# EFFECTS OF MINDFULNESS TRAINING ON THE MOTIVATION TO EXERCISE IN MIDDLE SCHOOL STUDENTS

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# EFFECTS OF MINDFULNESS TRAINING ON THE MOTIVATION TO EXERCISE IN MIDDLE SCHOOL STUDENTS

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This study investigated the reasons why Grade 9 students in Anshun City, Guizhou Province, China, desired to exercise and how mindfulness training impacted their motivation to play sports using a two-phase research design. Study 1 used a cross-sectional design with 212 randomly chosen students, employing the Sports Motivation Scale to assess baseline motivation. Independent samples t-tests revealed significant gender differences: male students scored higher than females in intrinsic motivation—wanting to know ($M = 20.48$ vs. $F = 18.47$), to accomplish ($M = 20.72$ vs. $F = 18.26$), and to experience stimulation ($M = 20.48$ vs. $F = 19.31$)—as well as extrinsic motivation, such as introjected regulation ($M = 20.84$ vs. $F = 19.91$), identified regulation ($M = 20.69$ vs. $F = 20.03$), and external regulation ($M = 18.11$ vs. $F = 16.74$) ($p < 0.05$). No significant difference was found in amotivation scores ($p > 0.05$). Study 2 used a randomized controlled trial with 44 students split evenly into an experimental group, which participated in an 8-week mindfulness program, and a control group. Repeated measures ANOVA assessed sports motivation at three time points (W0, W4, W8). Mindfulness training significantly enhanced intrinsic motivation, with improvements in experiencing stimulation, knowing, and accomplishing across all intervals (all $p < 0.05$). No significant changes occurred in extrinsic motivation or amotivation. In conclusion, gender influences adolescents' motivation to exercise, with boys being more motivated than girls. Mindfulness training appears to enhance autonomous motivation but not controlled motivation or amotivation.

Keyword : Mindfulness training, Sports motivation, Middle school students, Intrinsic motivation, Self-Determination Theory, Gender differences

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# CHAPTER 1

# Introduction

## Background

The well-being of the population plays an indispensable role in promoting national development. In contemporary society, scientific and technological progress lies at the core of competition, ultimately equating to talent acquisition and mass quality competition. Middle school students represent our nation's future; their physical health serves as not only a personal foundation for achieving individual goals but also a fundamental guarantee for becoming a sports powerhouse(Weiting, 2016). However, these students face immense academic pressure which limits their participation in physical activities due to time constraints. Simultaneously, social and technological advancements have led to an increase in leisure activities among students while sacrificing physical exercise. Research indicates that adolescents spend significantly less time engaging in recreational sports and exhibit sedentary behavior(Pelletier et al., 1995) ,thereby exacerbating the frequency and severity of physical health issues among students. Health related behaviors during middle school positively influence adult physical activity patterns; thus it is crucial to develop and maintain an active lifestyle. The World Health Organization (WHO) recommends that adolescents engage in at least one hour of moderate-to-vigorous intensity physical activity daily(Organization, 2019). Middle school is a period characterized by rapid growth from childhood to adulthood where students undergo significant physiological and psychological changes. Regular moderate physical activity can effectively promote musculoskeletal development in adolescents, reduce the incidence of coronary heart disease, and maintain both their physical and mental well-being (Sanchez et al., 2007). Recent studies have shown an alarming increase in myopia and obesity rates among middle school students (Bayingana et al., 2006). The "Healthy China 2030" Plan Outline explicitly states the strategic objective of "intensifying health education in schools and enhancing the health literacy of adolescents". Nevertheless, recent national student physical health monitoring data reveal that despite an overall improvement in students' physical condition, issues

such as persistently high obesity rates and continuously increasing rates of poor eyesight remain inadequately addressed(Yang & Ling, 2016).Highlighting the urgent need for effective strategies aimed at improving this situation.

Mindfulness is a Buddhist meditation practice that instructs practitioners to cultivate mindfulness and awareness of the mind-body connection through various methods, including meditation. It encourages individuals to actively attend to the present moment with an accepting mindset rather than a passive one (Kabat-Zinn & Hanh, 2009). The essence of mindfulness training lies in developing conscious awareness of one's current mind-body experience with openness, curiosity, and acceptance while refraining from automatic judgment. This ability plays a crucial role in maintaining physical and mental well-being (Society & Association, 2019). It encompasses three key aspects: intentionality, attentional focus, and attitudinal approach(Shauna L Shapiro, Linda E Carlson, John A Astin, & Benedict Freedman, 2006). Since its emergence, mindfulness has gradually become recognized as a powerful tool in clinical psychotherapy (Keng, Smoski, & Robins, 2011), with Hayes referring to mindfulness-based cognitive behavioral techniques as "the third wave" within this field(Hayes, Follette, & Linehan, 2010; Jabbarpour, 2006). Over the past two decades alone, there has been an exponential increase in research interest surrounding mindfulness interventions resulting in nearly 4,000 scientific publications on this topic (Ergas & Hadar, 2019). These studies consistently demonstrate positive effects across various domains such as physical health and mental well-being (Ludwig & Kabat-Zinn, 2008) as well as mood regulation, cognitive functioning, and interpersonal relationships(Brown, Ryan, & Creswell, 2007; Skoranski, Coatsworth, & Lunkenheimer, 2019). Consequently, mindfulness interventions are increasingly being implemented across diverse settings. Active participation in sports can significantly enhance the physical fitness of middle school students to a great extent.

Exploring and understanding the sports motivation of these students can moderately increase their engagement in athletic activities. According to motivation theory, moderate stimulation of individual motivation is essential for driving individuals

towards motivated behaviors. Therefore, appropriately stimulating sports motivation will undoubtedly promote improvement in middle school students' involvement in athletics (Zhengyu, 2000). The level of sports motivation strongly correlates with individual performance in athletics, as higher levels of motivation lead participants to invest more effort and work harder, ultimately resulting in better athletic performance (changzhu, 2012). Researchers have shown interest in increasing exercise motivation among different groups by exploring strategies that encourage people to be more physically active and less sedentary. Additionally, adolescents' attention towards athletics is closely linked to their athletic performance; thus enhancing their sporting abilities will boost enthusiasm for participating in such activities(Tang & Posner, 2009).

In recent years, numerous studies have been conducted on the levels of physical activity among middle school students in China. However, the majority of these studies have primarily focused on various factors, such as teacher influence, classroom environment, external influences, and personal factors that impact physical activity levels in adolescents. While exercise motivation has been extensively explored within the field of psychology, most research has predominantly concentrated on adults. For instance, they examine the motivation of social individuals to engage in mass sports and explore the motivation of youth to exercise and its association with specific sports participation behaviors. Regrettably, there is limited research available concerning exercise motivation among primary and secondary school students. Therefore, further investigation into this area is imperative to obtain a comprehensive understanding of changes in exercise motivation among young students. It is crucial to effectively motivate middle school students to engage in physical activities both at school and actively pursue them at home for enhancing their physical health. Mindfulness has recently emerged as a prominent subject within behavior change literature(S. L. Shapiro, L. E. Carlson, J. A. Astin, & B. Freedman, 2006). Consequently, some researchers have attempted mindfulness interventions targeting adolescent psychology; however, few studies have examined its intervention effects on exercise motivation and attentional processes specifically in adolescents. Furthermore, there are limited locally validated

scales for assessing exercise motivation among adolescents. Henceforth, this study aims to address these aforementioned issues step by step.

## Objectives of the Study

The objectives of this study are as follows:

### Study 1

1.Developed a sports motivation questionnaire.

2.To study the sports motivation of different middle school students.

### Study 2

1.To study the effect of Mindfulness training on middle school students

2.To compare the differential changes in sport motivation between the experimental and control groups following mindfulness intervention.

## Significance of study

### Theoretical Significance

1.Enhancement of Assessment Instruments: This study revises the existing questionnaire on sports motivation to better align with the psychological development characteristics and behavioral patterns of adolescents. This refinement enhances both the scientific rigor and practical applicability of the instrument, providing a more accurate measurement tool for future research in related fields.

2.Broadened Applications of Mindfulness Training: The creation of mindfulness exercises specifically designed for adolescents enriches the application of mindfulness interventions across diverse populations. Furthermore, it introduces innovative concepts for integrating mental health education with physical education, thereby promoting interdisciplinary research.

3.Comprehensive Examination of Psychological Intervention Mechanisms: By systematically exploring the pathways through which mindfulness training influences middle school students' motivation to participate in sports, this research contributes to a deeper understanding of how psychological regulation methods can foster and sustain

physical activity behaviors. It offers empirical evidence and theoretical support relevant to both sport psychology and educational psychology domains.

**Practical Significance**

1.Enhancing Students' Motivation for Participation in Sports: The mindfulness training program developed in this study is highly practical and can be seamlessly integrated into daily school teaching activities. It aids students in improving their concentration, emotional regulation, and self-awareness, thereby enhancing their intrinsic motivation to engage in physical activities.

2.Promoting Holistic Physical and Mental Development: By employing mindfulness interventions to stimulate students' interest in sports, this study contributes to alleviating academic stress and enhancing emotional well-being, thus supporting comprehensive physical and mental development. It addresses prevalent issues among adolescents today, such as insufficient physical activity and psychological pressure.

3.Supporting Reform in School Physical Education: The findings of this research provide valuable insights for educational administrators and frontline teachers, facilitating the development of more personalized and diverse physical education curricula. This promotes a transformation within school physical education towards an approach that nurtures both the body and mind.

4.Facilitating the Formation of Healthy Lifestyle Habits: By increasing students' awareness of and commitment to participating in sports, this research supports the cultivation of positive exercise habits. It lays a solid foundation for lifelong engagement in sports while further promoting the adoption of healthy lifestyle practices.

## Scope of the study

**Population**

This study focuses on Chinese students aged 15-16 in the third year of middle school. Anshun City, Guizhou Province, is a tourist city. The population of ethnic minorities such as the Buyi, Miao, Hui and Gelao accounts for 39% of the total population of the city. It is a city where people of various ethnic groups live together. In order to understand the motivation for sports among students in multi-ethnic areas, this

study selected junior high school students in Grade 9 from Anshun No.1 Middle School as the research subjects.A random sampling method was adopted to randomly select Chinese students in the third year of middle school students. Sample selection for Study 1: Random sampling was used. 212 students in the third year of junior high school were randomly selected. For Study 2, a random sampling method was adopted: students were randomly grouped into an experimental group and a control group. 22 participants were randomly selected from the middle school students in Study 1 for each of the experimental group and the control group.

**Sample**

**Study 1**

In order to conduct an in - depth investigation into the state of exercise motivation among middle school students.The research object of this article was Chinese middle school students. adopted a random sampling method.

Quantitative research employed the sample size method of employed the Krejcie & Morgan formula for sample size determination. Given a population of 470, with e=0.05, 95% CI ($\chi^2$=3.841), and p=0.5, the calculated sample size was 212 (211.6 rounded up).

**Study 2**

In order to investigate the influence of an eight - week mindfulness training program on the sports motivation of middle school students. Three measurements were independently carried out on the experimental group and the control group. Sample size estimation was performed in G Power using repeated measures ANOVA ($\alpha$=0.05, power=0.8, 2 groups, 3 measurements, within-factor correlation=0.5, sphericity correction $\varepsilon$=1), yielding a required sample size of 44.

**Variable**

**Independent Variables**

Mindfulness training

**Dependent variable**

sports motivation

**Definition of terms**

1.**Mindfulness** refers to the practice of cultivating a serene and focused state of mind and body, encompassing heightened awareness, attentional control, and enhanced memory capacity (BRENSILVER et al., 2011).

2.**Sports motivation** is defined as "the intrinsic drive that initiates and sustains an individual's engagement in sports activities, striving towards achieving athletic goals, as well as the psychological factors that stimulate and maintain athletes' involvement in sports." It represents a pivotal psychological factor influencing individuals' enthusiasm for participating in sports(Edward L Deci & Richard M Ryan, 1985).

3.**Middle school student** is Middle school students generally denote those who are engaged in learning during the secondary education phase. Their age typically ranges from around 12 to 18 years old, corresponding to the junior high school and senior high school levels. The precise definition may vary according to different countries and educational systems. However, it generally encompasses the following two categories:

Junior High School Students (Junior High School) and Senior High School Students (Senior High School). The junior high school stage in China includes grades seven to nine (in some regions, it is grades six to nine). The age range is approximately 12 to 15 years old. In the context of this study, the term "middle school students" specifically refers to those in the junior high school stage.

