An online survey was sent to students who were 18 years old or above enrolled in academic programs in universities in Rwanda for at least three months. Students who received the survey link were encouraged to share it with their peers. Students with a physical disability or medical condition which limited their ability to perform PA were excluded from the study.

- ***Data collection tool and procedure***

The study employed the International Physical Activity Questionnaire Short Form (IPAQ-SF). The survey had three sections. The first section collected basic

demographic information of study participants. The second section consisted of 7 open-ended questions surrounding an individual's last 7-day recall of PA. It measured the intensity of PA and sitting time that people do in their daily living (Craig et al., 2003). One open-ended question was added as part 3 for participants to give their comments. Ethical approval was obtained from the University of Global Health Equity (UGHE) Institutional Review Board (IRB) (Reference number: 0247). The study team shared the online survey with the university students and faculties known to them and encouraged them to further share the link to other students and faculties in Rwanda within their network.

- ***Measures***

The primary outcome of the study was the level of physical activity, categorized as low, moderate, or health-enhancing, based on the scoring protocol established by the IPAQ methodology. Additionally, participants' responses to the open-ended questions were summarized as themes.

- ***Data management and analysis***

The data was cleaned and coded in excel before analysis. Descriptive statistics were used to summarize the demographic information and the PA level. The Chi Square tests were used to test the association between socio-demographic factors and the PA levels. All factors found statistically significant in bivariate analysis were further analyzed using logistic regression. All data analyses were conducted using SPSS V.26, with the P-value set at less than 0.05. Themes emerged from the open-ended questions were also presented.

3. Results

A total of 248 university students in Rwanda completed the survey, with a median age of 22 years. Among them, 139 (55.9%) were male, 139 (54.7%) were enrolled in private universities, and 163 (66%) were in health sciences programs. Additionally, 75 (30.2%) were in their third year of study, and 167 (67.6%) resided on campus. Most of them (n=150, 60.7%) came from families in the medium socioeconomic class (Ubudehe category three), 122 (49.4%) of the respondents depended on government bursaries, and 77 (31.2%) relied on their parents. For parental education, 99 (40.1%) of the respondents' mothers and 114 (46.2%) of their fathers had attended university (table 1).

Most respondents (n= 144, 58.1%) performed health enhancing physical activity (HEPA) level, 41 (16.5%) had minimal level of physical activities, and 63 (25.4%) were inactive (Table 1).

Table 1: Demographics

		N (%)
Sample		248
Age	Median (IQR)	22 (16)
Gender	Male	138 (55.9%)
	Female	109 (44.1%)
University	Public	112 (45.3%)
	Private	135 (54.7%)
Faculty	Health Sciences	163 (66%)
	Not Health Sciences	84 (34%)
Year of study	Level 1	48 (19.4%)
	Level 2	51 (20.6%)
	Level 3	75 (30.2%)
	Level 4	56 (22.7%)
	Level 5	12 (4.9%)
	Level 6	2 (2.2%)
Residence	On-Campus	167 (67.6%)
	Off-Campus	80 (32.4%)
Income source	Government Bursary	122 (49.4%)
	Parental allowance	77 (31.2%)
	Side Job	16 (6.5%)
	Other	32 (13%)
Mother education	Didn't attend school	21 (8.5%)
	Primary School	61 (24.7%)
	Secondary School	58 (23.5%)
	University	99 (40.1%)
Father education	Didn't attend school	15 (6.1%)
	Primary school	51 (20.6%)
	Secondary school	54 (21.9%)
	University	114 (46.2%)
Family economy (Ubudehe category)	1	6 (2.4%)
	2	43 (17.4%)
	3	150 (60.7%)
	4	8 (3.2%)
Level of physical activity	HEPA	144 (58.1%)
	Minimum	41 (16.5%)
	Inactivity	63 (25.4%)

- ***Association between Physical Activity Level and Sociodemographic Factors***

Four factors were found to be independently associated with physical activity level, they included: 1) Gender (p<0.001), 2) type of university (p<0.001), 3) residence (p=0.043), and 4) father's education level (P=0.031) (Table 2).

