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Article

THE INFLUENCE OF CAMPUS SPORTS FACILITIES AND CULTURE ON PHYSICAL ACTIVITY ENGAGEMENT AMONG COLLEGE STUDENTS: A CASE STUDY FROM XI'AN, CHINA

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Abstract

Physical activities are important for students for their physical as well as mental health improvement. The study focuses specifically on the campus sports facilities and culture on the physical activity engagement among the college students of Xi'an, China. The improvement of such engagement can reduce physical inactivity, obesity and stress, however, many colleges in Xi'an exhibit low levels of consistent physical engagement for their students. Hence, the study is developed to address the existing gap based on the self-determination theory. Aspects under campus sports facilities like competence, autonomy and relatedness and their relationship with physical activity engagement is investigated in the study along with considering the mediating impact of culture. Primary data is gathered from 430 students of Xi'an Jiaotong University. The data analysis outcome shows that autonomy may not be a directly related factor to the growth of physical activity engagement. However, the mediating role of culture is supported through the Sobel test outcome. Therefore, the study result is impactful for universities to invest more on the accessibility and the maintenance of facilities that can be able to make students competent. However, the context of socioeconomic backgrounds of students in terms of achieving sport facilities is not explored in the study, however, it can be researched further in future.

Keywords

Alleviate depression, self-confidence, student-centered design, togetherness, modern culture;

Citation

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INTRODUCTION

Physical exercise is imperative to strengthening an individual's immune system, maintaining vigour and reducing the incidence of disease. As per the views of Zhou et al. (2023), physical exercise can help alleviate negative emotional states such as tension and anxiety triggered by adverse life events, fostering a more positive, resilient, and optimistic outlook on life. According to a report published by the World Health Organization (WHO), a growing prevalence of physical inactivity, stress, obesity, and movement disorders such as hypokinesia, and associated health problems are increasingly observed in adolescent youths and adults, with China being no exception (Kljajević et al., 2021). Likewise, Ferreira Silva et al. (2022) have also established that multiple factors influence physical activity behaviour, such as psychological, emotional, socioeconomic, and demographic, cognitive factors; sociocultural, environmental factors, along with physical activity characteristics and behavioural attributes, thus rendering physical activity engagement a multidimensional and complex interplay of various underlying dimensions. In addition to this, an astounding 81% of adolescents fail to meet the physical activity recommendation as proposed by the WHO (Ferreira Silva et al., 2022). Resultantly, a key objective of the World Health Organization's global action plan for a healthier world has been the reduction of the prevalence of physical inactivity worldwide by 15% by the year 2030 (Brown et al., 2024). Physical exercise is a multifaceted concept that can be examined from various perspectives. In this regard, Zhang, Ren & Zou (2022) have highlighted that physical activity engagement can considerably alleviate depression and anxiety alongside ameliorating psychological and behavioral problems. Furthermore, Brown et al. (2024) have asserted that physical activity is important for all aspects of health, yet the majority of university students are not active enough to reap these benefits.

Problem statement

Despite the increasing significance levied on physical activity for maintaining physical and mental health among adolescent students and youth, many educational institutions, such as the ones in Xi'an, China, exhibit low levels of consistent physical engagement among their pupils. This decline is influenced by a combination of academic pressure, sedentary lifestyles, and insufficient motivation. In addition to this, the research conducted by Li et al. (2024) has established that the engagement with physical activity is particularly low among college students in China, along with a prevalence of lack of adequate sleep, which imparts a substantial impact on college students' mental health. A degree of coherence with this standpoint can be observed in the opinions of He et al. (2023) who have stated that learning context affects the motivation and social outcomes in PA programs among the pupils in Shaanxi province, which calls for effective physical activity programs that might enhance students' awareness, competence, and motivation to participate in PA. While the educational establishments across China are equipped with varying degrees of sports facilities and promote different campus cultures, there is limited empirical evidence on how these environmental and cultural factors coincide and collectively influence physical activity behaviours and engagement levels among the students.

Objectives

The research aims to explore the influence of campus sports facilities and culture on physical activity engagement among college students: a case study from Xi'an, China.

The research objectives can be summarised as follows:

1. To explore how the perception of competence impacts their physical activity engagement among the college students in Xi'an, China
2. To analyse how the notion of autonomy influences the willingness of physical activity engagement among college students in Xi'an, China
3. To assess the impact of relatedness as an antecedent of willingness to engage in physical activity among college students.
4. To explore the mediating impact of institutional culture on physical activity engagement among college students in Xi'an, China

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The research questions developed are identified as follows:

1. How does students' perception of competence in sports activities function as a source of engagement in physical activity on campus?
2. In what manner does the conceptualization of autonomy in choosing and participating in physical activities affect the levels of engagement among college students in Xi'an, China?
3. To what extent does the impression of relatedness with peers and the campus community predict the level of physical activity engagement among college students in Xi'an, China?
4. What is the mediating impact of campus sports culture on the relationship between psychological needs and physical activity engagement among college students in Xi'an, China?