## Conceptual framework

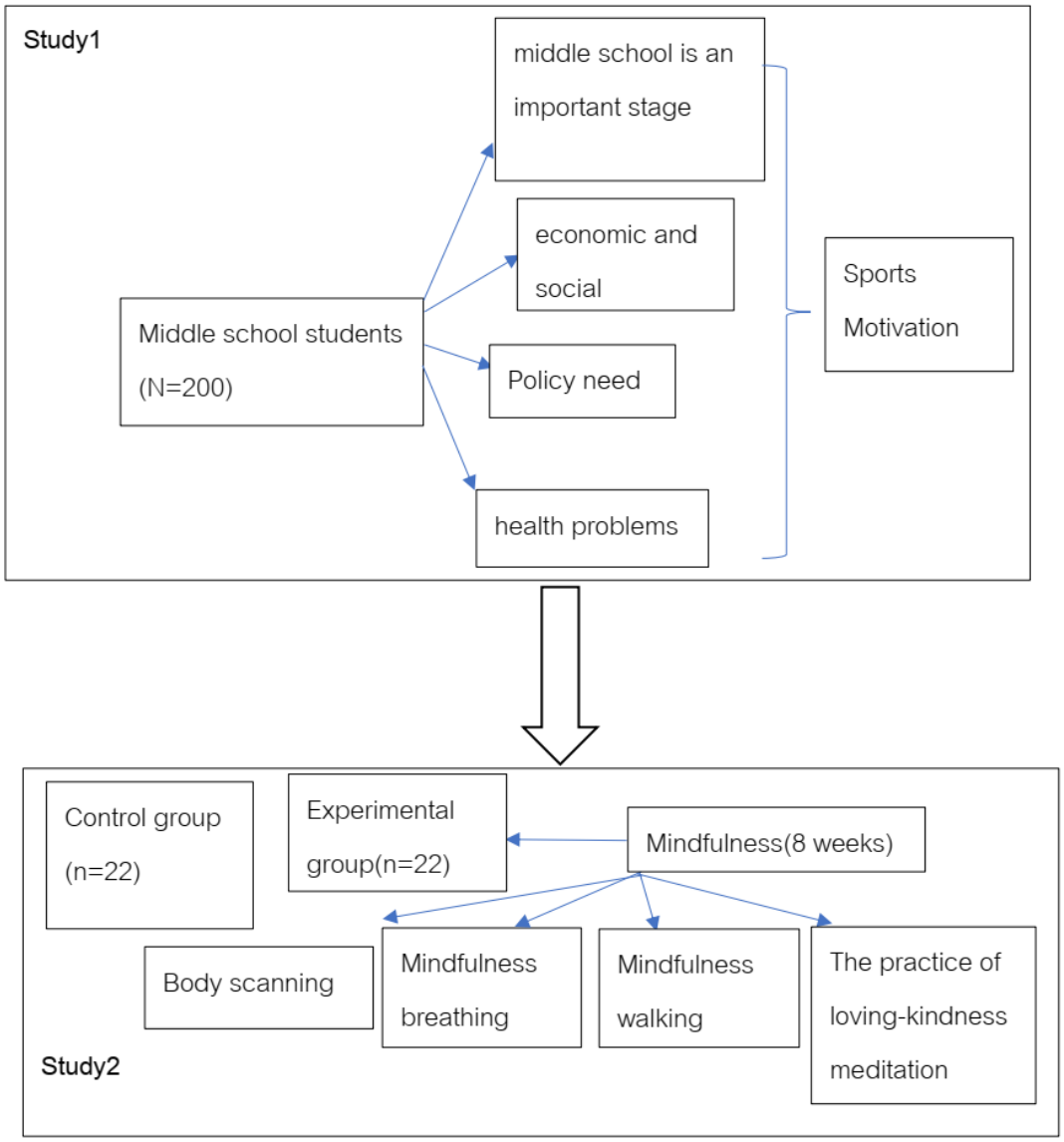


Figure 1 Research conceptual framework

## Research hypothesis

Study 1

Middle school students exhibit varying motivations for engaging in sports activities.

Study 2

1.The effects of the mindfulness training intervention differ between the experimental group and the control group.

2.Following the mindfulness training intervention, there are notable differences in exercise motivations between the experimental group and the control group.

3.Post-intervention, distinct disparities emerged between the experimental group and the control group.

# CHAPTER 2

## Literature Review

In this chapter, a comprehensive review of the literature and research on exercise motivation and mindfulness training was carried out. The aim was to explore the influencing factors of exercise motivation and to investigate the available data regarding how mindfulness training impacts exercise motivation. The following presents an overview of the literature:

1.sports motivation

1.1 The definition of motivation for sports

1.2 Theories of Motivation in Sports

2.Mindfulness

2.1 The Definition of Mindfulness

2.2 The theory of mindfulness

3.literature Review

3.1The effects of mindfulness on sports motivation

3.2The effects of Mindfulness

**1.sports motivation**

**1.1 The definition of motivation for sports**

Motivation is regarded as a behavioral process in which a person spends time or energy to fulfill a certain wish or achieve a certain goal(Matemáticas, 1976).The concept of sports motivation can be defined as "the internal drive that initiates and sustains an individual's engagement in sports activities, striving towards achieving athletic goals, as well as the psychological factors that stimulate and maintain athletes' involvement in sports" (Edward L. Deci & Richard M. Ryan, 1985). It plays a crucial role in influencing individuals' enthusiasm for participating in sports.Kilpatrick's research revealed significant variations in sports motivation among individuals of different age groups. Middle-aged and elderly individuals exhibit higher motivation to engage in

physical exercise, potentially attributed to the fact that teenagers are more active during their growth period (Kilpatrick, Hebert, & Bartholomew, 2005). Rubicon argues that sports motivation is a prerequisite for adherence to physical activity; generally, individuals with high sports motivation participate in regular physical exercise more frequently and sustain it over a longer duration compared to those with low exercise motivation (Kimbrough, Rose, Vallee, & Jr, 2005). Jin.H Yan et al. discovered through their research that Chinese youth primarily engage in exercise for reasons related to physical fitness and social activities; conversely, American youth predominantly focus on skill enhancement for competitive purposes. This indicates that sports motivation is also influenced by geographical region and educational approach (Yan & McCullagh, 2004). The motivations for middle school students' participation in sports are completely different(Pelletier et al., 1995).The key influencing factors regarding middle school students' engagement in sports span multiple dimensions, including the pursuit of health, acquisition of achievements, enhancement of skills, pursuit of status, experience of enjoyment, establishment of friendships, pursuit of power, and realization of independence(Weinberg, Tenenbaum, Mckenzie, Jackson, & Fogarty, 2000).

### 1.2 Theories of Motivation in Sports

Numerous theories have been proposed to explain motivation, with two theories in particular being highly applicable to motor motivation: self-determination theory (SDT) and goal orientation theory (AGT). In 1984, Nicholls and Machr et al. introduced the concept of goal orientation in sports, categorizing it into three sub-dimensions: mastery goal orientation, behavioral goal orientation, and social approval goal orientation. Among these theories, self-determination theory stands out as the most suitable for explaining sports motivation. This empirical organism-based theory of human behavior and character development by Edward L. Deci & Ryan (Edward L Deci & Ryan, 1995) provides a comprehensive framework for understanding and promoting physical exercise motivation and behavior(Richard M Ryan & Deci, 2017a).This theory posits that individuals inherently seek challenges, pursue their interests, and strive for social relevance(Edward L Deci & Ryan, 1995). Furthermore, by embracing more

autonomous motives and forms of engagement, individuals can actively engage in a range of behaviors and experience greater autonomy and fulfillment in their lives to achieve personal 'prosperity' (Richard M Ryan, Curren, & Deci, 2013). The theory encompasses three categories: extrinstic motivation, intrinsic motivation, and amotivation. Physical education motivation exists as a continuum that spans from amotivation to extrinsic motivation and ultimately to intrinsic motivation. At one end of this continuum lies amotivation, the middle transitional segment is occupied by extrinsic motivation, and the endpoint is intrinsic motivation.

**Dimensions of Intrinsic Motivation**

1.Motivation for Know: This dimension pertains to an individual's engagement in activities stemming from an inherent interest in the learning process itself. The underlying intention is to explore the unknown, satiate curiosity, or acquire knowledge.

2.Motivation for Accomplish: It refers to the impetus that drives individuals to act in pursuit of self - worth and the accomplishment of success objectives. This is manifested as the proactive embrace of challenges and the pursuit of self - transcendence.

3.Motivation for Experience Stimulation: This represents the most autonomous form within intrinsic motivation. Here, individuals seamlessly integrate their actions with their sense of self and participate solely for the purpose of relishing the pleasure and well - being that the activity affords.

**Dimensions of Extrinsic Motivation**

1.Introjected: In this case, individuals are influenced by external rules yet have not fully assimilated them. The motivation behind their behavior is to evade anxiety, avoid blame, or safeguard self - esteem, rather than a genuine appreciation of the activity's value.

2.Identified: Individuals engage in a rational assessment process, through which they transform external goals into an integral part of their own identity. When performing actions, they experience a sense of autonomy and do not encounter significant internal conflicts.

3.External Regulation: Here, an individual's behavior is completely dictated by external pressures or rewards. This could involve complying with requirements or seeking financial incentives, and it represents the most externally controlled form of extrinsic motivation. For example, when individuals lack awareness of the importance of physical exercise and show no inclination to engage in it, their participation in such activities is rendered devoid of motivation.

**Dimensions of amotivation**

It refers to a state in which an individual lacks behavioral motivation or intention. This state is typically characterized by a complete lack of interest in activities and the belief that actions will not yield any meaningful value or outcome.

## 2.Mindfulness

### 2.1 The Definition of Mindfulness

The concept of mindfulness originated in ancient Eastern Buddhist meditation and forms the core of primitive Buddhist practice. Davids translated this concept as "mindfulness" (Davids, 1900). Initially defined as the maintenance of both mind and body, mindfulness refers to the cultivation of tranquility and concentration, encompassing awareness, attention, and memory (BRENSILVER et al., 2011).

Kabat Jin played a pivotal role in dissociating mindfulness from its Buddhist origins and applying it to clinical psychotherapy with successful therapeutic outcomes. In recent years, mindfulness has emerged as a prominent research topic within psychology.After engaging in long-term, standardized mindfulness practice, practitioners experience physiological changes characterized by decreased blood pressure, slower tachycardia, and reduced respiratory rate. Recent advancements in EEG, MRI, and other technologies have facilitated researchers in obtaining objective data on the central nervous system to comprehend the impact of mindfulness training on practitioners. Utilizing these technologies has revealed significant alterations in brain function and structure from novice to skilled mindfulness practitioners. Specifically, studies have demonstrated that mindfulness training induces modifications in brain structure within the following areas: attenuation of amygdala activity intensity associated

with emotions; augmentation of left lateralization activity within the brain; and reduction of gray matter density within the amygdala(Zhou & Liu, 2017). Furthermore, long-term regular and scientific mindfulness training can also lead to an increase in thickness of the cingulate cortex as well as gray matter density across various brain structures such as the prefrontal cortex(Fen & Yuxia, 2011).The individual's attention capacity is closely associated with the prefrontal cortex, which partially elucidates the impact of mindfulness on attentional function. Moreover, neuroscientific investigations have directly evidenced the effects of mindfulness training by eliciting activation in both the left frontal lobe and right hemispheric regions, thereby enhancing emotional regulation and somatosensory function at an individual level(Hölzel et al., 2010; Tang, Hölzel, & Posner, 2015). These findings imply that mindfulness training may exert direct influence on brain dynamics, leading to alterations in an individual's mental state. Notably, a study revealed increased thickness of the pretemporal cortex along with reduced low-frequency amplitude after 40 days of mindfulness training among novice practitioners while observing negative changes in low-frequency amplitude specifically within the left precuneus.

**2.2 The theory of mindfulness**

Mindfulness techniques encompass mindfulness cognitive therapy and mindfulness- based stress reduction, with the latter being the most prevalent approach. It can be further categorized into formal and informal training methods. Formal training involves activities such as focused breathing, mindful walking, body scanning, and mindful eating. On the other hand, informal training can be seamlessly integrated into daily life situations like taking an elevator or walking, aiming to cultivate a state of attentiveness and self- awareness. Notably, breathing serves as both a foundational practice for other mindfulness techniques and a core component itself; practitioners may choose either a seated or supine position during this exercise to ensure comfort. The focus should be directed towards the process of respiration and the sensory experience of air entering through the nasal cavity, passing through the trachea and

lungs, and circulating throughout the body until reaching abdominal movements. Whenever attention deviates, simply remind oneself to redirect it back to breathing.

