Effects of Sports Games on Motivation of Participation in Physical Activities among University Students in Shanxi China

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Abstract -- **Physical inactivity among university students has become a global concern, contributing to various health and psychological issues. To address this, sports games have been increasingly integrated into physical education as a strategy to enhance motivation and participation in sports. Currently, there is still a lack of clear conclusions on whether sports games can effectively promote college students to form the habit of long-term adherence to physical activity. Although research has focused on the use of gamification in physical education, few studies have focused on the specific effects of physical education games on students' motivation. It is worth noting that there is still a lack of empirical research on how different types of sports games differentially affect students' intrinsic motivation and extrinsic incentives. During the experimental study, 72 college students aged 18-25 years were divided into an gamification group (36) and a control group (36) using random assignment. The experimental group used a gamified physical activity program that included a point system, teamwork challenges, and achievement rewards, while the control group engaged in regular physical activity with a six-week sports game intervention. Pre- and post-experimental motivation levels were assessed using the Sports Motivation Scale II (SMS-II) before and after the experiment. A comparative analysis of the data recovered from the experimental and control groups revealed that the students in the experimental group were more motivated to participate in sports activities, with a 27.6% increase in their willingness to do so compared to the control group. The students in the experimental group were significantly less unmotivated ($p < 0.05$), and the level of intrinsic motivation increased significantly ($p < 0.05$). However, it is worth noting that extrinsic motivation of the students in the control group rose by 10.3% after the intervention, which may be related to the pressure of external academic evaluation. Through the analysis of the 6-week comparative experiment, it is concluded that sports gamification is effective in increasing students' motivation to participate in sports activities. However, careful consideration should be given to whether gamification elements can be integrated with teaching and learning and whether they can be adapted to meet the needs of different students, in order to ensure consistency with curricular objectives and personalized learning.**

Keywords -- **Sports games, Motivation of participation, Physical activities, University students, Shanxi**

I. INTRODUCTION

In recent years, the declining participation rate of Chinese university students in physical activity has become a serious challenge in the field of public health. Under the "Healthy China 2030" strategy, although policymakers constantly emphasize physical fitness, the spread of "lazy health" and "home culture" among contemporary youth has eroded the traditional vitality of campus sports (Zhang et al., 2021). This phenomenon is particularly prominent in Shanxi Province, where weak sports infrastructure, sociocultural overemphasis on academic achievement, and digital entertainment encroachment on fragmented time have fostered "passive" and "utilitarian" physical activity motivation among university students (Guo & Li, 2023). A national survey revealed that 49% of Shanxi university students reduced physical exercise to "test-oriented fitness, " with 34% admitting they "exercise solely due to health warning concerns" (Chinese Student Physical Health Monitoring Center [CSPHMC], 2023). When physical activity becomes an externally pressured obligation, its sustainability inevitably deteriorates.

Sports games, a structured, goal-oriented activity that combines competition and recreation, are a potential means to enhance motivation for physical activity. Based on motivational frameworks such as Self-Determination Theory (SDT), physical games can promote intrinsic motivation by fulfilling an individual's psychological needs for autonomy, competence, and social belonging (Standage & Ryan, 2020). It has been shown that the application of gamification interventions in physical education can significantly increase adolescents' sport adherence and subjective pleasure (Hu et al., 2021; Liang et al., 2023). However, there is still limited research on Chinese college students, especially in areas such as Shanxi.

This study will investigate the effects of sports games on the motivation of Shanxi university students in physical activity. By assessing how sport game-based strategies affect psychological and behavioural outcomes, it aims to provide empirical support for regional policy development and teaching methods.

II. PROBLEM STATEMENT

Sedentary lifestyles and insufficient physical activity have become pressing concerns among university students. While existing studies have largely focused on the direct health benefits of regular exercise, there is a notable gap in understanding how competitive sports environments influence students' motivation to engage in physical activities. Recent research from the past three years suggests that sports games can significantly enhance intrinsic motivation, self-efficacy, and social connectedness, thereby potentially increasing physical activity participation. However, much of this research has been limited to specific sports or narrow demographic samples, lacking a comprehensive exploration of the motivational mechanisms at play in a competitive setting.

This study seeks to investigate the effects of sports games on the motivation for participating in physical activities among university students. It aims to examine how various aspects of sports competition—such as the competitive environment, team dynamics, and the presence of rewards—impact both intrinsic and extrinsic motivational factors. By employing a mixed-methods approach that includes surveys, interviews, and experimental comparisons, the research will provide a deeper understanding of how sports games can serve as an effective strategy to promote active lifestyles on campus. The insights gained are expected to inform the development of targeted interventions and policy recommendations to enhance student engagement in physical

activities, ultimately contributing to improved health and well-being in the university setting.