Significance of the Study

Given that the study is focused on the Shaanxi province in China, a refined understanding could be afforded regarding the intricate interplay of campus environment, student behaviour, and motivation to engage in physical activities. This research is based on the intuitive viewpoints of the pupils across the educational institutions in Xi'an, which helps in comprehending the availability, accessibility, variety, and quality of sports facilities for the students. The statistical approach encompassed in this study manifests a precise measurement of various psychological factors related to engagement in physical activities, thereby enhancing the generalisability of the findings across different geographical regions. The findings from this research could be constructive in highlighting the pertinent factors influencing the motivation of students in engaging with physical activities, alongside affording a comprehensive notion of the strategies to be undertaken to cultivate a supportive campus culture to improve student health outcomes. Additionally, given that the educational landscape in China is riddled with extreme pressure and recreational activity is often undervalued, the insights from this study could help shift perspectives and balance student life with healthier lifestyle choices. Herein, outcomes of this research can guide the university administrators and policymakers in policy development and prioritising investments in sports infrastructure, thus promoting a culture that encourages physical activity.

LITERATURE REVIEW

Theoretical Framework

The implementation of self-determination theory can identify the psychological framework to predict the way individuals get motivated and perform when their psychological requirements for competence, autonomy, and relatedness are fulfilled and satisfied. In order to promote physical activity among college students in China, the management can implement SDT through the strategic development of sports facilities by supporting campus sports culture. Bernhart et al. (2022) think that for addressing autonomy, the management of the college should arrange a campus sports program for the students by assembling different activities for engaging them in sports. These options can involve unstructured recreational space, outdoor adventure programs, structured indoor sports, and fitness classes.

The students can be provided with the opportunity to select activities according to their interests. This can help the teachers control the participation of the students to enhance intrinsic motivation. It also allows access to the identified issues and flexible schedules, such as non-competitive entry requirements and others, to support the autonomous engagement of the college students in Xi'an, China. On the other hand, promoting competence is also crucial. The authority of the college can provide sports facilities by confirming access to user-friendly equipment, well-maintained space, and other requirements that can accommodate the skill levels of the students (Llanos-Muñoz et al., 2023). Providing instructional support like personal training, workshops, or leading the fitness group can allow the students to develop self-confidence and their potential. They can get the opportunity to track their progress through different programs or apps for reinforcing the sense of achievement and improvement among the students through sustained participation.

However, promoting relatedness based on self-determination theory can help the students to get connected to others and maintain the culture of the campus by focusing on inclusion in physical activity. According to Manninen et al. (2022), this can include team sports, fitness classes, and wellness events to increase social support and peer interaction. The authority can also take the

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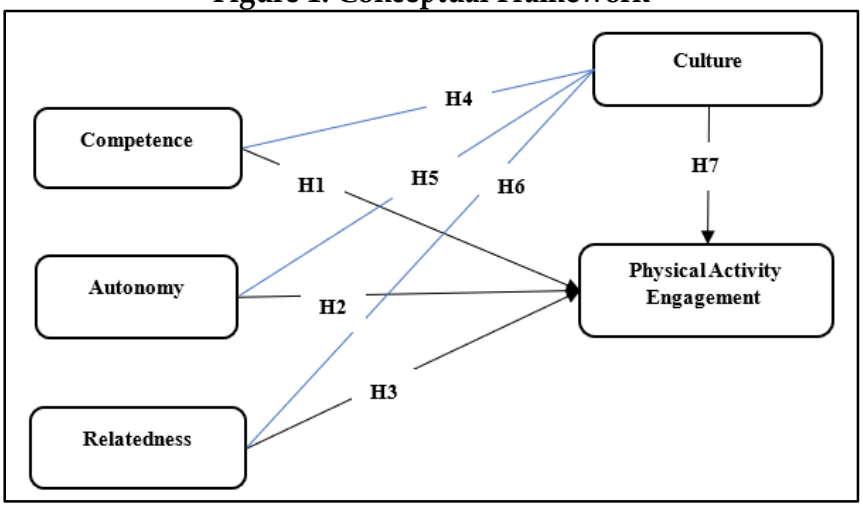
initiative of developing new programs, like competition among the students, to create a sense of belonging. Promoting different ways to value the participation and the effort of the students over competition can motivate them to develop a better atmosphere by reducing the fear of judgment or intimidation, mainly for the participants with less experience (Yefan, 2023). Therefore, the implementation of self-determination theory can help the management of the college to design a sports campaign on the campus by arranging different programs and facilities for the students, regarding an appropriate physical infrastructure. It can satisfy the psychological needs of the students by promoting a healthy environment to make them feel competent, autonomous, and connected with different physical activities, and manage their well-being.

Conceptual Framework

Figure 1: Conceptual Framework



Even though numerous studies have examined physical activity among Chinese college students, there have been very few which have specifically focused on Xi'an. Due to its distinct urban developmental and cultural heritage, Xi'an presents unique factors which impact student engagement in physical activities. Along with this, existing research also treated sports facilities and campus sports culture as separate entities. This means that a lack of comprehensive studies which have analysed how the interplay between these two components can together impact physical activity levels of college students. Furthermore, it has also been noticed that different studies have prioritised administrative or managerial viewpoints regarding sports facilities and have overlooked the first-hand experiences of college students themselves. A lack of longitudinal studies which have tracked changes in physical activity levels of students in college over a period in relation to modifications made in the campus sports infrastructures. Past research has also predominantly focused on urban universities in China and often ignored the disparities and unique challenges which are faced by institutions in semi-urban and rural areas. Lastly, there is also a gap in understanding how socio-economic background of college students can have an impact on their access to and participation in campus sports activities as well.