Additionally, breath awareness can serve as a relaxation exercise in conjunction with other techniques. Body scanning is an essential mindfulness training technique that is most effective when practiced in a warm, comfortable, and tranquil environment while assuming a seated, supine or standing position(Creswell, 2016). By consciously observing each individual part of the body (from head to toe or vice versa), directing focused attention towards each scanned area, and sustaining this awareness for a period of time; one's ability to perceive bodily sensations is enhanced while establishing a deeper connection with their own physicality. Consequently, mental focus shifts from ruminative thinking towards attending to bodily experiences themselves; thereby facilitating detachment from internal thoughts and restoring emotional tranquility. This practice aids in stress reduction while cultivating mindfulness and enhancing attentional flexibility.

Mindfulness walking is a method of mindfulness training that emphasizes the process of walking. To facilitate beginners' learning, the instructor intentionally slows down each step for observation. Initially, this exercise should be conducted in a quiet and uncluttered space, allowing practitioners to solely focus on their own walking process. Gradually lifting the arms and maintaining forward gaze, attention should be directed towards every movement during the walk while ensuring smooth breathing throughout without deliberate control. In instances where attention is diverted or distracted, practitioners simply observe this shift and restore awareness to their feet and legs. Mindful eating also constitutes a common practice within life mindfulness, involving conscious consumption with heightened sensory awareness (Warren, Smith, & Ashwell, 2017). During meals, individuals consciously observe food characteristics such as color, shape, texture, and smell while attentively noting bodily sensations experienced throughout the eating process — ultimately integrating mindful attitudes into daily life.

Mindfulness training cultivates the practitioner's ability to attentively observe the process of chewing food, enabling them to discern the nuanced sensations from the

mouth to the esophagus and down to the stomach, while also perceiving any changes that occur. In initial mindfulness diet training, raisins are employed as a tool for practitioners to embrace an open-minded and inquisitive attitude towards their sensory experience. They are encouraged to see, touch, smell, taste, swallow, and fully engage with raisins as if encountering them for the first time. Once this mindset is established, practitioners are guided towards experiencing everyday life with a mindful disposition

The practice of compassion meditation involves the silent repetition of phrases aimed at cultivating kindness and acceptance towards oneself and others (Kearney, Malte, Storms, & Simpson, 2021). Its purpose is to guide practitioners in adopting a positive attitude towards life and engaging in spiritual healing. Given that individuals often neglect self- blessings in their daily lives, this practice serves as a means to cultivate positive energy and eliminate negative emotions. Commencing with focused breathing for emotional stability, practitioners proceed to bestow blessings upon themselves or others. This transformative practice fosters happiness and facilitates profound inner awareness while enhancing empathy and communication skills (Chen et al., 2021).

In addition, prior to engaging in formal practice, practitioners are required to maintain a positive attitude: firstly, by cultivating acceptance. Mindfulness originates from Buddhism and its abstract nature may lead practitioners to question its scientific validity before commencing practice. Acceptance entails reminding participants to observe the changes occurring in the present moment; secondly, by preserving their original intention. To fully appreciate the richness of the present experience, it is essential for participants to cultivate an attitude of curiosity as if encountering things for the first time; thirdly, by learning how to let go. As practitioners begin focusing on their inner experiences, they will soon realize their inclination towards controlling certain thoughts, emotions or states and often struggle with letting go of these thoughts resulting in excessive attachment; fourthly, by fostering trust. The development of self-trust and trust in one's own feelings is indispensable during mindfulness training; fifthly, by maintaining patience. People tend to lose patience quickly when repeating actions.

Therefore, it is crucial for individuals engaged in mindfulness practice to constantly remind themselves not to become impatient with their progress; finally but importantly, by practicing non-judgment. This embodies one of the fundamental principles of mindfulness practice, wherein the cultivation of mindfulness facilitates a moment-to-moment focus on personal experiences while simultaneously avoiding being swayed by preferences, biases, opinions, and thoughts. This enables us to perceive matters objectively, impartially, and authentically through observation or participation.

Mindfulness training (MT) encompasses a range of psychological techniques rooted in the concept of 'mindfulness', aimed at enhancing individuals' level of mindfulness(Haibo, gold, Xili, & Long, 2012). Mindfulness training can be categorized into temporary, short- term, and long-term based on the duration of practice (Davidson, 2010; Davidson & Kaszniak, 2015; Sayers, Creswell, & Taren, 2015). Temporary mindfulness meditation refers to a brief practice lasting no more than an hour. Short-term mindfulness meditation involves practicing for four days to four months. Long-term mindfulness meditation entails practicing for over ten years.

Mindfulness meditation encompasses two types of training, namely focused attention mindfulness training and open monitoring mindfulness training, based on the number of objects individuals are aware of during practice (Lutz, Slagter, Dunne, & Davidson, 2008). Focused attention mindfulness training involves sustained focus on a single target object and emphasizes redirecting attention back to the object when it wanders (Lutz et al., 2008), primarily enhancing individual's attentional capacity. On the other hand, open monitoring mindfulness training does not involve a specific focal point but emphasizes non-judgmental awareness of present experiences as well as recognition of automatic emotions and cognitive patterns (Lutz et al., 2008), mainly improving emotional regulation abilities. Initially, practitioners typically concentrate on a single object such as their breath; however, with accumulated experience they expand their awareness to include any sensations, thoughts or phenomena experienced by them until reaching the advanced stage of open monitoring mindfulness meditation – a progression from simplicity to complexity.

## 3.Literature Review

### 3.1The effects of mindfulness on sports motivation

The level of sports motivation is strongly correlated with individual performance in sports, and a higher level of sports motivation promotes greater dedication and effort in athletic pursuits, thereby leading to improved sports performance. Conversely, a low level of sports motivation hinders individuals' commitment to the sporting process, making them more prone to giving up. Consequently, the study of sports motivation has always been a significant research area within physical education, sports science, and competitive athletics. Various theories on sports motivation are required for comprehensive understanding, including achievement goal theory (Amalia, 1988) and self-determination theory(Edward L. Deci & Richard M. Ryan, 1985; Edward L. Deci & Ryan, 2000).

In the current body of domestic and international research on sports motivation, a majority of studies have primarily focused on enhancing college students' motivation towards sports. However, it is crucial to acknowledge that the middle school stage holds significant importance in life's developmental trajectory. Simultaneously, due to academic pressures, middle school students are engaging in less physical activity and experiencing an increase in sedentary behavior. Consequently, their health is confronted with substantial challenges as obesity and myopia rates continue to rise annually. Therefore, addressing the imperative need to enhance middle school students' motivation for increased sports participation has become imminent.

### 3.2The effects of Mindfulness

Among the various mindfulness measurement tools, the Five Factor Mindfulness Questionnaire (FFMQ) (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006)and the Measure of Attentional Awareness Scale (MAAS)(Bishop et al., 2004) are widely utilized both domestically and internationally. Notably, the FFMQ comprises 39 items encompassing five dimensions: observation, description, conscious action, non-judgmental stance towards internal experience and non-reaction to internal experience. Hong Kong scholar Zhong Boguang et al. have refined this questionnaire resulting in a streamlined version known as FFMQ-SF with identical dimensions but

reduced to 20 items. Its reliability and validity have been confirmed among college students and athletes(Boguang, Chunqing, Brother, & Jingdong, 2016). The MAAS is also frequently employed for assessing attention and awareness of present experiences in daily life by capturing personal traits associated with attentional focus or lack thereof on thoughts and feelings while disregarding the current moment. In addition, there are various mindfulness inventories available such as the Freiburg Mindfulness Inventory (FMI), Southampton Mindfulness Questionnaire (SMQ), and Mindfulness Measures (MMS) among others. Measurement of state mindfulness currently includes the following assessments: firstly, the State Mindfulness Attention Awareness Scale (State- MAAS) which is a revised version of the Mindfulness Attention Awareness Scale, designed to measure attention, focus, and awareness in recent or current daily activities. Secondly, the Toronto Mindfulness Scale (TMS) encompasses two dimensions

Curiosity and Decentering - serving as another tool for measuring state mindfulness. Lastly, Tanayev and Bernstein's State Mindfulness Scale (SMS) developed in 2013 reflects both physical and mental aspects of mindfulness along with higher-order factors representing overall state mindfulness.

Mindfulness is one of the types of modern meditation treatment.Meditation is a complex method of emotional and attention regulation(Lutz et al., 2008).At present, the concept of mindfulness is not unified in academia, which can be divided into three categories.The first category believes that mindfulness is a method of attention intervention.Kabat-Zinn believes that mindfulness is "a method of focusing attention on the present moment with purpose and without judgment" (Kabat-Zinn, 2003).This is the definition of mindfulness widely accepted by academia.The second category believes that mindfulness is a series of psychological processes.Keng et al. (2004) believe that mindfulness makes individuals have non-refined processing through the process of attention regulation, and establishes a curious, open and accepting attitude towards the awareness of the present moment and personal experience, including "self- control of attention" and "orientation to personal experience". This is also the operational definition of mindfulness that researchers unanimously agree upon(Keng et al., 2011). The third

category posits mindfulness as a psychological state or trait, encompassing both temporary changes in affect, cognition, and self-awareness resulting from mindfulness training (state mindfulness), as well as enduring changes in these domains (trait mindfulness). Trait mindfulness is considered a shared quality among individuals(Park, Reilly-Spong, & Gross, 2013), akin to positive psychology's strengths and advantages, and serves as a positive factor promoting physical and mental health as well as happiness for individuals (Seligman & Peterson, 2004).

Self-Determination Theory (SDT), proposed by American psychologists Edward L. Deci and Richard M. Ryan in the 1980s, provides a theoretical foundation for understanding and promoting intrinsic motivation in individuals. It emphasizes the importance of satisfying basic psychological needs to stimulate intrinsic motivation(Edward L Deci & Richard M Ryan, 1985). The theory is based on a core concept that individuals are inherently proactive, pursuing self-realization and personal growth while highlighting their active role in the formation of motivation. As a novel motivational theory, SDT views motivation as a continuum arranged according to the degree of self-determination. It categorizes human behavior into self-determined actions and non-self-determined actions, positing that the driving forces behind behaviors include intrinsic needs and emotions.

According to Self-Determination Theory, human behavioral motivations can be summarized into three fundamental psychological needs: autonomy, relatedness, and competence. A key principle of SDT is that individuals require specific psychological needs to achieve optimal motivation and well-being within their activities. These psychological needs influence goal setting, motivation formation, and engagement levels across various contexts. Autonomy refers to an individual's perceived control over their own actions; competence pertains to an individual’s ability to accomplish specific tasks; relatedness signifies the connection between individual needs and social belonging with others.

Self-Determination Theory underscores the agency of individuals in the motivational process, suggesting that people can flexibly manage their interactions with

their environment while emphasizing significant social influences on personal potential development. Consequently, it transcends mechanistic metaphysical constraints by presenting an organic dialectical view of motivation.

The establishment of these three basic psychological needs offers new perspectives for comprehensively understanding human behavior. Currently, research has supported the significance of these three psychological requirements across various studies. This theory regards the pursuit of self-determination as an inherent motivator for human behavior while providing detailed explanations regarding self-determined actions. The findings from Self-Determination Theory enrich motivational theories and have been validated through applications in practical fields such as religion, education, healthcare, sports, politics among others.

In recent years, numerous studies have been conducted on the levels of physical activity among middle school students in China. However, the majority of these studies have primarily focused on various factors, such as teacher influence, classroom environment, external influences, and personal factors that impact physical activity levels in adolescents. While exercise motivation has been extensively explored within the field of psychology, most research has predominantly concentrated on adults. For instance, they examine the motivation of social individuals to engage in mass sports and explore the motivation of youth to exercise and its association with specific sports participation behaviors. Regrettably, there is limited research available concerning exercise motivation among primary and secondary school students. Therefore, further investigation into this area is imperative to obtain a comprehensive understanding of changes in exercise motivation among young students. It is crucial to effectively motivate middle school students to engage in physical activities both at school and actively pursue them at home for enhancing their physical health. Mindfulness has recently emerged as a prominent subject within behavior change literature(Shauna L Shapiro et al., 2006). Consequently, some researchers have attempted mindfulness interventions targeting adolescent psychology; however, few studies have examined its intervention effects on exercise motivation and attentional processes specifically in

adolescents. Furthermore, there are limited locally validated scales for assessing exercise motivation among middle school students.

# CHAPTER 3

## Research Methodology

In this study, the investigators performed the following steps:

1. Define the populations and the samples
2. Create research tools
3. Data collection
4. Data analysis

### 1. Define the population and the samples

#### 1.1 population

The study 1 recruited a sample of 212 middle school students aged 16-18 from No.1 Middle School in Anshun, Guizhou Province.

**Inclusion criteria:**

1.Grade 9 students from the First Middle School of Anshun City, Guizhou Province.

2.Willing to participate in this experimental study and have signed the informed consent form.

3.Physically and mentally healthy.