After accounting for all other factors, male had 2.57 higher odds of having HEPA compared to females (adj OR = 2.57, 95% CI [1.49, 4.45], p = 0.001), while students in public university were found also to have 2.3 times higher odds of having HEPA compared to those in private university (adj OR = 2.30, 95% CI [1. 23, 4.02], p = 0.003). However, residency (adj OR = 0.66, 95% CI [0.36, 1.23], p = 0.19) and father's education (adj OR = 1.22, 95% CI [0.68, 2.18], p = 0.50) were not statistically significant factors after adjusting to other factors (Table 2).

Table 2: Association Between Physical Activity Level and Sociodemographic Factors

Category		HEPA	Minimally active or less	Unadj OR	P-value	Adj OR	P-value (95%CI)
Gender	Male	97 (69.8%)	42 (30.2%)	3.05	<0.001*	2.57	0.001*
	Female	47 (43.1%)	62 (56.8%)	Ref		Ref	(1.49, 4.45)
Type of university	Public	91 (74%)	32 (26.0%)	3.25	<0.001*	2.3	0.003*
	Private	63 (46.7%)	72 (53.3%)	Ref		Ref	(1.32, 4.02)
Type of faculty	Health sciences	94 (57.3%)	70 (42.7%)	NA	0.74	NA	NA
	Not health sciences	50 (59.5%)	34 (40.5%)				
University level	≤3	103 (59.2%)	71 (40.8%)	NA	0.41	NA	NA
	>3	38 (53.5%)	33 (46.4%)				
Residence	On-campus	88 (52.7%)	79 (47.3%)	0.50	0.01*	0.66	0.19
	Off-campus	56 (69.1%)	25 (30.9%)	Ref		Ref	(0.36, 1.23)
Income source	Government bursary	80 (65.0%)	43 (34.9%)	NA	0.09	NA	NA
	Parental allowance	36 (46.8%)	41 (53.3%)				
	Side job	9 (56.3%)	7 (43.8%)				
	Other	19 (59.4%)	13 (40.6%)				
Mother's education level	Secondary and below	85 (60.8%)	55 (39.2%)	NA	0.38	NA	NA
	Tertiary	55 (55%)	45 (45%)				
Father's education level	Secondary and below	77 (64.2%)	43 (35.8%)	1.76	0.03*	1.22	0.50
	Tertiary	58 (50.4%)	57 (48.5%)	Ref		Ref	(0.68, 2.18)
Ubudehe	1	5 (83.3%)	1 (16.7%)	NA	0.55	NA	NA
	2	28 (65.1%)	15 (34.9%)				
	3	84 (55.6%)	67 (44.4%)				
	4	5 (62.5%)	3 (37.5%)				
	Don't know	22 (55%)	18 (45.0%)				
Median age	Year	22.55	22.25	NA	0.31	NA	NA

*Significant at P=0.05

- ***Comments from Open Ended Question***

Based on the responses collected from the open-ended question. Three common themes were identified:

Theme 1: *Experiencing the tangible health benefits from physical activities in turn became the motivator for exercise.* Many individuals find motivation in seeing the health benefits gained from regular physical activity, such as improved physical fitness, stress relief, enhanced mental well-being, and increased energy levels. Seeing these positive changes reinforces their commitment to maintaining an active lifestyle.

Theme two: *Lack of time and access to facilities are common barriers to physical activity.* Many respondents cited lack of time, mostly due to busy study schedules, and their academic commitments as a major obstacle to engaging in regular physical activity. Additionally, limited access to gyms, or exercise equipment made it challenging to incorporate structured workouts into their routines. The high cost of gym memberships and fitness coaches hindered their participation in physical activities.

Theme three: *Organized group activities can help encourage people to engage in exercises.* Many respondents suggested social and peer support can enhance participation in exercises. Thus, structured group activities can boost motivation for an active lifestyle. Group settings provide social support, accountability, and a sense of community, which can make exercise more enjoyable and sustainable. The car free day in Rwanda was cited as an example of creating the environment for individuals to come together and exercise together.