III. LITERATURE REVIEW

The incorporation of sports games into university physical education has received renewed attention as an innovative strategy to increase students' motivation to engage in physical activity. In recent years, particularly in the context of China's evolving education policies and health promotion activities, researchers have explored how game-based physical activities can influence college students' exercise behaviour and potential motivation.

Sports games as motivational tools

Sports games differ from traditional fitness routines by providing elements of competition, fun, cooperation, and spontaneity. These characteristics contribute to higher levels of intrinsic motivation in participants (Chen et al., 2022). Research has shown that when physical activities are constructed as games, students are more likely to find them fun and less stressful, resulting in increased frequency and duration of participation (Li and Zhang, 2023). In particular, mini-games, team-based activities, and modified traditional sports have been found to be effective in encouraging sustained participation.

Chinese college students' motivation for physical activity

Chinese college students' motivation for physical activity is influenced by a variety of factors, including academic load, peer influence, and the design of the physical education program. According to a study by Wang and Li (2023), students reported higher motivation and participation rates in physical activities that included game-like features, attributing participation to factors such as enjoyment, group interaction, and skill development. The use of Self-Determination Theory (SDT) continues to be prevalent in recent Chinese research, identifying autonomy, competence, and relatedness as key contributors to motivation (Zhao & Sun, 2022).

Regional context: Shanxi Province

Shanxi Province, a province with a strong academic tradition but relatively low rates of physical activity among college students, provided a unique setting for this study. Recent regional surveys have shown that although students recognize the importance of exercise, their actual participation remains limited (Shanxi Education Survey, 2023). Introducing game-based elements into physical education has been proposed as a way to make the activity more engaging and culturally appealing, especially in institutions where traditional teaching methods predominate (Hu et al., 2024).

Existing research gaps

Although the benefits of physical education competition are widely recognized, there is limited empirical evidence specifically targeting students in central and western provinces such as Shanxi. Recent studies have tended to focus on first-tier cities or eastern regions, where there are significant differences in infrastructure, cultural preferences, and educational strategies. In addition, longitudinal studies are needed to assess the lasting effects of physical game interventions on student motivation and physical activity behaviours (Luo & Chen, 2022).

Practical and educational implications

Given the growing concerns about student health and sedentary lifestyles, understanding the motivational impact of physical games offers practical and theoretical benefits. Educators can redesign physical education curricula to include more interactive and fun formats, potentially leading to better health and academic performance. In addition, region-specific studies, such as the one conducted in Shanxi, can provide customized strategies that respect local educational norms and student preferences.

In summary, research from the past five years indicates that sports competitions significantly enhance university students' motivation to engage in physical activities through a range of intrinsic and extrinsic mechanisms. Specifically, competitive environments help set clear goals and offer opportunities for successful experiences, thereby boosting students' intrinsic interest and self-efficacy. Teamwork and social belonging provide positive social interactions, while reward systems and effective coaching play a crucial role in stimulating extrinsic motivation. Additionally, sports competitions have beneficial effects in alleviating stress and improving mental health, which may have a lasting impact on long-term lifestyle habits.

IV. MATERIALS AND METHODS

Participants

This study was conducted with students in public physical education classes at Taiyuan Institute of Technology. All respondents signed an informed consent form and voluntarily and actively participated in this study.The mean age of the participants was approximately 21.8 years with a standard deviation of 3.56. Exclusion criteria related to adherence to specific principles were followed in selecting the sample. The principles included active participation throughout the study and completion of the suggested measurement tools. A total of 102 students expressed interest in participating in this study, but the final sample was 72 after a rigorous screening process based on strict criteria.

Study Design

This study was conducted during the public physical education - soccer sports course during the 2025 school year.In order to test the proposed hypothesis, participants were divided by random sampling into a gamification group (GG, n = 36) and a control group (CG, n = 36) as well as a pre and post intervention measure of the Scale of Motivation for Sport (SMS-II). CG was used as a reference group without gamification, controlling for the influence of other extraneous factors. The soccer program had the same content, the same instructors, and the same class time nodes.GG classes are held on Tuesdays from 10:00 to 12:00,CG classes are held on Wednesdays from 10:00 to 12:00.The time was designed to take into account the consistent mental state of the students, which would not affect the results of the experiment.