**Exclusion criteria:**

1.Individuals with heart disease, infectious diseases, respiratory diseases, or severe mental illnesses.

2.Individuals who do not agree to participate in this experimental study and have not signed the informed consent form.

#### 1.2 Sample selection

A total of 44 middle school students from Anshun No. 1 Middle School were randomly selected to participate in this experimental study and provided informed consent.Subsequently, they were randomly assigned into an experimental group and a control group.

**1.3 Sample size planning**

Study 1:The research object of this article was Chinese middle school students. adopted a random sampling method.

Quantitative research employed the sample size method of employed the Krejcie & Morgan formula for sample size determination. Given a population of 470, with e=0.05, 95% CI ($\chi^2$=3.841), and p=0.5, the calculated sample size was 212 (211.6 rounded up).

Study2: Sample size estimation was performed in GPower using repeated measures ANOVA ($\alpha$=0.05, power=0.8, 2 groups, 3 measurements, within-factor correlation=0.5, sphericity correction $\varepsilon$=1), yielding a required sample size of 44.

**2.Create research tools**

Sport Motivation Scale (SMS):The scale was originally developed by French scholars Brière et al. based on Cognitive Evaluation Theory. In 1995, Canadian researcher Pelletier et al. translated the French version into English and further refined it into the Sport Motivation Scale (SMS).The SMS comprises three dimensions:

Intrinsic Motivation (consisting of knowledge, acomplish and experience stimulate),Extrinsic Motivation (including introjection, identification,and external regulation ),Amotivation.

The scale consists of 28 items, rated on a 7-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7). Higher scores in a given dimension indicate a stronger influence of that motivational factor on exercise behavior.

Psychometric evaluations demonstrated high reliability and construct validity, with:

Table 1Cronbach's alpha coefficients of each subscale

| dimension | α |
|---|---|
| Intrinsic motivation-to knowledge | 0.72 |
| Intrinsic motivation-to achievement | 0.75 |
| Intrinsic motivation- experience excitement | 0.75 |
| Introfection | 0.67 |
| External regulation | 0.73 |
| Identified regulation | 0.76 |
| Amotivation | 0.6 |

In China, scholar Ye Ping et al. adopted the Chinese version of the SMS in related research, achieving robust results.

Revised Sport Motivation Scale (SMS)(Pelletier et al., 1995) based on the opinions of IOC experts and prvious students try out testing opinions. Some of items are as follows:

Table 2 Partial scale content

| Questions | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1. Because I feel happy in exciting experiences. | | | | | | | |
| 2. Because sports help me gain more knowledge about the activities I participate in, which brings me great pleasure. | | | | | | | |

In this study, research instruments were developed and evaluated through the following systematic procedures:

2.1. A comprehensive review of existing literature related to sports motivation measurement was conducted to inform the development of the instrument.

2.2. Initial draft items were prepared and subsequently submitted to the academic advisor for guidance and feedback.

2.3. Following revisions based on the advisor's input, the refined items were forwarded to three experts in the fields of behavioral science and psychology for content validity assessment. The Item-Objective Congruence (IOC) index was utilized to evaluate the degree of alignment between each item and its intended construct. Experts rated each item using the following scale:

A score of +1 indicates that the item clearly and accurately reflects the intended construct.

A score of 0 suggests uncertainty regarding the item's relevance to the construct.

A score of -1 indicates that the item does not align with the construct being measured.

2.4. Upon receiving the completed IOC forms from the experts, the study calculated the IOC scores for each item to assess its congruence with the defined objective. Only items achieving an IOC score of 0.5 or higher were retained. Items falling below this threshold were either revised or excluded from the final version of the instrument. Based on expert evaluations, the IOC scores for the finalized items ranged from 0.65 to 1.00, indicating strong content validity.

2.5. The finalized version of the instrument, incorporating all validated items, was then used for data collection.

The data collected in this phase were based on the revised scales informed by the IOC evaluation results.

**3. Data collection**

Data was collected from February 2025 to March 2025, targeting Grade 3 middle school students with normal cognitive abilities. Face-to-face questionnaire distribution was employed, preceded by an explanation of the questionnaire filling

process to all participants. The exercise motivation, mindfulness of both experimental and control groups were assessed before, during (over a period of four weeks), and after the experiment.

**4. Data analysis**

1. The mean (M) and standard deviation(SD) of the samples were measured using SPSS 24.0.

2. Describe the situation of the sample using percentages.

3. Use an independent samples t-test to compare the differences between different groups.

4.The Repeated - measures ANOVA statistical method was employed to compare whether significant differences existed between the experimental and control groups before the experiment, at week 4, and week 8. P-values were calculated for this purpose.

# CHAPTER 4
## Results

The study "The Impact of Mindfulness on Middle School Students' Motivation for Physical Activity" consists of two studys. Study 1 investigate and compare the physical activity motivation of junior high school students in Grade Nine at Anshun No.1 Middle School. This study was conducted among 212 students. The item is retained if the IOC calculated based on expert ratings is greater than 0.6.7.Independent sample t-tests were used to compare intrinsic motivation, extrinstic motivation, and amotivation between different genders, with a statistical significance level of 0.05. Study 2 selected 44 students with lower physical activity motivation scores and randomly divided them into an experimental group and a control group based on their motivation scores. The experimental group underwent an eight-week mindfulness training program. To examine the effects of the intervention, SPSS statistical software was employed to analyze changes in intrinsic motivation, extrinsic motivation, and amotivation across both the control and experimental groups at three time points: prior to the training, after four weeks of training, and after eight weeks of training. The analytical procedures included the following steps:

1. Conducting normality tests and independent samples t-tests to assess baseline differences in intrinsic motivation, extrinsic motivation, and amotivation between the two groups before the intervention.

2. Applying repeated measures ANOVA to evaluate the variations within and between groups across the three measurement periods. This analysis aimed to determine whether there were statistically significant differences between the control group and the experimental group before training, after four weeks, and after eight weeks of mindfulness instruction. The level of statistical significance was set at $p < 0.05$.

### Study1

The study primarily involved middle school students from Guizhou Province, with a total sample size of 212. The questionnaires were randomly distributed to

participants through their teachers. Following data collection, scales that contained incomplete responses or displayed clear response patterns were removed. A final count of 200 valid responses was achieved, yielding an effective response rate of 94.34%. Further details regarding the participants' demographic characteristics are provided in Table 3.

Table 3 Number and percentage of the general data of Chinese students (n=200)

| General data of Chinese students | Number of Students | Percentage |
|---|---|---|
| **Gender** | | |
| Male | 93 | 46.50 |
| Female | 107 | 53.50 |
| Total | 200 | 100.00 |
| **Whether there are brothers and sisters** | | |
| only child | 52 | 26.00 |
| non-only child | 148 | 74.00 |
| Total | 200 | 100.00 |
| **Favorite types of sports** | | |
| Ball games | 95 | 47.50 |
| Rope Skipping | 9 | 4.50 |
| Running | 3 | 20.00 |
| Other Sports | 93 | 15.00 |
| Total | 200 | 100.00 |

In the valid sample, the general data of Chinese students in the table shows that the majority of females were53.50% and males were 46.50%. non-only child accounted for 74.00% of the total, and only child accounted for 26.00%. Preferred sports types were distributed as follows: ball games accounted for 47.50%, rope-based activities accounted for 4.5%, running accounted for 20%, and other sports categories accounted for (15%)

Table 4 Descriptive statistics of intrinsic motivation(n=200)

| Variable | Gender(Male n=93 、 female n=107) | M | S.D. |
|---|---|---|---|
| to knowledge | Male | 20.48 | 4.13 |
| | female | 18.47 | 4.40 |
| to accomplish | male | 20.72 | 4.09 |
| | female | 18.26 | 4.00 |
| | male | 20.48 | 3.84 |
| To experience stimulation | female | 19.31 | 4.34 |

The scores of each index of intrinsic motivation in the middle school were measured by the Adolescent Sport Motivation Scale. It can be seen from the table that among all the index scores, the indexes of knowledge seeking, achievement and stimulation of male were 20.48, 20.72 and 20.48, respectively, and those of female were 18.47, 18.26 and 19.31, respectively, indicating that the level of each index of male' intrinsic motivation was higher than that of females. The legend shows that the distribution of these three indicators is basically uniform, which indicates that the development of each indicator of internal motivation of junior high school students in Anshun City is relatively balanced.

Table 5 compares intrinsic motivation by gender(n=200)

| Variable | Gender( Male n=93 、 female n=107) | M | S.D. | t | P-value |
|---|---|---|---|---|---|
| to knowledge | Male | 20.48 | 4.13 | 6.28 | 0.00* |
| | female | 18.47 | 4.40 | | |
| to accomplish | male | 20.72 | 4.09 | 8.98 | 0.00* |
| | female | 18.26 | 4.00 | | |
| | male | 20.48 | 3.84 | | 0.00* |
| To experience stimulation | female | 19.31 | 4.34 | 4.33 | |

* $p < .05$.

The data were analyzed by independent sample t test, and the three indicators of intrinsic motivation were compared. The results showed that the p values of to knowledge, to accomplish and to experience stimulation between males and females were all less than 0.05, so there was a significant difference in intrinsic motivation between males and females.

Table 6 Descriptive statistics of extrinstic motivation (n=200)

| Variable | Gender(Male n=93 female n=107) | M | S.D. |
|---|---|---|---|
| Introjected | Male | 20.84 | 4.13 |
| | female | 19.91 | 4.46 |
| Identified | male | 20.69 | 4.06 |
| | female | 20.03 | 4.14 |
| | male | 18.11 | 5.16 |
| External regulation | female | 16.74 | 5.01 |

* $p < .05$.

Males students had the highest values of introjected (20.84), identified (20.69) and external regulation (18.11). The lowest values of the above three indicators appeared in females, which were introjected (19.91), identified (20.03) and external regulation (16.74). It shows that the level of extrinstic motivation of male middle school students is higher than that of female students.

Table 7compares extrinstic motivation by gender(n=200)

| Variable | Gender(Male n=93 female n=107) | M | S.D. | t | P-value |
|---|---|---|---|---|---|
| Introjected | Male | 20.84 | 4.13 | 3.20 | .00* |
| | female | 19.91 | 4.46 | | |
| Identified | male | 20.69 | 4.06 | 2.24 | .03* |
| | female | 20.03 | 4.14 | | |
| | male | 18.11 | 5.16 | 3.02 | .00* |
| External regulation | female | 16.74 | 5.01 | | |

The data were analyzed by independent sample t test, and the three indicators of extrinstic motivation were compared. The results showed that the p values of

introfected(0.00), identified(0.03) and external regulatory(0.00) between males and females were all less than 0.05, so there was a significant difference in external motivation between males and females.

Table 8 Descriptive statistics of disincentives by gender(n=200)

| Variable | Gender(Male n=93、femalen=107) | M | S.D. |
|---|---|---|---|
| Amotivation | male | 15.13 | 3.44 |
| | female | 14.77 | 3.72 |

In the middle school, males (15.13) and females (14.77) scored on each index of amotivation.

Table 9 compares the level of amotivation of different genders(n=200)

| Variable | Gender(Male n=93、female n=107) | M | S.D. | t | P-value |
|---|---|---|---|---|---|
| Amotivation | male | 15.13 | 3.44 | 0.71 | 0.48 |
| | female | 14.59 | 3.72 | | |

* $p < .05$.

The data were analyzed by independent sample t test, and the comparison of the indicators of amotivation showed that the p value of amotivation between males and females was greater than 0.05, so there was no significant difference between males and females.

Table 10 Descriptive statistics of sport motivation composition (n=200)

| Variable | Component | M | S.D. |
|---|---|---|---|
| Intrinsic motivation | to knowledge | 19.41 | 2.48 |
| | To accomplish | 19.41 | 2.29 |
| | Experience stimulate | 19.86 | 2.00 |
| Extrinstic motivation | introjected | 20.34 | 2.10 |
| | Identified | 20.34 | 2.10 |
| | External regulation | 17.39 | 3.03 |
| Amotivation | amotivation | 14.94 | 3.59 |

The main sport motivation was Intrinsic motivation (58.68), followed by Extrinstic motivation (58.07) and amotivation (14.94).

Study 2

The objective of this study is to investigate and compare the effects of mindfulness on exercise motivation among middle school students. The research objects were 44 middle school students from Anshun No. 1 Middle School in Guizhou Province. The research sample was randomly divided into two groups (sorted by score) .

Control group: no intervention training.

The experimental group: received 8 weeks mindfulness intervention training.