Hypothesis Development

Hypothesis Development: Competence and Physical Activity Engagement

According to the study conducted by Xu et al. (2021), in the context of physical activity, competence refers to an individual's perceived ability for successfully performing any physical tasks including skill mastery, physical literacy, confidence and self-efficacy in sports or other exercise related activities. Physical activity engagement, on the other hand, as explained in the study conducted by Shu et al. (2024), is the frequency, intensity, duration and consistency of participation in any structured or unstructured physical activity such as gym workouts, sports, or recreational movement. The study conducted by Zhang et al. (2022), has shown that perceived physical competence is a crucial predictor of voluntary exercise behaviour among college students. As also seen in the study conducted by Xu et al. (2021), competence can help in reducing the negative impact of academic stress on physical activity- making students more confident on their physical skills and

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finding greater time for physical activity engagement. Shu et al. (2024) and Wu et al. (2021) also suggested that a lack of competence on the other hand often results in exercise avoidance because of embarrassment or fear of failure which is very common among the female students in urban Chinese universities. The following hypothesis has been developed for showing the relationship between competence and physical activity engagement of college students in Xi'an, China.

H1: Competence has a significant impact on Physical activity engagement of college students in Xi'an, China

Hypothesis Development: Autonomy and Physical Activity Engagement

Autonomy, as defined in the study conducted by Yan et al. (2025), is a person's sense of control and self-initiation of any action. In the context of physical activity, as seen in the study conducted by Liu et al. (2022), autonomy refers to freedom to choose how, when and what kind of physical activity to participate in. As also mentioned in the study conducted by Zhang, Ren & Zou (2022), autonomy supportive environments in colleges helps in increasing physical activity participation among Chinese college students. As also seen in the study conducted by Hao & Yang (2022), when students are forced to participate in government mandated fitness tests, their autonomy gets restricted. This, as per the study conducted by Zhang et al. (2021), can often result in reduced motivation to participate in any physical activity. Yan et al. (2025) also explained that greater autonomy helps in improving motivation among the college students for consistent participation in different physical activities. Along with this, as seen in the study conducted by Liu et al. (2022), autonomy is also linked to greater psychological well-being of college students, which in turn is related to more frequent physical activity specifically among stressed college students. As also seen in study conducted by Zhang, Ren & Zou (2022), programs which are able to integrate student-centred design like university wellness challenges, helps in promoting autonomy. This, as per the study conducted by Zheng et al. (2023), helps to see higher voluntary participation of college students in different physical activities as well. The following is the hypothesis showcasing the assumed relationship between autonomy and physical activity engagement of college students in Xi'an, China

H2: Autonomy has a significant impact on Physical activity engagement of college students in Xi'an, China

Hypothesis Development: Relatedness and Physical Activity Engagement

Previous studies have indicated that relatedness highlights the requirement to feel the belonging, which significantly affected the engagement of physical activity among the college students in Xi'an, China. According to Huang et al. (2025), both peer support and parental support are considered as an important role for the students to promote physical activities. Different research has consistently shown that encompassing peer and parental support, including social support, can improve the physical activity habits of the students, which can help them develop a positive environment for exercise. It can also enhance the ways of social interaction by motivating the students to focus and their physical activities. Li et al. (2025) think that regular physical activity can provide a positive effect on the physique of the students and improve their social skills and mental health. According to the implementation of self-determination theory, relatedness is referred to as a primary factor that affects the behaviour in motivation of students. In the colleges of Xi'an, peer acceptance and social connection are mainly valued for maintaining relatedness in physical activity settings.

Li et al. (2024) stated that the culture in the sports campus of the colleges often focuses on the collective participation of the students in basketball games, group fitness classes, and the sports events organised by the colleges. The students of such colleges in China prefer to participate in different physical activities for highlighting their abilities and to get support from their parents and peers. It provides more opportunities for encouragement, emotional bonding, and shared achievement among the students when they get engaged in the exercise with other students or their friends. Zhang et al. (2025) believed that it highlights the togetherness, which enhances motivation and provides a suitable experience to the students for participating in the physical activities by making it more sustainable and enjoyable. Moreover, the expectations and the social norms within the peer group have a significant impact on the physical activity engagement of the students in the

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college, improving their behaviour by avoiding social exclusion.

H3: Relatedness has a significant impact on Physical activity engagement of college students in Xi'an, China

Hypothesis Development: Competence, Physical Activity Engagement and Culture

The competence in physical activity is an important motivating factor for college students to become physically active. Then, students who are skilled and capable in sports and exercise are more likely to participate regularly. Nevertheless, competence alone does not fully account for students' engagement rates. Students' view and act on their abilities in China are strongly influenced by cultural values in Xi'an, China (Yu et al., 2024). The shapes of these values influence their motivations and their decision making with respect to physical activity. Traditionally, Chinese culture feels that academic success should be prioritized over physical fitness. There is great expectation by family and society for all students in Xi'an to study. Students may choose not to engage in physical activity even when in possession of high physical competence, if this goes against the cultural priorities. This leaves a difference between the ability and the behavior. Thus, competence translates into physical activity through mediation of cultural norms (Shu et al., 2024). As such, students are also changing their perceptions through modern influences, like Western fitness trends and social media. Xi'an young people are more health conscious and are aware of physical activity as a part of balanced life. This cultural shift stimulates students who already feel competent to exercise more. It will bolster physical engagement by the interaction of modern culture with personal ability. This culture is a positive force, it does support competence expression. Finally, conclude that culture in Xi'an acts as an intermediary between competence and physical activity engagement in college students (Mengyu et al., 2025). Competence increases when the preferred cultural values support physical activity and participation is likely to increase. Even competent students find it difficult to stay inactive if culture does not encourage it. It provides them with an insight of how to design more effective programs for students.