4. Discussion

This study assessed the level of physical activity (PA), and the factors associated with it among university students in Rwanda, using the International Physical Activity Questionnaire Short Form (IPAQ SF). The findings highlighted key demographic and environmental influences on PA engagement. A majority (58.1%) of respondents engaged in health enhancing physical activity (HEPA), while 16.5% had minimal PA levels and 25.4% were inactive. The results showed that while most respondents are physically active, a substantial proportion remain at risk for inactivity-related health concerns.

Among the factors examined, gender and type of university were significantly associated with PA levels. Male students were more likely to engage in HEPA compared to females (OR = 2.57, p = 0.001), aligning with existing literature, which consistently showed that men tend to be more physically active than

women. A rare exception was one study in Germany where among students who attend physical education universities, females had a higher PA level than their male counterpart's where lack of technical facilities was a demotivator (Bronikowski et al., 2020).

Differences in exercise preferences, cultural norms, environmental influences, and psychosocial factors could have contributed to such differences. Studies have shown that males often prefer structured, high-intensity activities, such as competitive sports, weight training, and endurance exercises, while females are more likely to engage in lower-intensity activities, such as yoga, walking, or dance-based fitness (Reading & LaRose, 2022; Burford et al., 2021). These variations in exercise preferences may contribute to the differences observed in PA engagement.

Additionally, cultural and societal expectations can influence PA participation among women. In many communities, particularly in conservative or traditional settings, women may face social restrictions, or gender-role expectations that limit their opportunities for PA (Ogidan et al., 2013). In some more conservative cultures in East Africa region, female participation in sports and vigorous exercise may not be widely encouraged, leading to lower engagement rates (Tusiime & Mse, 2022). Moreover, psychosocial barriers, such as lack of self-confidence, fear of judgment, or body image concerns, have been identified as significant deterrents to female PA participation (Obi et al., 2023).

Access to safe exercise spaces, availability of gender-inclusive fitness programs, and institutional support may also play a crucial role. Based on the comments through the open-ended questions, access to facilities was commonly cited as a barrier. If university campuses do not offer sufficient female-friendly PA facilities or structured programs tailored to their needs, women may be less likely to engage in regular exercise. School-based and infrastructural policies have been shown to increase PA in various countries (Gelius et al., 2020). With some modifications based on local context, effective policies can help promote PA.

Given these disparities, future research should explore the specific cultural, social, and psychological factors influencing PA levels between males and females. This would enable the development of targeted interventions that cater to the unique needs and preferences of both sexes, ensuring that both male

and female students have equal opportunities to engage in PA. Universities and policymakers should consider implementing gender-sensitive policies, such as female-only fitness spaces, structured group classes, or awareness campaigns addressing gender-specific barriers to PA. By acknowledging and addressing these differences, institutions can work toward reducing gender disparities in physical activity and promoting an inclusive and supportive fitness culture.

Additionally, students in public universities had significantly higher odds of engaging in HEPA compared to those in private universities (OR = 2.30, p = 0.003). This may be due to differences in campus facilities, extracurricular activities, academic workload distribution, or social economic factors.

Some studies suggested that public universities provide more access to sporting facilities and organized PA (Carballo-Fazanes et al., 2020). Additionally, students from private universities might have more demanding schedules and prioritize their academic, career, and professional development thus limiting their PA (Leslie et al., 2001). Furthermore, financial burdens contribute to the level of PA since the cost of tuition in public universities are generally lower, and students are more likely to receive scholarships therefore, having less financial stress enabling them to participate in PA (Haase et al., 2004). These differences emphasize the institutional roles in availing resources that enhance or hinder the culture of PA among university students. One of the comments from the respondents was related to organized sports can enhance participation, due to the inbuilt social and peer support. Universities may consider incorporating physical education sessions in their curriculum to promote a more structured group PA and foster a more active and healthier student population.