The study used 24.0 SPSS statistical program to analyze intrinsic motivation (to knowledge,to accomplish and experience stimulation), extrinstic motivation (introjected, identified and external regulation) and amotivation before training, after 4 weeks of training and 8 weeks of training. The specific statistical methods are as follows:

The Mean and Standard Deviation of gender, intrinsic motivation (to knowledge, to accomplish and experience stimulate), extrinstic motivation (introjected, identified and external regulation) and amotivation were calculated to describe the basic situation of the control group and the experimental group.

A 2×3 repeated measures analysis of variance was used to compare the differences between the control group and the experimental group before training, after 4 weeks of training and after 8 weeks of training, and the time differences between the groups. The statistical significance level was set at 0.05.

Table 11Demographic characteristics of the subjects in the control group (n=22)

| Demographic variables | | Number of students | Percentage |
|---|---|---|---|
| Gende | female | 10 | 54.55 |
| | male | 12 | 45.45 |
| brothers and sisters | have | 16 | 63.64 |
| | not have | 6 | 36.36 |

All students were from middle school, with males accounting for 54.55% and females for 45.45%. Regarding sibling situations within their families, 36.36% were only children, 63.64% were not the only child.

Table 12 Demographic characteristics of the subjects in the experimental group (n=22)

| Demographic variables | | Number of students | Percentage |
|---|---|---|---|
| Gender | male | 11 | 50.00 |
| | female | 11 | 50.00 |
| Brothers and sisters | have | 15 | 68.18 |
| | Not have | 7 | 31.82 |

A total of 22 students volunteered to participate in the study. males accounting for 50.00% and girls for 50.00%. Regarding sibling situations within their families, 31.82% were only children, and 68.82% were not the only child.

Comparison and analysis of test results of each index between the experimental group and the control group before the experiment.

Before the experiment, the intrinsic motivation, amotivation and extrinstic motivation of the two groups of middle school students were compared, and there was no significant difference, indicating that the two groups were at the same level in each test index and could carry out the experiment. The comparative analysis of each test index between the two groups is shown in Table 13.

Table 13Demographic characteristics of the subjects in the experimental group (n=22)

| Variable | W0 | | W4 | | W8 | |
|---|---|---|---|---|---|---|
| | M | S.D. | M | S.D. | M | S.D. |
| Experience stimulate | 17.46 | 2.13 | 19.32 | 2.46 | 20.91 | 3.34 |
| To know | 17.32 | 2.12 | 19.14 | 2.78 | 21.05 | 2.68 |
| To accomplish | 17.23 | 2.91 | 19.41 | 2.13 | 20.86 | 2.05 |
| amotivation | 13.77 | 2.07 | 13.68 | 2.08 | 13.64 | 1.92 |
| External regulation | 17.91 | 2.07 | 17.82 | 2.13 | 17.73 | 2.19 |
| introjected | 17.73 | 1.75 | 17.59 | 1.82 | 17.55 | 1.97 |
| identified | 17.82 | 1.71 | 17.68 | 1.73 | 17.59 | 1.79 |

The results showed that the mean scores of W0 in the experimental group were intrinsic motivation (experience stimulation 17.46, to know17.32, to accomplish 17.23), amotivation 13.77 and extrinstic motivation (external regulation 17.91, introjected17.73, identified 17.82). The average w4 scores were intrinsic motivation (experience stimulation 19.318, to know 19.14, accomplish 19.41), amotivation 13.68 and extrinsticl motivation (external regulation 17.82, introjected 17.59, identified 17.68). The average W8 scores were intrinsic motivation (experience

stimulation 20.91, to know 21.05, accomplish 20.86), amotivation 13.64 and extrinstic motivation (external regulation 17.73, introjected 17.55, identified 17.59).

Table 14Demographic characteristics of the subjects in the control group (n=22)

| Variable | W0 | | W4 | | W8 | |
|---|---|---|---|---|---|---|
| | M | S.D. | M | S.D. | M | S.D. |
| Experience stimulate | 17.68 | 2.03 | 17.77 | 2.27 | 17.86 | 2.27 |
| To know | 17.82 | 2.02 | 17.91 | 3.27 | 17.96 | 3.29 |
| To accomplish | 17.73 | 2.88 | 17.82 | 2.46 | 17.91 | 2.56 |
| amotivation | 13.64 | 1.65 | 13.55 | 1.68 | 13.46 | 1.63 |
| External regulation | 17.50 | 2.26 | 17.36 | 2.34 | 17.27 | 2.31 |
| introjected | 17.96 | 1.94 | 17.91 | 2.02 | 17.82 | 1.94 |
| identified | 17.86 | 2.01 | 17.82 | 1.99 | 17.77 | 2.09 |

The results showed that the mean scores of W0 in the control group were intrinsic motivation (experience stimulation 17.68, to know17.82, to accomplish 17.73), amotivation 13.64 and extrinstic motivation (external regulation 17.50, introjected17.96, identified 17.864). The average w4 scores were intrinsic motivation (experience stimulation 17.773, to know 17.91, accomplish 17.82), amotivation 13.55 and extrinsticl motivation (external regulation 17.36 introjected 17.91, identified 17.82). The average W8 scores were intrinsic motivation (experience stimulation 17.86 to know 17.96, accomplish 17.91), amotivation 13.46 and extrinstic motivation (external regulation 17.27, introjected 17.82, identified 17.77).

The comparison of pre-test intrinsic motivation (to known, to accomplish, to experience stimulate), extrinstic motivation (identified, introjected, external regulation), amotivation between the experimental group and the control group was carried out using an independent sample t-test in this study, with the results presented in Table 15.

Table 15 compares the level of motivation of different groups (n=44)

| Variable | Component | Experimental group | Control group | t | P-value |
|---|---|---|---|---|---|
| Intrinsic motivation | to knowledge | 17.45±2.13 | 17.68±2.03 | -0.36 | 0.72 |
| | To accomplish | 17.32±2.12 | 18.14±1.89 | -1.35 | 0.18 |
| | Experience stimulate | 16.82±2.47 | 17.73±2.88 | -1.13 | 0.27 |
| Extrinstic motivation | Introjected | 12.95±1.84 | 13.77±2.07 | -1.39 | 0.17 |
| | Identified | 17.95±2.26 | 17.73±1.75 | 0.41 | 0.69 |
| | External regulation | 18.09±2.18 | 17.82±1.71 | 0.46 | 0.65 |
| amotivated | amotivated | 17.50±2.26 | 18.05±2.10 | -0.83 | 0.41 |

. * $p < .05$.

It can be seen that the p value of independent sample T test of each test index of the two groups before the experiment was greater than 0.05, indicating that there was no significant difference in the pretest scores of intrinsic motivation (experience stimulate, to know, to accomplish), amotivation and extrinstic motivation (introjected , identified, external regulation ) between the experimental group and the control group before the experiment. The test scores of the two groups were at the same level, and the experiment could be carried out.

Repeated measures ANOVA results of Intrinsic motivation(to experience stimulation) in the experimental group and the control group.

Table 16 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(Intrinsic motivation - To experience stimulation) (n=44)

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 72.86 | 1.75 | 41.54 | 7.39 | 0.00 | 0.15 |
| group | 69.82 | 1.00 | 69.82 | 8.50 | 0.01 | 0.17 |
| time* group | 59.05 | 1.75 | 33.66 | 5.99 | 0.01 | 0.13 |
| Error | 414.09 | 73.68 | 5.62 | | | |
| Mauchly's W=0.79 X2=9.62 df=2 p=0.01 | | | | | | |

* $p < .05$.

Mauchly's W = 0.791 (p = 0.008), indicating a violation of the sphericity assumption. Since the W value was greater than 0.75, the analysis results were based on the Huynh-Feldt corrected values.

The main effect of time was significant (F = 7.39, p = 0.00), with a partial $\eta^2$ = 0.15, suggesting that intrinsic motivation varied significantly across different time points. The main effect of group was also significant (F = 8.50, p = 0.01), with a partial $\eta^2$ = 0.17, indicating a significant difference between the experimental and control groups.

Furthermore, the time × group interaction was significant (F = 5.99, p = 0.01), with a partial $\eta^2$ = 0.13, demonstrating that the effect of time on experience stimulation differed depending on the group.

Table 17 Simple main effect (Intrinsic motivation - To experience stimulation) (n=44)

| Inter - group | (I) time | (J) time | Difference in means (I-J) | SE | P-value | The 95% confidence interval for the difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Upper limit |
| Experimental group | W0 | W4 | -1.86* | 0.60 | 0.00 | -3.08 | -0.65 |
| | W0 | W8 | -3.46* | 0.81 | 0.00 | -5.088 | -1.83 |
| | W4 | W8 | -1.59* | 0.58 | 0.01 | -2.75 | -0.43 |
| Control group | W0 | W4 | -0.09 | 0.60 | 0.88 | -1.31 | 1.12 |
| | W0 | W8 | -0.18 | 0.81 | 0.82 | -1.81 | 1.45 |
| | W4 | W8 | -0.09 | 0.58 | 0.88 | -1.25 | 1.07 |

* $p < .05$.

In the experimental group, the mean differences among the three time points (W0, W4, and W8) were all statistically significant. The mean difference between W0 and W4 was -1.864 ($p = 0.003$), with a 95% confidence interval (CI) of [-3.08, -0.65]; the mean difference between W0 and W8 was -3.46 ($p = 0.01$), with a 95% CI of [-5.08, -1.83]; and the mean difference between W4 and W8 was -1.59 ($p = 0.01$), with a 95% CI of [-2.75, -0.43]. None of the 95% confidence intervals for these differences included zero, indicating a significant decrease in the mean values of the experimental group over time.

In the control group, the mean differences among the three time points (W0, W4, and W8) were not statistically significant. The mean difference between W0 and W4 was -0.09 ($p = 0.88$), with a 95% CI of [-1.31, 1.12]; the mean difference between W0 and W8 was -0.18 ($p = 0.82$), with a 95% CI of [-1.81, 1.45]; and the mean difference between W4 and W8 was -0.09 ($p = 0.88$), with a 95% CI of [-1.25, 1.07]. All 95%

confidence intervals included zero, suggesting no significant changes in the mean values of the control group across different time points.

Table 18 Simple effect between groups (Intrinsic motivation - To experience stimulation) (n=44)

| time | (I) Between-groups | (J) Between-groups | Difference in means (I-J) | SE | P-value | The 95% confidence interval for the difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Upper limit |
| W0 | Experimental group | Control group | -0.28 | 0.63 | 0.72 | -1.50 | 1.04 |
| W4 | Experimental group | Control group | 1.55* | 0.71 | 0.04 | 0.11 | 2.98 |
| W8 | Experimental group | Control group | 3.05* | 0.86 | 0.00 | 1.31 | 4.78 |

. * p < .05.

At the W0 time point, the mean difference between the experimental group and the control group was -0.23 (p = 0.72), with a 95% confidence interval of [-1.50, 1.04]. The interval included zero, indicating no significant difference between the experimental and control groups at W0.

At the W4 time point, the mean difference between the experimental group and the control group was 1.55 (p = 0.04), with a 95% confidence interval of [0.11, 2.98]. The interval did not include zero, indicating that the mean of the experimental group was significantly higher than that of the control group at W4.

At the W8 time point, the mean difference between the experimental group and the control group was 3.05 (p = 0.00), with a 95% confidence interval of [1.31, 4.78]. The interval did not include zero, indicating that the mean of the experimental group was significantly higher than that of the control group at W8.