H4: Culture mediates the relationship between competence and Physical activity engagement of college students in Xi'an, China

Hypothesis Development: Autonomy, Physical Activity Engagement and Culture

College students are influenced by autonomy when deciding how to engage in physical activity. Students have the freedom to decide what they will do, and then they are less prone to give up and not be persistent. That is why many college students there express a desire to make their own choice about the way they engage in exercise. Nevertheless, autonomy does not hold participation on its own (Xu et al., 2021). The way how autonomy is used and understood is based on cultural values. In Chinese culture, there is a deep respect for authority and an emphasis on collective purpose. Ultimately, students do not follow their own choice but rather listen to what their parents, teachers, or peers say. The effect of autonomy can be in turn limited by cultural pressure. Even if students feel free, still no one will do it on its own if it contradicts the family or social expectations. In this way, culture mediates the influence of autonomy on physical activity (Kayani et al., 2021). This is reflected at the same time by modern culture which is changing the student's view in Xi'an: exposure to global media, fitness influencers, and urban lifestyle pushes the students toward more personal choice. Physical activity is seen these days as a personal goal, related to health and self-expression, by many students. In such an environment, autonomy proves to be more effective. As a student, to be independent and to live in a modern culture is more prone to take regular exercise. In summary, culture mediates the relationship between autonomy and physical activity engagement among college students in Xi'an (Li et al., 2023). These cultural influences are not understood by schools and health programs. Creating an environment that supports decision rights for students helps to allow them to take care of their own health.

H5: Culture mediates the relationship between autonomy and Physical activity engagement of college students in Xi'an, China

Hypothesis Development: Relatedness, Physical Activity Engagement and Culture

Physical activity engagement depends heavily on feeling relatedness, or the feeling of connection with others. When friends, classmates, or fit family elevate exercise in their daily life, college

students in Xi'an are more likely to join in the exercise action. It makes them want to join group activities such as sports, dance or fitness clubs. On the other hand, the strength of relatedness is heavily cultural and social norm dependent on its environment (Zhou et al., 2024). In traditional Chinese culture, the importance of group harmony and relationships is very high. Activities involving social bonds are a natural part of understanding among the students. Instead, physical activity becomes something that is done as a group instead of an individual goal (Zheng et al., 2023). Relatedness both stimulates and is stimulated by more physical activity in this context, as culture is about group participation and social support. However, not all cultural influences are equally supportive (Wu et al., 2021). For some students in Xi'an it may lead to more pressure of paying attention to academics rather than social or physical activities. In these instances, even if students want to be social they might not go beyond physical activity if it is not counted as useful or appropriate. Relatedness can be counterbalanced by culture's effect if culture channels positive relatedness towards more study versus health or away from positive types of physical expression. The conclusion is that culture in Xi'an has a significant impact on the way that relatedness affects physical activity engagement (Li, 2025). If social connection through exercise is rewarded with cultural norms, students become active. Relatedness is less effective when culture prefers academic success or detracts from group activities. This relationship helps universities and policymakers better support students.

H6: Culture mediates the relationship between relatedness and Physical activity engagement of college students in Xi'an, China

Hypothesis Development: Campus Sports Facilities, Physical Activity Engagement and Culture

According to the study conducted by Li et al. (2024), even when campuses provide better sports facilities, students' usage differs significantly because of cultural beliefs about fitness and body image. Research such as the one conducted by Yin et al. (2023), in Chinese urban universities have also shown that Confucian academic values which are known to prioritise study over leisure often discourage college students to engage in physical activities. As further seen in the study conducted by Kayani et al. (2021), in regions like Xi'an, traditional gender norms also contribute to lower female participation in campus sports activities. Lin et al. (2022) and She et al. (2023) also explained that Collectivist cultural values also shape student preferences towards group-based or peer-driven activities in colleges. As further seen in the study conducted by Li et al. (2024), students from rural areas in China often lack exposure to recreational sports culture. This, as per the findings of the study conducted by Wu et al. (2024), makes it difficult for them to gain confidence or be interested in using sports facilities available in the universities. Liu et al. (2024) and Yin et al. (2023) further have found that campus facilities are more frequently used when they support culturally popular sports such as badminton or basketball rather than westernised fit regimes. The following is the hypothesis developed for describing the mediating role of culture on the relationship between campus sports facilities and physical activity engagement of college students in Xi'an, China:

H7: Culture mediates the relationship between campus sports facilities and Physical activity engagement of college students in Xi'an, China.

METHOD

The research is associated with investigating a relationship between campus sports facilities, culture and the physical activity engagement. Therefore, a quantitative data analysis method is considered suitable for the study. The hypotheses that are developed based on the literature review can be tested through the quantitative data analysis based outcome. The quantitative research designs in the study are considered helpful for uncovering patterns and making effective predictions in relation to the context of the research topic (González-Díaz & Bustamante-Cabrera, 2021). Apart from this, the chances of testing the reliability of the instruments and other methods are also significant or can be done properly while the quantitative research designs are followed. The primary data collection method is incorporated in the study to gather relevant information. The chances of collecting interpretation free as well as raw data are higher while primary data collection is followed. In addition, the chances of gaining up-to-date data are higher in such cases. Different types of procedures are used for the collection of primary data. Here, the survey method can be

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used for the collection of objective data, because the entire research is conducted on the basis of quantitative research designs.