The open-ended responses provided further insight into motivators and barriers to PA among students. Many reported that experiencing tangible health benefits (e.g., stress relief, increased energy, improved physical fitness) motivated them to continue exercising. Enjoyment from PA and prior participation in PA were associated with consistency and higher PA level among students (Dishman et al., 2005). The health benefits are not restricted to physical wellness. Studies have shown PA can reduce depression (Roshanaei-Moghaddam et al., 2009; Coughenour et al., 2021; Liu et al., 2023). Perceived benefits, including personal behavior control, have been associated with higher PA level among university students in developing countries (Pengpid et al.,

2015). Enjoyment from PA and prior participation in PA is associated with consistency and higher PA level among students (Dishman et al., 2005).

Peer support and social can also be positively correlated with increased PA level among adolescents (Deliens et al., 2015; Cheng et al., 2014). Our study results highlighted the role of organized group activities as a potential strategy to encourage exercise, citing initiatives like Rwanda's Car-Free Day as effective in fostering a more active lifestyle.

Conversely, lack of time and access to exercise facilities were the most frequently cited barriers. Similar barriers were also found in other research studies (Deliens et al., 2015). Busy academic schedules and high costs of gym memberships made it difficult for students to engage in structured PA.

Additionally, lack of education on the importance of PA often results in lower participation, a phenomenon seen among university students in Kuwait, where insufficient knowledge leads to a passive attitude toward PA (Alsahli, 2015). Our study results also showed father's education level was initially identified as associated factor, despite that did not remain statistically significant after adjusting for other factors, suggesting that the parental education level might have influenced their children's PA engagement indirectly. Other studies have also shown that without understanding the benefits of PA, students and the general population lack proactiveness in PA (Parra-Rizo et al., 2022). Awareness programs could potentially enhance the PA levels of the students.
Lastly, lack of motivation was raised as an intrapersonal barrier to PA which limits willingness to participate (Pauline, 2013; Trost et al., 2002). To overcome this, the positive outcomes of PA should be emphasized to motivate individuals and create a more active lifestyle (Pauline, 2013).

5. Recommendations

Based on the study results, targeted interventions to encourage female participation in PA, such as gender-inclusive sports programs, fitness workshops, and awareness campaigns highlighting the benefits of regular exercise should be developed. Establishing accessible spaces for students, and safe space for female students to engage in PA comfortably are important.
Universities should invest in creating more accessible recreational spaces, such as gyms or sports fields. It is also advisable to incorporate physical education sessions within academic settings to encourage participation.

Since time was cited as a main barrier to PA, institutions should promote flexible and time-efficient exercise options. On-campus fitness programs, or virtual workout sessions could be considered.

To increase access to affordable fitness resources, institutes could consider subsidized gym memberships or student-led exercise groups, such as running clubs, dance classes, or team sports, to foster social motivation and accountability. Collaborations with other initiatives, such as during Car-Free Day to create more structured, community-driven PA opportunities may also enhance participation.

Integrating movement-based activities into lectures or study sessions can also be considered to promote an active campus culture. Health campaigns to emphasize the physical and mental health benefits of PA should be conducted regularly to encourage sustained participation.

Future research could explore additional psychosocial and environmental factors influencing PA engagement to develop more tailored interventions.

- ***Limitations***

This study provided the prevalence of PA levels and the associated factors among university students in Rwanda. The results offered insights to promote PA and, in turn, improve health outcomes. However, the findings should be interpreted in light of certain limitations. The study utilized a self-administered survey method, which could not eliminate social desirability bias. Students might have overestimated or underestimated their PA levels. Additionally, the study employed snowball sampling, which may have excluded students without access to the internet or smart devices, potentially limiting the representativeness of the sample. Nevertheless, this is the first study to document the PA levels of university students in Rwanda and can serve as a foundation for future research.

- ***Declarations:***
- ***Ethics approval and consent to participate:*** This study did not collect personally identifiable information. IRB approval was obtained from the University of Global Health Equity with reference number UGHE-IRB/2023/038.
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- ***Authors' contributions:*** All authors contributed to this study equally.

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