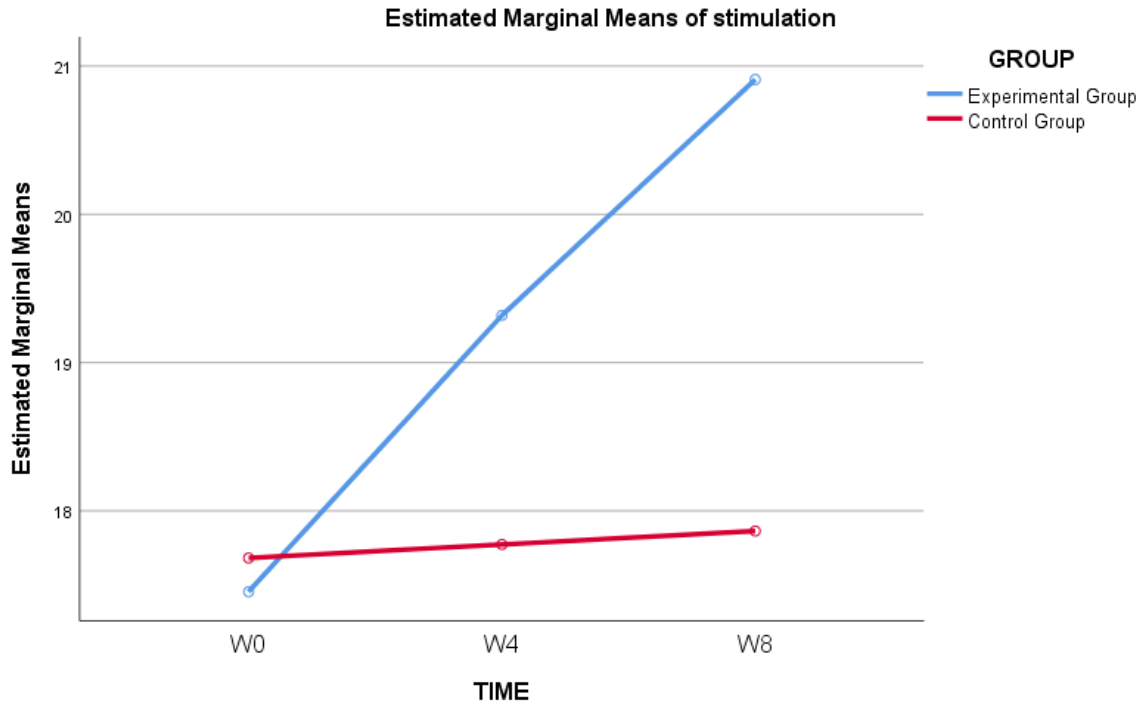


Figure 2 Outline of marginal mean value for experience stimulate estimation

Table 19 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(Intrinsic motivation -to know) (n=44)

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 82.11 | 2 | 41.05 | 6.13 | 0.00 | 0.13 |
| group | 70.96 | 2 | 35.48 | 5.30 | 0.01 | 0.11 |
| time* group | 53.46 | 1 | 53.46 | 5.88 | 0.02 | 0.12 |
| Error | 562.27 | 84 | 6.69 | | | |
| Mauchly's W=0.97 X2=1.47 df=2 p=0.48 | | | | | | |

* p < .05.

The results of Mauchly's test of sphericity showed that W = 0.97 (p = 0.48), indicating that the data met the assumption of sphericity, and thus no correction was required for the results.

The main effect of time was significant (F = 6.13, p = 0.00), with a partial $\eta^2$ = 0.13, suggesting that different time points had a significant impact on intrinsic motivation.

The main effect of between-group differences was also significant (F = 5.30, p = 0.01), with a partial $\eta^2$ = 0.11, indicating a significant difference between the experimental and control groups.

Furthermore, the interaction effect between time and group was significant (F = 5.88, p = 0.02), with a partial $\eta^2$ = 0.12, demonstrating that the effect of time on intrinsic motivation (to knowledge dimension) varied depending on the group.

Table 20 Simple effect within groups (Intrinsic motivation -to know) (n=44)

| time | (I) Between-groups | (J) Between-groups | Difference in means (I-J) | SE | P-value | The 95% confidence interval for the difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Lower limit |
| Experimental group | W0 | W4 | -1.82* | 0.82 | 0.03 | -3.47 | -0.17 |
| | W0 | W8 | -3.73* | 0.81 | 0 | -5.37 | -2.09 |
| | W4 | W8 | -1.91* | 0.70 | 0.01 | -3.33 | -0.49 |
| Control group | W0 | W4 | -0.09 | 0.82 | 0.91 | -1.74 | 1.56 |
| | W0 | W8 | -0.14 | 0.81 | 0.87 | -1.78 | 1.51 |
| | W4 | W8 | -0.05 | 0.70 | 0.95 | -1.46 | 1.37 |

* p < .05.

In the experimental group, the mean difference between W0 and W4 was -1.82 (p = 0.03), with a 95% confidence interval (CI) of [-3.47, -0.17], indicating that the mean

at W4 was significantly lower than that at W0. The mean difference between W0 and W8 was -3.73(p = 0.000), with a 95% CI of [-5.37, -2.09], demonstrating that the mean at W8 was significantly lower than that at W0. The mean difference between W4 and W8 was -1.909 (p = 0.01), with a 95% CI of [-3.33, -0.49], showing that the mean at W8 was significantly lower than that at W4. These results suggest statistically significant differences in means across different time points in the experimental group, with a progressive decline over time.

In the control group, the mean difference between W0 and W4 was -0.091 (p = 0.91), with a 95% CI of [-1.74, 1.56]; the mean difference between W0 and W8 was -0.136 (p = 0.87), with a 95% CI of [-1.78, 1.51]; and the mean difference between W4 and W8 was -0.05 (p = 0.95), with a 95% CI of [-1.46, 1.37]. All 95% confidence intervals included zero, indicating no statistically significant differences in means across time points in the control group.

Table 21 Simple effect between groups (Intrinsic motivation -to know) (n=44)

| time | (I) Between-groups | (J) Between-groups | Difference in means (I-J) | SE | P-value | The 95% confidence interval for the difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Lower limit |
| W0 | Experimental group | Control group | -0.50 | 0.62 | 0.43 | -1.76 | 0.76 |
| W4 | Experimental group | Control group | 1.23 | 0.92 | 0.19 | -0.62 | 3.07 |
| W8 | Experimental group | Control group | 3.09* | 0.90 | 0.00 | 1.27 | 4.92 |

* p < .05.

At the W0 time point, the mean difference between the experimental group and the control group was -0.5 (p = 0.43), with a 95% confidence interval of [-1.76, 0.76]. The interval included zero, indicating no statistically significant difference between the experimental and control groups at W0.

At the W4 time point, the mean difference between the experimental group and the control group was 1.23 (p = 0.19), with a 95% confidence interval of [-0.62, 3.07]. The interval included zero, suggesting that there was still no statistically significant difference between the two groups at W4.

However, at the W8 time point, the mean difference between the experimental group and the control group was 3.09 (p = 0.00), with a 95% confidence interval of [1.27, 4.92]. The interval excluded zero, demonstrating that the mean of the experimental group was significantly higher than that of the control group at W8.

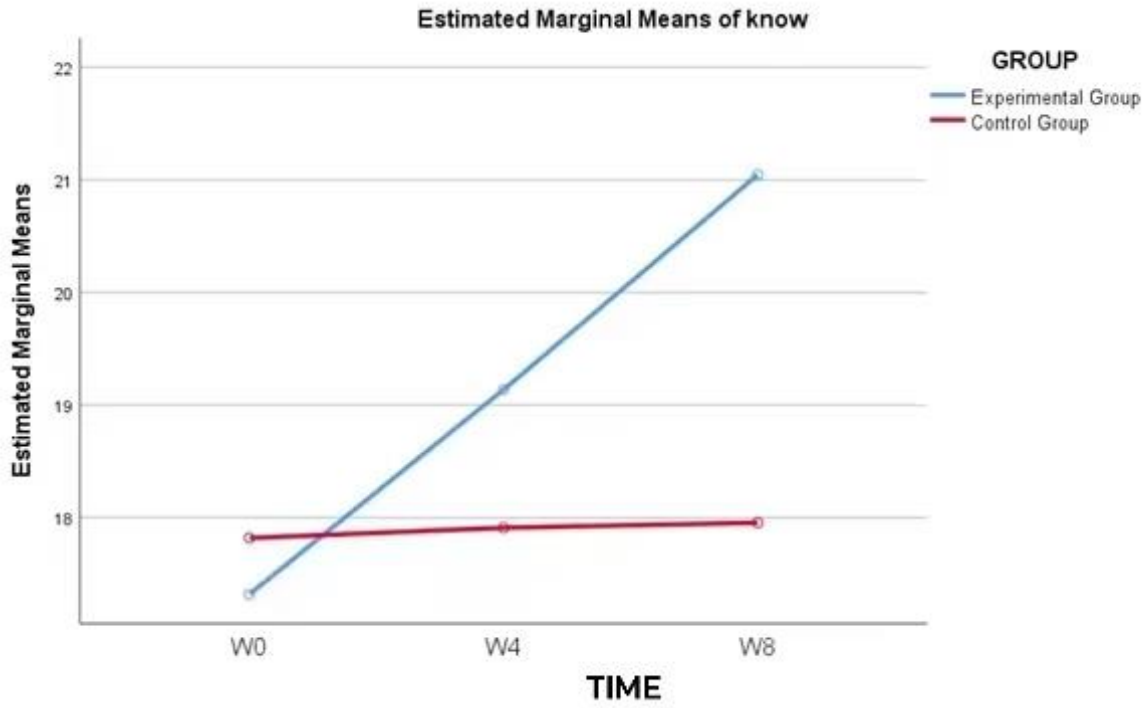


Figure 3 Outline of marginal mean value for to know estimation

Table 22 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(Intrinsic motivation -to accomplish) (n=44)

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 81.15 | 1.82 | 44.57 | 5.67 | 0.01 | 0.12 |
| group | 60.01 | 1 | 60.01 | 12.62 | 0.00 | 0.23 |
| time* group | 66.61 | 1.82 | 36.58 | 4.65 | 0.02 | 0.10 |
| Error | 601.58 | 76.48 | 7.87 | | | |
| Mauchly's W=0.83 X2=7.53 df=2 p=0.02 | | | | | | |

* $p < .05$.

The results of Mauchly's test of sphericity showed that W = 0.83 (p = 0.02), indicating a violation of the sphericity assumption. Since the W-value exceeded 0.75, the analysis was based on Huynh-Feldt corrected results. `

In the repeated-measures ANOVA with "intrinsic motivation - sense of achievement" as the dependent variable, the main effect of time was significant (F = 5.67, p = 0.01), with a partial $\eta^2$ = 0.12, suggesting that intrinsic motivation varied significantly across different time points. The between-group main effect was also significant (F = 12.62, p = 0.00), with a partial $\eta^2$ = 0.23, indicating a significant difference between the experimental and control groups.

Furthermore, the time × group interaction was significant (F = 4.65, p = 0.02), with a partial $\eta^2$ = 0.10, demonstrating that the effect of time on achievement motivation differed depending on group assignment.

Table 23 Simple effect within groups (Intrinsic motivation -to accomplish) (n=44)

| time | (I) time | (J) time | Difference in means (I-J) | SE | P-value | The 95% confidence interval for the difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Lower limit |
| Experimental group | W0 | W4 | -2.18* | 0.89 | 0.02 | -3.98 | -0.39 |
| | W0 | W8 | -3.64* | 0.88 | 0 | -5.42 | -1.86 |
| | W4 | W8 | -1.455* | 0.60 | 0.02 | -2.71 | -0.20 |
| Control group | W0 | W4 | -0.091 | 0.89 | 0.92 | -1.89 | 1.70 |
| | W0 | W8 | -0.182 | 0.88 | 0.84 | -1.96 | 1.60 |
| | W4 | W8 | -0.091 | 0.62 | 0.88 | -1.34 | 1.16 |

* $p < .05$.

In the experimental group, the mean difference between W0 and W4 was -2.18 ($p = 0.02$), with a 95% confidence interval of [-3.98, -0.39], indicating that the mean at W4 was significantly lower than that at W0. The mean difference between W0 and W8 was -3.64 ($p = 0.00$), with a 95% confidence interval of [-5.42, -1.86], demonstrating that the mean at W8 was significantly lower than that at W0. The mean difference between W4 and W8 was -1.46 ($p = 0.02$), with a 95% confidence interval of [-2.71, -0.20], showing that the mean at W8 was significantly lower than that at W4. These results suggest statistically significant differences in means across different time points in the experimental group, with a gradual decline in means over time.

In the control group, the mean difference between W0 and W4 was -0.09 ($p = 0.92$), with a 95% confidence interval of [-1.89, 1.70]. The mean difference between W0

and W8 was -0.18 (p = 0.84), with a 95% confidence interval of [-1.96, 1.60]. The mean difference between W4 and W8 was -0.091 (p = 0.884), with a 95% confidence interval of [-1.34, 1.16]. Since all 95% confidence intervals included zero, these findings indicate no statistically significant differences in means across different time points in the control group.

Table 24Simple effect between groups (Intrinsic motivation -to accomplish) (n=44)

| time | (I) Between-groups | (J) Between-groups | Difference in means (I-J) | SE | P-value | The 95% confidence interval for the difference | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower limit | Lower limit |
| W0 | Experimental group | Control group | -0.50 | 0.87 | 0.57 | -2.26 | 1.26 |
| W4 | Experimental group | Control group | 1.59* | 0.69 | 0.03 | 0.19 | 2.99 |
| W8 | Experimental group | Control group | 2.96* | 0.70 | 0 | 1.54 | 4.37 |

* p < .05.

At the W0 time point, the mean difference between the experimental group and the control group was -0.5 0(p = 0.57), with a 95% confidence interval of [-2.26, 1.26]. Since the interval includes zero, this indicates no statistically significant difference between the experimental and control groups at W0.

At the W4 time point, the mean difference between the experimental group and the control group was 1.59 (p = 0.03), with a 95% confidence interval of [0.19, 2.99].