Figure 2: Krejcie & Morgan

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	26	140	103	340	181	1000	276	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is Population Size
"S" is Sample Size.

Source: pubs.sciepub.com (2021)

The survey method can be helpful to gather data from a large number of respondents without spending excessive time behind it. In addition, the survey method is also supportive for gathering information that is based on variables used in the stride. Hence, collecting primary data through a survey method is supported in the study for providing the idea about factors that can motivate college students to enable their engagement towards physical activities (Mazhar et al., 2021). Additionally, benefits such as easy administration of the overall data collection process can be done while the survey method is employed. The specificity as well as factors like accuracy is also considered for the selection of survey methods to investigate the relationship between campus sports facilities as well as engagement towards the physical activities among college students. In addition, a sampling method is also to be considered to determine the respondents of the study. Before drawing the sampling size, it is important to decide the population as well as the unit of analysis for the study. Here, college students from Xi'an, China are considered as the unit of analysis. In addition, the sizes of the target population of students in this case are the students of a renowned university known as Xi'an Jiaotong University. The total number of college students under the university is 54760 in this case (sie.xjtu.edu.cn, 2024). A subset is drawn from the targeted pollution to conduct surveys with them.

The table helps in identifying that for a population that lies between 500000 to 75000, either 381 or 382 sample sizes can be an effective option (pubs.sciepub.com, 2021). However, for gaining a more in-depth idea as well as outcome, a sample size of 400 is considered in this study. Moreover, the determined number of respondents from the population can be gathered through the help of a simple random sampling method. It can be stated that the simple random sampling method came in support to reduce the chances of any kind of biases in this case. Additionally, each and every student belonging to the population has the equal chance for participation in the survey process. The survey process is voluntary by nature; therefore, anyone can leave the survey as per his or her wish. The survey is planned to be accomplished through the help of some questionnaires. Some closed-ended questionnaires are developed in the study for gathering or gaining responses from the students (Semyonov-Tal & Lewin-Epstein, 2021). In addition, all of the closed-ended questionnaires developed based on the variables as well as some secondary sources to gain data about the different aspects of the campus support fatalities that impacts on the students' physical activity engagement. Additionally, the questionnaire is attached with a five-point likert scale. The likert scale has 5 opinions (such as "strongly disagree, disagree, neutral, agree, strongly agree). Hence, the respondents are able to choose any of the options to give their responses. In addition, some questions are also to be developed for asking questions about age, gender or other demographic information for students. In addition, instrument development can be helpful for gathering

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structured data that can be analyzed through the help of data analysis procedure. The research design is quantitative in the study and the primary data is collected through a survey method. Hence, a quantitative data analysis method is suitable in the study. Quantitative data analysis can be supportive for the interpretation of numerical data and it is supportive for data-driven decision making (Bousdekis et al., 2021). Furthermore, quantitative data analysis is closely associated with the benefits such as reliability checking that can be done easily while the quantitative method is used. Additionally, generalisability of outcome is a key beneficial aspect that can be effective in this study.

Tools such as IBM SPSS are used to accomplish the study. Using IBM SPSS can be supportive for generating results by considering various types of statistical analysis (Rahman & Muktadir, 2021). Mainly, the descriptive statistical analysis as well as the inferential statistical analysis is planned to be covered in this study. Apart from this, the beneficial aspects of using SPSS like user friendly interface as well as providing various types of options helps in identifying it as a flexible data analysis platform. Tests such as multiple regression and sobel test can be conducted under the study in terms of investigating the relationship that exists within the variable. In addition, the data analysis through SPSS is also associated with assessing the correlation that exists between the variables. The reliability as well as the validity test can also be done through the help of the IBM SPSS tool. Testing the reliability and validity can be helpful to enhance the essence of the research study. In addition, the quality of the research should also be maintained through it. Analysis of demographic information should be accomplished through the help of IBM SPSS tool. Here, in the study, the researcher followed all the ethical considerations to avoid errors and biases. The researcher has also followed the principles required to maintain the transparency of the study while collecting data. Informed consent, anonymity, confidentiality, and privacy have been properly maintained by the researcher during the survey process. However, the "Personal Data Protection Act 2010" of China has been followed for the security of the collected data. All the data has been collected without forcing or harming participants by maintaining their consent.

FINDINGS

Demographic Analysis

Table 1: Demographic Analysis

		Count	%
Age	18-20 years	112	28.00%
	21-23 years	207	51.70%
	Above 23 years	81	20.30%
Ethnicity	Han	53	13.30%
	Hui	73	18.30%
	Manchu	139	34.80%
	Mongol	84	21.00%
	Others	51	12.80%
Gender	Male	172	43.00%
	Female	228	57.00%

Based on the tables, it has been recognised that 400 participants for the study have been selected, where 172 participants are male and 228 participants are female. This indicates that there are more sample members, including female participants, than male participants for this study. For the next demographic characteristics, this has been recognised that 112 participants are from the age group within 18-20 years, 207 participants within 21-23 years, and 81 participants are from the age group

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above 23 years. The study shows that the majority of the students are female and from the age group of 21-23. This shows that the majority of the participants that is 139, belonged to the ethnicity of Manchu, whereas 84 belonged to Mongol, 53 to Han, 73 to Hui, and 51 belonged to other ethnicities.