Intervention

The entire intervention program was implemented by a teacher (the principal investigator) who was familiar with the students. This teacher had extensive experience in implementing gamified pedagogy and was trained in the use of new information and communication technologies to implement gamified teaching methods. The intervention program was conducted during the soccer sport course for a period of 6 weeks,the duration was 36 hours (Table I).

TABLE I: RESEARCH PROGRAMS

Dimension	Item
Week 1	GC and CC conducted the initial pre-experiment data collection and participants completed the Sports Motivation Scale (SMS-II).
Week 2	Teaching content: ball sense training. GG group: small area ball grabbing battle, rules: each round 3-4 students enter a small delineated area, each person needs to control a ball. The goal is to control their own ball while trying to kick the others' balls out of bounds. The student who leaves the ball at the end wins.CG Group: Normal teaching.
Week 3	Teaching content: ball control and speed training. group GG: relay race with the ball, rules: divide the students into teams, each team stands at the starting point.Each team will carry the ball around obstacles (e.g. cones and barrels) and return to hand over to the next team member. The first team to finish wins.CG Group: Normal teaching.
Week 4	Teaching content: soccer inside foot push pass training. gg group: pass the ball solitaire, rules: students form a big circle, each with a number.The teacher calls out two numbers and the student with the ball has to quickly pass the ball to the student who is called out. Students who pass the ball incorrectly or catch the ball incorrectly have to do a small punishment (e.g. jumping in place for 5 times).Group CG: Normal teaching.
Week 5	Group GG: Shooting accuracy training, rules: divide the goal into nine squares with tape.Students take turns to shoot and score different points for hitting different targets.CG Group: Normal teaching.
Week 6	GC and CC conducted a post-experimental data collection, and participants again completed the Sport Motivation Scale (SMS-II).

To ensure a comprehensive comparative assessment of the impact of the sport gamification intervention on student motivation, the same questionnaire was used before and after the experiment. The teaching content included: soccer ball sense training, ball control training, inside of the foot push-passing training, and shooting accuracy training, which are required by the university physical education soccer course syllabus to be mastered by the students after learning. The teaching content was the same in both GG and CG, with the difference that GG included sports games consistent with the teaching content in each lesson, while CC was mainly based on the traditional teaching methods such as lecturing and practicing.

Measurement Instruments

The SMS-II consists of 18 items, including: intrinsic motivation, extrinsic motivation, and unmotivated dimensions, and uses a 7-point Likert scale to measure six different types of motivation, as detailed in the following Table II.

TABLE II: SMS-II RELATED ELEMENTS AND ISSUES

Dimension	Item	
Intrinsic Motivation	Enjoyment	1.I exercise because I really enjoy the process.
		2.Exercise is a pleasure for me, not a task.
		3.Exercise makes me happy and excited.
	Psychological Growth	4.Exercise makes me feel self-improvement and growth.
		5.I enjoy challenging myself to see how much I can improve.
		6.Exercise allows me to develop new abilities and skills.
Extrinsic Motivation	Identified Regulation	7.I exercise because I know it is good for my health.
		8.I want to keep in good physical shape, so I take part in sport.
		9.Exercise is important to me because it is consistent with my values and goals
	Introjected Regulation	10.I would feel guilty if I didn't exercise.
		11.Exercising makes me feel more confident, otherwise I would be disappointed in myself.
		12.I exercise because I don't want to let myself or others down.
	External Regulation	13.I play sports because my coach, parents, or others expect me to.
		14.I play sports to get medals, money, or other rewards.
		15.I might not play sports if there were no rewards or recognition.
Amotivation	Amotivation	16.To be honest, I don't know why I exercise.
		17. Exercise doesn't mean much to me.
		18. Sometimes I wonder why I continue to exercise.

Data analysis

Quantitative analysis was carried out using SPSS 24.0 software. Descriptive statistics were performed for each variable, listing the mean and standard deviation. The Kolmogorov-Smirnov test was used to assess the normality of the data, which showed that all variables were not normally distributed ($p < 0.05$). The Mann-Whitney U test was used to test for differences between the GG and CG groups at the beginning and at the end of the intervention. The use of Wilcoxon test was also used to analyze the changes within the groups as a result of the intervention.

V. RESULTS

Pre-experimental data

At the beginning of the study, we collected pre-experimental baseline data to ensure comparability between the GG and pairs of CGs. The results showed that there were no significant differences between GG and CG in any of the motivational adjustments (usually $p > 0.05$ indicates no significant difference), as shown in Table III.