The interval excludes zero, indicating that the mean of the experimental group was significantly higher than that of the control group at W4.

At the W8 time point, the mean difference between the experimental group and the control group was 2.96(p = 0.00), with a 95% confidence interval of [1.54, 4.37]. The interval excludes zero, demonstrating that the mean of the experimental group was significantly higher than that of the control group at W8.

This indicates that the dimension of "to accomplish" shows a statistically significant intervention effect over time. Compared with the baseline (W0), the advantage of the experimental group gradually increased at the 4th week (W4) and the 8th week (W8).

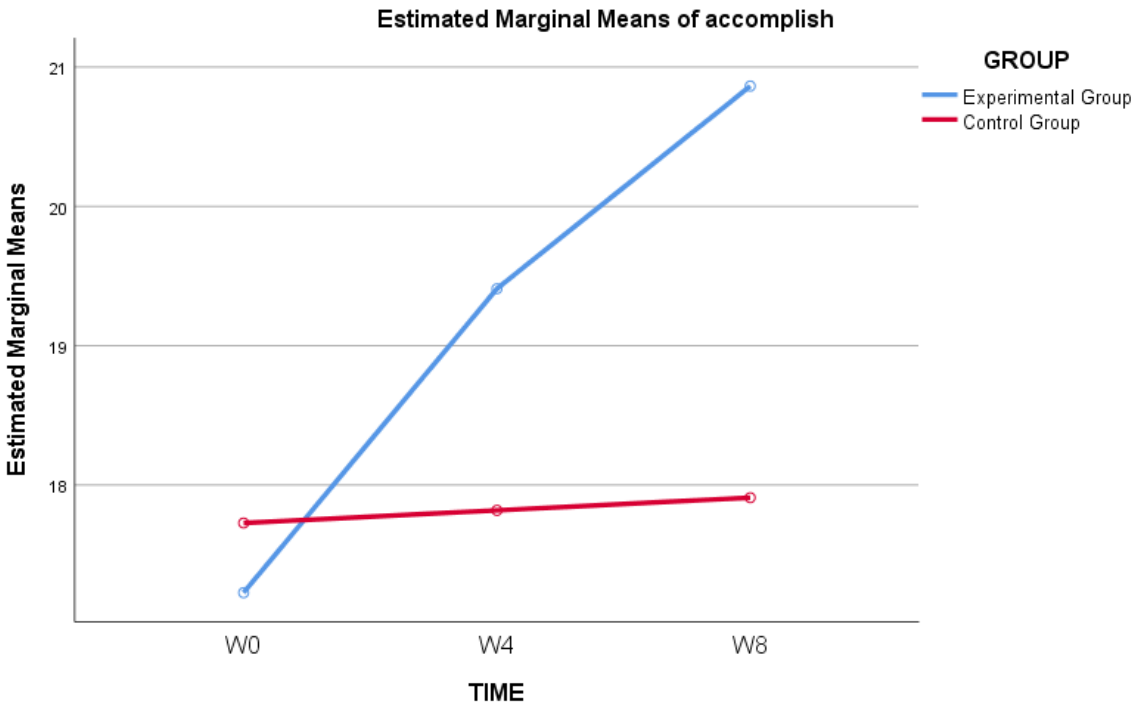


Figure 4 Outline of marginal mean value for to accomplish estimation

Table 25 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(Amotivation) (n=44)

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 0.56 | 2 | 0.28 | 0.07 | 0.93 | 0.00 |
| group | 0.76 | 1 | 0.76 | 0.28 | 0.60 | 0.01 |
| time* group | 0.02 | 2 | 0.01 | 0.00 | 1.00 | 0.00 |
| Error | 316.76 | 84 | 3.77 | | | |
| Mauchly's W=1.00 X2=0.13 df=2 p=0.94 | | | | | | |

* $p < .05$.

The results of Mauchly's test of sphericity indicated that the assumption of sphericity was met (W =1.00, p = 0.94), thus no correction was applied to the results. The main effect of time was not statistically significant (F = 0.07, p = 0.93), with a partial $\eta^2$ = 0.00, suggesting that different time points had no significant effect on amotivation. Likewise, the between-group main effect was non-significant (F = 0.28, p = 0.60), with a partial $\eta^2$ = 0.01, indicating no significant difference between the experimental and control groups. Furthermore, the time × group interaction effect was also non-significant (F = 0.00, p =1.00), with a partial $\eta^2$ = 0.00, demonstrating that the effect of time on amotivation did not differ significantly between the experimental and control groups.

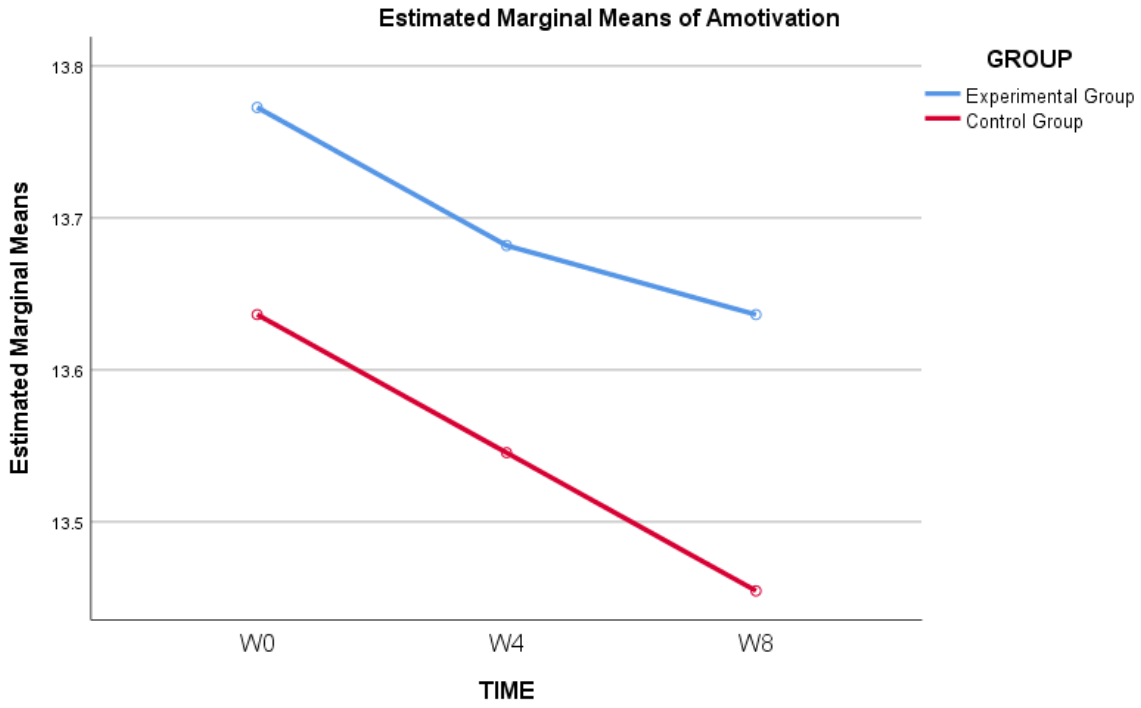


Figure 5Outline of marginal mean value for to amotiation estimation

Table 26 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(extrinstic motivation - external regulation) (n=44)

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 0.92 | 2 | 0.46 | 0.08 | 0.92 | 0.00 |
| group | 6.37 | 1 | 6.37 | 1.71 | 0.20 | 0.03 |
| time* group | 0.02 | 2 | 0.01 | 0.00 | 1.00 | 0.00 |
| Error | 463.73 | 84 | 5.52 | | | |
| Mauchly's W=0.97 X2=1.28 df=2 p=0.53 | | | | | | |

* p < .05.

The results of Mauchly's test of sphericity indicated that the assumption of sphericity was met (W = 0.97, p = 0.53), thus no correction was applied to the results. The main effect of time was not statistically significant (F = 0.08, p = 0.92, partial $\eta^2$ =

0.00), suggesting no significant differences in external regulation of extrinsic motivation across different time points. Similarly, the main effect of group was non-significant (F = 1.71, p = 0.20, partial $\eta^2$ = 0.03), indicating no significant differences between the experimental and control groups. Furthermore, the time × group interaction effect was also non-significant (F = 0.00, p = 1.00, partial $\eta^2$ = 0.00), demonstrating that the effect of time on the external regulation dimension of extrinsic motivation did not differ significantly between the experimental and control groups.

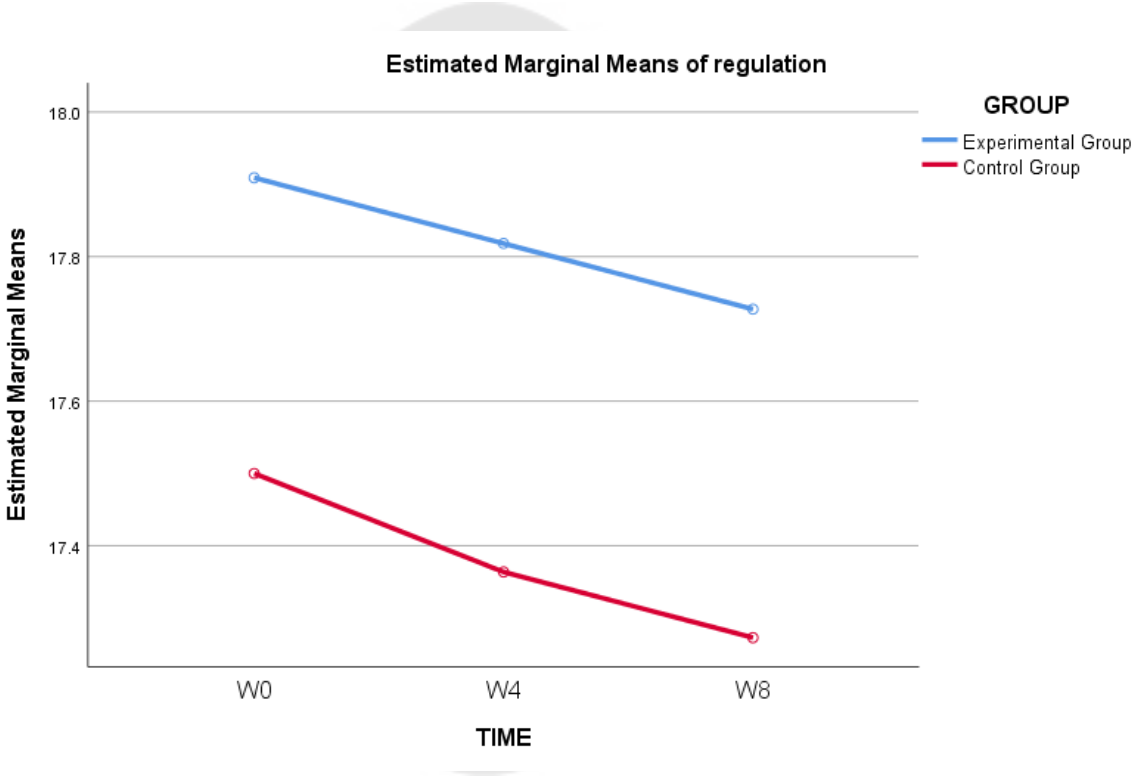


Figure 6 Outline of marginal mean value for external regulation estimation

Table 27 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(extrinstic motivation - introjected) (n=44)

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 0.56 | 2 | 0.28 | 0.07 | 0.94 | 0.00 |
| group | 2.46 | 1 | 2.46 | 1.07 | 0.31 | 0.00 |
| time* group | 0.05 | 2 | 0.02 | 0.01 | 0.10 | 0.00 |
| Error | 362.73 | 84 | 4.32 | | | |
| Mauchly's W=0.90 X2=4.55 df=2 p=0.10 | | | | | | |

* $p < .05$.

The results of Mauchly's test of sphericity indicated that the assumption of sphericity was met ($W = 0.90$, $p = 0.10$), thus no correction was applied to the results.

The main effect of time was not statistically significant ($F = 0.07$, $p = 0.94$, partial $\eta^2 = 0.00$), suggesting no significant differences in externalization across different time points. Similarly, the main effect of group was non-significant ($F = 1.07$, $p = 0.31$, partial $\eta^2 = 0.00$), indicating no significant differences between the experimental and control groups.

Furthermore, the time × group interaction effect was also non-significant ($F = 0.01$, $p = 0.10$, partial $\eta^2 = 0.00$), demonstrating that the effect of time on the assimilative motivation dimension of introjected did not differ significantly between the experimental and control groups.