Reliability Test

Table 2: Reliability Test

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.97	0.97	30

The table above shows the reliability test that is conducted by the help of "Cronbach's Alpha" method for assessing the effectiveness of the instruments through which the information is collected from the respondents. The result of Cronbach's alpha tests helps in identifying that the value is above 0.70. The value is 0.970 that is little bit higher from the desirable range. It also helps in identifying that the scale is extremely dependable and the analysis of the data that is to be accomplished through the outcome can generate critical ideas in the result. The decision-making based on the outcome can also be done.

Pearson's Correlations Analysis

Pearson's correlation analysis is mainly accomplished to gain an idea about the correlation that exists between the variables used in the study. It can be expected that a higher value can indicate a higher co-relationship in this case.

Table 3: Pearson's Correlations Analysis

	C	A	R	CL	PAE
C	1	0.946	0.946	0.947	0.972
A	0.946	1	0.954	0.91	0.934
R	0.946	0.954	1	0.905	0.935
CL	0.947	0.91	0.905	1	0.936
PAE	0.972	0.934	0.935	0.936	1

The outcome gained above helps in identifying that the relationship between the dependent as well as independent variables are very high. For example, the relationship between competence and the dependent variable is indicated by the correlation value of 0.972. In addition, the correlation between physical activity engagement as well as autonomy is 0.934. Apart from this, the correlation between relatedness and the dependent variable is 0.935. In addition, the correlation between culture and the physical activity engagement is also investigated through the test. It shows that a high level of correlation exists between these two variables that are indicated by the value of 0.936.

Multiple Regression Analysis

Multiple regression analysis is considered as an important aspect of the research that can be helpful for identifying the impact of independent variables on the dependent one. In addition, the Sig. value is the determinant of the impact of independent variables on the dependent one. The value should be equal to 0.05 or below to it.

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Table 4: Multiple Regression Analysis

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	0.08	0.036		2.195	0.029	0.008	0.152
C	0.674	0.048	0.68	13.896	0	0.579	0.769
A	0.069	0.043	0.068	1.599	0.111	-0.016	0.153
R	0.105	0.044	0.101	2.376	0.018	0.018	0.192
CL	0.142	0.037	0.139	3.886	0	0.07	0.214

The table above helps in identifying that apart from the competency as well as the relatedness, autonomy is not directly related to the generation of impact regarding the engagement towards the physical activities accomplished under an educational institution. The Sig. value obtained in respect to the variable relatedness is 0.111 that is higher than 0.05. Hence, consideration of the impact of autonomy as well as the impact of relatedness of campus sports facilities as well as the competency that is influenced through these facilities are very much significant in this matter. However, the relationship between culture and the dependent variable is also indicated.

Sobel test

The sobel test is done in the study to identify the mediating impact of culture that can influence the relationship between factors under campus sports facilities and physical activity engagement.

Table 5: Sobel test for Culture (CL) and Physical Activity Engagement (PAE)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	0.173	0.053		3.245	0.001	0.068	0.278
	CL	0.957	0.018	0.936	53.268	0	0.922	0.992

a. Dependent Variable: PAE

From the above table 5, it can be recognised that the t-score achieved in this case is 53.268 with the sig value of .000. This mainly represents the statistical significance of the model that shows the relationship between physical activity environment and culture.

Table 6: Sobel test for Competence (C) and Culture (CL)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	0.173	0.053		3.245	0.001	0.068	0.278
	CL	0.957	0.018	0.936	53.268	0	0.922	0.992

a. Dependent Variable: PAE

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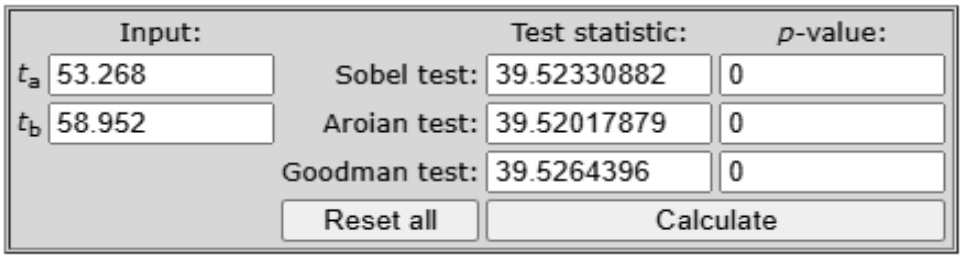
Figure 3: Sobel test for Competence (C) and Culture (CL)



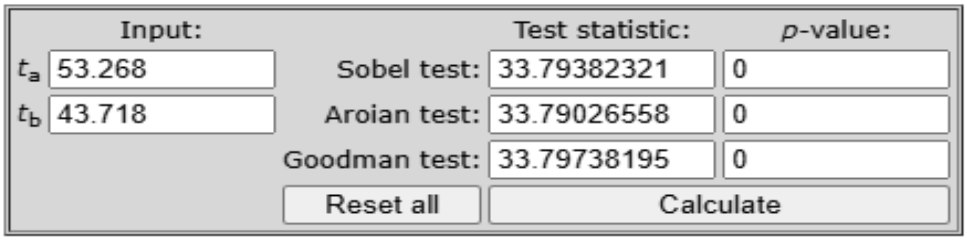
The above table shows that the value of the t-statistic for competence is 58.952, along with the value of the Sobel test is 39.523 from Figure 3 for Competence (C) and Culture (CL), which are compatible with the desired approaches and considered to be the strong factor.