TABLE III: COMPARISON BETWEEN GG AND CG AT PRE-TEST USING THE MANN-WHITNEY U TEST (Av ± SD)

Dimension	Item	GC	CC	Sig.
	Enjoyment	5.02±0.48	5.13±0.52	0.125

Intrinsic Motivation	Psychological Growth	5.36±0.24	5.20±0.45	0.476
	Identified Regulation	4.37±0.12	4.14±0.23	0.698
Extrinsic Motivation	Introjected Regulation	3.02±0.34	3.13±0.15	0.578
	External Regulation	3.19±0.56	3.33±0.67	0.964
Amotivation	Amotivation	2.18±0.64	2.54±0.34	0.478

Interaction Effect Test

To assess the effectiveness of the gamification intervention, changes in motivational regulation were compared between the gamification intervention groups using the Wilcoxon test (Table IV).

TABLE IV: LONGITUDINAL COMPARISON INTRA-GROUP USING THE WILCOXON TEST (Av ± SD POSSTTEST)

Item	GC			CC		
	Av ± SD	Sig.	ES	Av ± SD	Sig.	ES
Enjoyment	5.23±0.32	<0.01	0.398	5.18±0.54	0.718	-
Psychological Growth	5.58±0.32	0.013	0.412	5.22±0.48	0.897	-
Identified Regulation	4.78±0.18	0.032	-	4.17±0.25	<0.01	0.278
Introjected Regulation	3.56±0.38	0.045	0.124	3.18±0.19	0.043	0.354
External Regulation	3.69±0.54	0.120	-	3.33±0.67	0.138	-
Amotivation	1.58±0.45	0.010	0.380	2.51±0.32	0.367	-

As shown in Table IV, after 6 weeks of intervention GC group showed significant increase in Enjoyment, Psychological Growth and Introjected Regulation, while there was a significant decrease in Amotivation. In CC group there was no effect except for significant changes in Identified Regulation, Introjected Regulation.

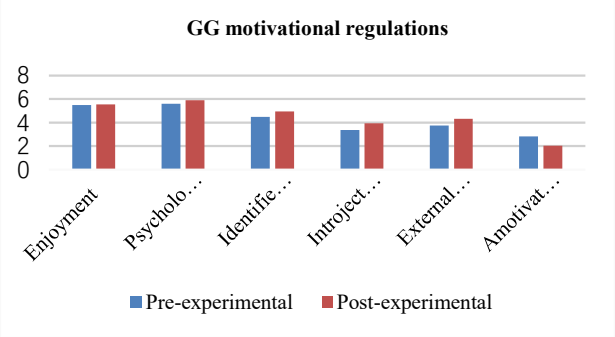

Figure1.Descriptive Data of the Motivational Regulations for GG Showing the Changes Produced between the Pre- and Posttest

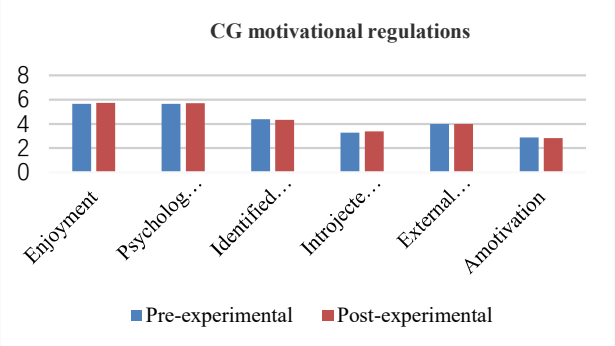

Figure 2. Descriptive Data of the Motivational Regulations for CG Showing the Changes Produced between the Pre- and Posttest.

VI. DISCUSSION

The purpose of this study was to explore the impact of gamification interventions on the motivational regulation of university students participating in physical activities and sports science courses. The findings provide in-depth insights into the effects of gamification on intrinsic and extrinsic motivation as well as amotivation, while also comparing differences between the intervention group (GC) and the control group (CC).

Impact of Gamification on Intrinsic Motivation

In terms of the enjoyment dimension, the gamification group showed a significant positive change ($Z=-2.756$, $p<0.01$), with an effect size of 0.398, indicating that the experimental intervention had a moderately strong effect on the enhancement of students' affective experience. The negative Z-value reflects that the distribution of data in the gamification group was more skewed towards the high scores compared to the control group, and that the gamification design effectively enhanced the enjoyment of the learning process.

In the psychological growth dimension, the same statistically significant level was reached ($Z=-2.492$, $p=0.013$), with an effect size of 0.412 further confirming the facilitating effect of gamification mechanism on students' cognitive development and self-efficacy. The effect sizes of both dimensions exceeded the small effect threshold (0.2) defined by Cohen, highlighting the practical value of the intervention.