Table 7: Sobel test for Autonomy (A) and Culture (CL)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	0.253	0.062		4.089	0	0.132	0.375
	A	0.903	0.021	0.91	43.718	0	0.863	0.944

a. Dependent Variable: CL

Figure 4: Sobel test for Autonomy (A) and Culture (Cl)



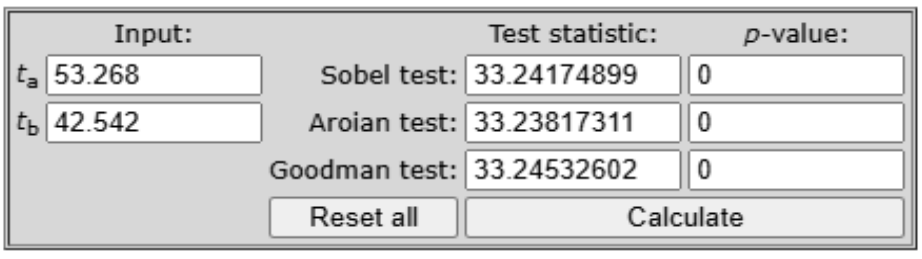
From the above table 7 and figure 4, this has been recognised that the Sobel test has highlighted the relation between autonomy and culture within the value of 33.793 with a t value of 43.718. Thus, it is considered highly significant.

Table 8: Sobel test Relatedness (R) and Culture (CL)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	0.194	0.065		2.992	0.003	0.067	0.322
	R	0.925	0.022	0.905	42.542	0	0.883	0.968

a. Dependent Variable: CL

Figure 5: Sobel test Relatedness (R) and Culture



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Here, the Sobel test value in Table 8 and Figure 5 related to the relationship between relatedness and culture is 33.241, with the t value of 42.542 and a sig value less than 0.5. Thus, this value of the Sobel test needs to be higher than 1.96 for the impact to be highly significant.

Hypothesis Testing

Table 9: Hypothesis Testing

Hypothesis	Outcomes
H1: Competence has a significant impact on Physical activity engagement of college students in Xi'an, China	Supported
H2: Autonomy has a significant impact on Physical activity engagement of college students in Xi'an, China	Not supported
H3: Relatedness has a significant impact on Physical activity engagement of college students in Xi'an, China	Supported
H4: Culture mediates the relationship between competence and Physical activity engagement of college students in Xi'an, China	Supported
H5: Culture mediates the relationship between autonomy and Physical activity engagement of college students in Xi'an, China	Supported
H6: Culture mediates the relationship between relatedness and Physical activity engagement of college students in Xi'an, China	Supported
H7: Culture mediates the relationship between campus sports facilities and Physical activity engagement of college students in Xi'an, China	Supported

From the table of hypothesis testing, this has been recognized that the first hypothesis supports competence for its significant impact on the physical activity engagement of college students. However, the second hypothesis has not been supported by highlighting the poor relationship between autonomy and physical activity engagement. However, the third hypothesis has been properly supported by highlighting the relationship between relatedness and physical activity engagement. The fourth and fifth hypotheses show that culture supported the relationship between competence and physical activity engagement, as well as supported the relationship between autonomy and physical activity engagement. Meanwhile, the sixth and seventh hypothesis testing show that culture supported a positive relationship with relatedness with physical activity engagement, as well as a relationship between campus sports facilities and Physical activity engagement of college students in Xi'an, China. Thus, the outcome of the hypothesis testing shows a positive and significant result regarding the relationship between the independent, dependent, and mediating variables.

DISCUSSION

This research investigates how college students in Xi'an, China participates in physical activity using campus sports facilities. It also investigates the effects of cultural factors on students' involvement in physical activities. Based on this study, it emphasizes the significance of psychological need of competence, autonomy, and relatedness and such need's mediating link in institutions' culture on the willingness of students' participation in physical activity. In that light, the results inform how educational institutions might enhance the student engagement in physical activity by means of their structured facilities and supportive culture. The first research objective (RO1) was a study on how student perception of competence affects that person's performance in physical activities. The results of H1 were that competence does have a significant effect on physical activity engagement (Xu et al., 2021). Students are most likely to participate in such activities if they believe that they can do physical activities.

Other studies in the literature are in tune with the notion that there is a sense of personal ability that

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can help motivation and interest in sports. The findings support that if students believe in their physical skills, they spend more active and continual time in physical activity. Second research objective (RO2) was to create a conceptual understanding of how autonomy will influence students' willingness to participate in physical activities. Nevertheless, H2 was contradicted (Hao & Yang, 2022). Therefore, that autonomy does not substantially contribute to physical activity engagement by the surveyed students. However, this result is different from some past studies that relate autonomy to internal motivation.

This may be due to the fact that the campus life of Xi'an school is structured, and the students do not feel a high level of freedom that may lead students to self-choosing its activities physically. Thus, it is possible that autonomy does not function as a main motivational factor within this particular situation. The third objective (RO3) checked out the impact associated with relatedness on others' willingness to assist in physical activity projects. Hypothesis H3 was supported, and relatedness was found to be an important transgender physical activity engagement (Huang et al., 2025). The higher the level of a student's sense of belonging and connection to other students, the more likely they are to participate in sports or other physical activities. It provides the rationale for the notion that young adults derive physical activity from social support and community. Shared goals, group participation and peer encouragement ensure that people maintain physical engagement on campuses. The fourth objective (RO4) was to explore how institutional culture moderates the psychological needs' impact on physical activity engagement.