Hamari et al.'s(2014) study on immersion in gamified learning environments and Sailer et al.'s (2017) exploration of long-lasting incentives for educational gamification form theoretical echoes. Cross-validation of the three sets of studies suggests that gamification is not simply about increasing fun, but that its core value lies in reconfiguring the learning experience through task design so that the process of knowledge acquisition conforms to human psychological incentives, a finding that provides a theoretical anchor for educational technology development.

Impact on Extrinsic Motivation

Both GC and CC showed significant changes in the external motivation regulation dimension. significant increases in both the GC group ($Z = -2.143$, $p = 0.032$) and the CC group ($Z = -2.935$, $p < 0.01$) indicated that students recognized the intrinsic value of the learning activity more clearly through the intervention; changes in the GC group ($Z = -2.011$, $p = 0.045$; effect size = 0.124) and the CC group ($Z = -2.027$, $p = 0.043$; effect size = 0.354) reflect the tendency of students in both groups to partially internalize external pressures as self-driven. Although both groups showed changes in external motivation, the mechanisms differed. Gamification designs (e.g., point badges, progress visualization) may have reinforced students' value identity through symbolic rewards (Ferriz-Valero et al., 2021); traditional feedback systems rely more on social recognition (e.g., class rankings), which resulted in higher amounts of introjected moderated effect sizes, suggesting that external motivation may be more reliant on authority-driven pressures in non-gamified environments.

Ferriz -Valero et al.'s (2021) empirical study showed that external rewards (e.g., badges, public recognition) in an educational setting can motivate students to shift from “passive

compliance" to "active acceptance" of task goals by satisfying their perceived need for competence. This finding is consistent with the enhancement of recognition regulation in the present study. In addition, Self-Determination Theory (SDT) further suggests that even when external interventions do not directly enhance intrinsic motivation, optimal feedback design (e.g., immediacy, information richness) may still facilitate the internalization of motivation (Ryan & Deci, 2000).

Impact on Amotivation

The study showed a significant reduction in non-motivation in GC ($Z = -2.578$; $p = 0.010$; effect size = 0.380), suggesting that gamification can be effective in mitigating students' lack of motivation to learn. This finding is consistent with the findings of Feliz-Valero et al. (2020), who concluded that gamification interventions can reduce non-motivation to learn by increasing engagement and providing a more enjoyable and rewarding learning experience. In contrast, no significant changes in motivation were observed in CC, suggesting that traditional teaching methods may be less effective in addressing students' lack of motivation.

Comparison Between GC and CC

Negative Z-scores reflect significantly higher post-test scores than pre-test scores, suggesting that students in the Gamification Condition (GC) group experienced more extensive and statistically significant changes, particularly in terms of increased intrinsic motivation and decreased extrinsic motivation. Gamification not only improves overall motivation to learn, but also fosters more autonomous forms of motivation to learn.

It is worth noting that both groups showed an increase in recognition regulation, which may be due to the pressure students felt to succeed and may also stem from the presence of external assessments. However, the CC group did not show significant improvement in intrinsic motivation, further highlighting the unique advantages of gamification in promoting self-directed motivation.

VII. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

There are some limitations to this study. First, the study was conducted over a relatively short period of time (6 weeks) and lacked research on the long-term effects of gamification on motivation. Second, this study did not employ probabilistic sampling, which may limit the generalizability of the findings. Future research could use more representative samples and adopt randomized controlled trial designs to enhance the reliability of the conclusions.

Additionally, further investigation is needed into the role of external rewards in gamification. While gamification can enhance intrinsic motivation, the presence of external rewards may also strengthen external regulation, as seen in the observed increases in introjected regulation in both groups. Future studies should examine how different types of gamification mechanisms influence various forms of motivation.

VIII. CONCLUSION

This study provides further evidence that gamification can be an effective strategy for enhancing intrinsic motivation and reducing amotivation, particularly in the context of university physical education. Although both gamification and traditional teaching methods influenced extrinsic motivation, the positive effects of gamification on enjoyment and psychological growth underscore its potential as a motivational tool. Educators seeking to enhance student engagement may consider incorporating gamification elements to create a more dynamic and appealing learning environment.

Three actionable insights emerge: First, gamified designs should balance competitive elements with collaborative mechanisms to avoid excessive psychological pressure from introjected regulation. Second, hybrid incentive strategies integrating gamified frameworks with formative assessment systems should be developed. Third, future curriculum designs must address gender and cultural sensitivities in motivational interventions, such as tailoring reward types and social interaction intensities to diverse student populations.

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