Both hypotheses H4, H5 and H6 were supported, revealing that competence, autonomy and relatedness significantly affected the relationship via culture (Mengyu et al., 2025; Xu et al., 2021 and Zhou et al., 2024). If it can create a strong institutional culture that encourages health, physical education and student wellbeing, the gap between personal psychological need and participation can be covered. If such a culture exists, students who are otherwise less autonomous can still be encouraged to be active through their body. In addition, hypothesis H7 also indicated that culture intermediates the relationship between increment of campus sports facilities and physical activity engagement (Liu et al, 2024 and Yin et al., 2023). This leads to the belief that merely having facilities is not enough. The effectiveness of how those facilities are promulgated and incorporated into campus life through culture that goes along with them.

CONCLUSION

The above study has investigated the impact of campus sports facilities and sports culture on college students' engagement in physical activity in the case of universities in Xi'an, China. The findings have clearly shown that factors such as competence, autonomy and relatedness all have a certain amount of impact on physical activity engagement among the students. The results derived from the study contribute to both the academic literature and the practical policy making on student health and wellness initiatives in China. The study has helped in expanding the understanding of environmental and cultural determinants of physical activity among Chinese college students. The findings of the study also support socio-ecological and behavioural models of health promotion by providing context-specific evidence from Xi'an. Along with this, the study also confirmed interrelationships between different factors of sports facilities which expand the theoretical understanding of self-determination theory. The findings of this study also add value to cross-cultural studies on student health behaviour and highlight the role of regional differences.

The study further also encourages universities to invest in better maintained and greater accessible sports facilities for college students. Along with this, the results also highlight the need to have inclusive sports programs for students which can appeal to a diverse student population and their physical education needs and preferences. The findings of the study further also suggest incorporating sports culture as a formal component of student orientation and campus life. The results also showcase targeted campaigns and its necessity for shifting sedentary behaviours among students towards more active behaviours. Along with this, the findings of the study also support administrative decision making and aligning infrastructure with student health policies. It also provides actionable insights for students to use for enhancing their extracurricular programming in Chinese colleges in the region of the study.

The findings of the study can be used to recommend the universities to increase their investment in both outdoor as well as indoor sports infrastructure. The universities must also attempt to integrate sports and wellness clubs into the core of student engagement strategies. Furthermore, it is also important that the universities design and implement peer-led fitness programs for building a stronger culture of participation. It is also important to establish routine evaluation mechanisms for different sports facilities in the universities which can ensure safety and usability among the different students in the college. The study is geographically limited to Xi'an, China, which restricts generalisability of the results to other regions of the country. The study is focused primarily on university students which excludes perspectives from faculty and administration regarding sports engagement among the university students. Seasonal or weather variations have not been taken into consideration for understanding and analysing physical activity trends among the university students. It is also evident that the socioeconomic backgrounds of students have not been deeply examined in relation to access of facilities for the students. The future studies can expand to other cities of China and compare regional trends in sports culture and sports facility usage. Along with this, there can be more studies which can investigate psychological motivations influencing decisions of students to engage in sports.

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Instrument Development

Variables	S.No.	Questionnaires	Source
Competence	C1	I can accomplish the most difficult assignments given in this class.	(Goldman, Goodboy & Weber, 2017)
	C2	I am not confident in my abilities to perform well in this class	
	C3	I can accomplish anything that is assigned to me in this class	
	C4	I do well in this class compared to other students	
	C5	I do not feel competent when I am working on coursework for this class	
	C6	When it comes to class assignments, I do not know what I am doing	
Autonomy	A1	I think autonomous learning is a necessity for all students.	(Mansooji, 2022)
	A2	I think learner autonomy increases motivation for learning.	
	A3	Learners enjoy their learning more if they are autonomous.	
	A4	Learners should be given the chance to discuss their learning.	
	A5	With proper strategies, all learners can become autonomous.	
	A6	Learners should be able to learn outside the class.	
Relatedness	R1	Encourages us to trust in our ability to complete the tasks well	[Adapted from](Fierro-Suero et al., 2020)
	R2	Always fosters good relationships between classmates	
	R3	Does different things to what we are used to	
	R4	Tries to give us freedom when we are completing the activities	
	R5	Proposes activities that are tailored to our level	
	R6	Promotes a positive environment among classmates	
Culture	CL1	My peers are held together by loyalty, trust and commitment	Van Beek, A. P., & Gerritsen, D. L. (2010)
	CL2	My peers are held together by formal procedures, rules and policies	
	CL3	The classroom climate promotes trust, openness and people development	
	CL4	The classroom climate promotes tradition, stability and efficiency	
	CL5	The classroom climate promotes competition and achievements of targets and objectives	
	CL6	The classroom climate promotes emphasizing trying new things and meeting new challenges.	
Physical Activity Engagement	PAE1	PE class is fun regardless of athletic ability	[Adapted from] (Gwon & Shin, 2023)
	PAE2	Actively participates in physical education class.	
	PAE3	Physical education classes help life.	
	PAE4	I think physical education class is more important than other subjects.	
	PAE5	Physical education class develops the habit of following the rules in social life.	
	PAE6	Through physical education class, you can learn order in a group.	