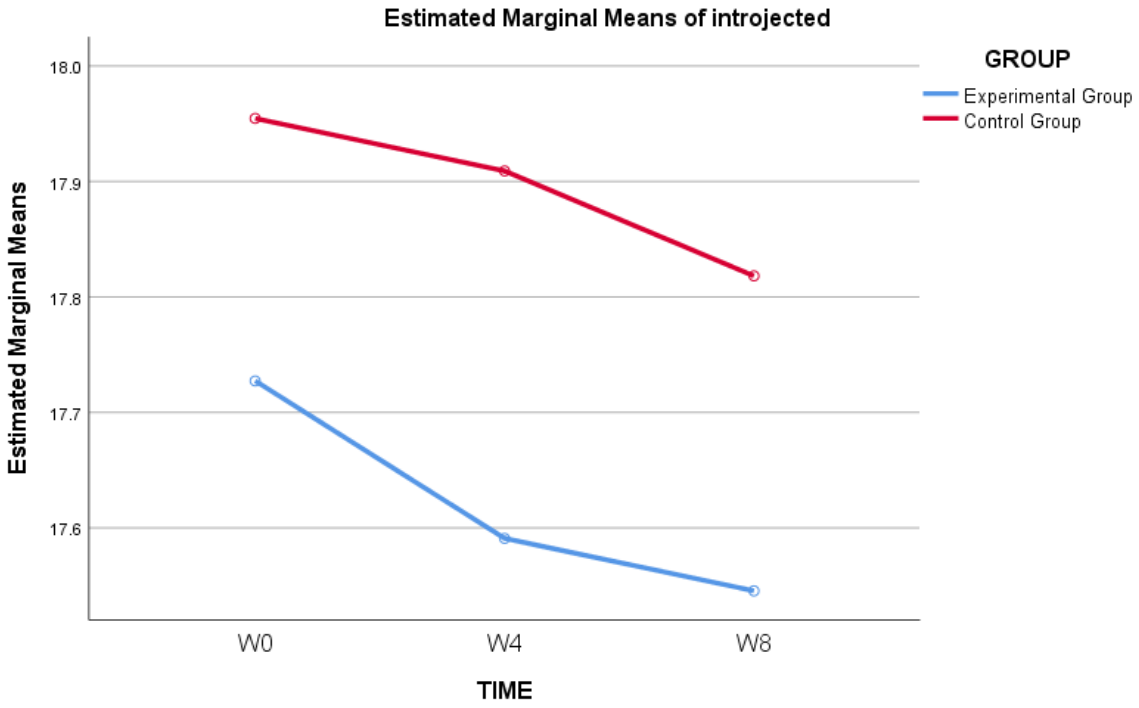


Figure 7Outline of marginal mean value for introjected estimation

Table 28 Significant results of intra-subject effects of pretest, post-test, and follow-up related factors in the experimental group and control group(extrinsic motivation - identified

| Variable | SS | df | MS | F | P-value | partial $\eta^2$ |
|---|---|---|---|---|---|---|
| time | 0.56 | 2 | 0.28 | 0.08 | 0.92 | 0.00 |
| group | 0.49 | 1 | 0.49 | 0.13 | 0.72 | |
| time* group | 0.11 | 2 | 0.05 | 0.02 | 0.99 | 0.00 |
| Error | 294 | 84 | 3.50 | | | |
| Mauchly's W=0.971 X2=1.196 df=2 p=0.550 | | | | | | |

* p < .05.

The results of Mauchly's test of sphericity indicated that the assumption of sphericity was met (W = 0.97, p = 0.55), thus no correction was applied to the results.

The main effect of time was not statistically significant (F = 0.08, p = 0.92), with a partial $\eta^2$ = 0.00, suggesting no significant differences across different time points in external recognition.

Similarly, the between-group main effect was non-significant (F = 0.13, p = 0.72), with a partial $\eta^2$ = 0.00, indicating no significant differences between the experimental and control groups.

Furthermore, the time × group interaction effect was also non-significant (F = 0.02, p = 0.99), with a partial $\eta^2$ = 0.00, implying that the influence of time on the extrinsic motivation dimension of identified motivation did not differ significantly between the experimental and control groups.

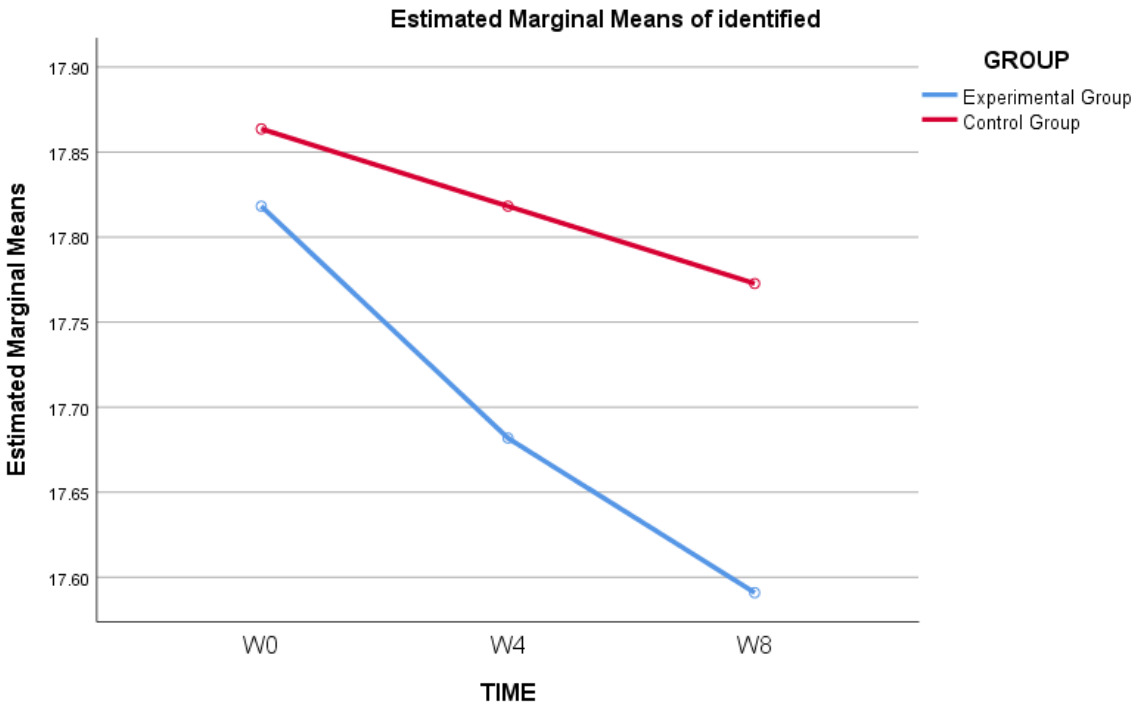


Figure 8 Outline of marginal mean value for identified estimation

# CHAPTER 5

## Summary of the discussion suggestions

The research topic, " the effect of mindfulness on the motivation of middle school students to exercise." consisted of 2 studys. study 1 was to explore the intrinsic motivation, extrinstic motivation, and amotivation for sports participation among middle school students . Study 2 was to examines the differential changes in motor motivation between the experimental and control groups following mindfulness intervention.The sample of 212 students in the third grade of the First Middle School in Anshun City, Guizhou Province, China was used in this study. Data collection was conducted through the use of measurement scales. Scales that exhibited a consistent response pattern or showed signs of insincere answering were excluded from the final analysis, resulting in a valid sample size of 212 participants.

Prior to data collection, ethical clearance was obtained from Srinakharinwirot University under the approval number SWUEC-672610. Following this, official permission letters were acquired from the Social Science and Behavioral Science Research Sub-Committee of the same university. With all necessary approvals secured, the researchers proceeded to gather the data independently.

The research tool utilized in this study comprised two main sections: (1) respondent information, including sociodemographic and background details, and (2) a scale measuring sport motivation.

In summary, the findings of the study are presented as follows:

1.Summary

2.Discussion

3.Suggestion

## Summary

### study1

#### 5.1 comparison intrinsic motivations between different genders.

The Sports motivation scale was used to measure the scores of each index of intrinsic motivation of middle school students. As can be seen from the table, among all the index scores, the indexes of to known, accomplish and experience stimulate of males were 20.48, 20.72 and 20.48, respectively, and those of females were 18.47, 18.26 and 19.31, respectively, indicating that the levels of each index of males' intrinsic motivation were higher than those of female. As can be seen from the legend, the distribution of these three indicators is basically uniform, indicating that the development of each indicator of intrinsic motivation of middle school students in Anshun City is relatively balanced. Independent sample t test was used to analyze the data and compare the three indicators of intrinsic motivation. The results showed that the p values of both male and female in to known, accomplish and experience stimulate were less than 0.05, that is, there was a significant difference in intrinsic motivation between males and females.

#### 5.2 Compare the extrinstic motivation between different genders.

Male students had the highest values of introjected (20.84), identified (20.69) and external regulation (18.11). The lowest values of the above three indicators appeared in female students, which were internalization (19.91), identification (20.03) and external regulation (16.74). It shows that the level of external motivation of male junior high school students is higher than that of female students.

The data were analyzed by independent sample t test, and the three indicators of exttinstic motivation were compared. The results showed that the p values of introfected, identified and external regulatory between males and females were all less than 0.05, so there was a significant difference in external motivation between male students and female students

#### 5.3 Comparison of amotivation between different genders.

Males students (13,75) and female students (12.98) scored on each index of amotivated.The data were analyzed by independent sample t test, and the

results of the comparison of the indicators of amotivation showed that the p value of amotivation between male students and female students was greater than 0.05, so there was no significant difference between male students and female students .

Study2

**5.4 Compare the differences in extrinstic motivation and amotivation between the experimental group and the control group at W0, W4, and W8.**

The results of the dimension of amotivation showed that the main effect of time was not significant ($p = 0.93$), partial $\eta^2 = 0.00$, indicating that different time points had no significant effect on amotivation. The main effect between groups was also not significant ($p = 0.60$) with partial $\eta^2 = 0.01$, indicating no significant difference between the experimental and control groups. In addition, the interaction between time and group was also not significant ($p = 1.00$), partial $\eta^2 = 0.00$, indicating that the effect of time on amotivation was not significantly different between the experimental group and the control group.

The main effect of time in external regulation dimension was not significant ($p = 0.92$), partial $\eta^2 = 0.00$, indicating that different time points had no significant effect on extrinstic motivation-external regulation. The main effect between groups was also not significant ($p = 0.20$), partial $\eta^2 = 0.03$, indicating that there was no significant difference between the experimental and control groups. In addition, the interaction between time and group was also not significant ($p = 1.00$), partial $\eta^2 = 0.00$, indicating that there was no significant difference in the effect of time on external regulation between the experimental group and the control group.

The main effect of introjected dimension time of introjected was not significant ($p = 0.94$), partial $\eta^2 = 0.00$, indicating that there was no significant effect of externalization at different time points. The main effect between groups was also not significant ($p = 0.31$), with partial $\eta^2 = 0.00$, indicating no significant difference between the experimental and control groups. In addition, the interaction between time and group was also not significant ($p = 1.00$), partial $\eta^2 = 0.00$, indicating that there was no

significant difference in the effect of time introjected dimension between the experimental group and the control group.

The main effect of time of identified dimension was not significant (p = 0.92), partial $\eta^2$ = 0.00, indicating that there was no significant effect of external regulation at different time points. The main effect between groups was also not significant (p = 0.72) with partial $\eta^2$ = 0.00, indicating that there was no significant difference between the experimental and control groups. In addition, the interaction between time and group was also not significant (p = 0.985), partial $\eta^2$ = 0.00, indicating that there was no significant difference in the effect of time identified dimension between the experimental group and the control group.

**5.5 Compare the significant differences in intrinsic motivation between the experimental group and the control group at W0, W4 and W8.**

In terms of experience stimulate, based on period paired comparisons, the experimental group showed significant improvements in W0-W4 (M.D.=-1.86, p=0.00) andW4-W8 (M.D.=-1.59, p=0.00). The results indicated that following an eight-week mindfulness intervention, there was a significant improvement in the experience stimulate dimension of intrinsic motivation.

Regarding to know, the experimental group demonstrated significant increases in W0-W4 (M.D.=--3.73, p=0.03) and W4-W8(M.D.=--1.91, p=0.01). This suggests that to know improved significantly after mindfulness intervention.

Turning to accomplish, the experimental group significant inductions in W0-W4 (M.D.=--2.18, p=0.01) and W4-W8(M.D.=--1.46, p=0.02).This implies that to accomplish levels increased significantly after mindfulness intervention.

In conclusion, during the fourth and eighth weeks, the experimental group demonstrated substantial improvements in experiential stimulation, epistemic pursuit, and achievement. These findings indicate that participation in the mindfulness training program significantly strengthened intrinsic motivation. Nevertheless, when compared with the control group, the experimental group did not exhibit significant differences in extrinsic motivation (including external regulation, introjection, and

identification) and amotivation. This outcome suggests that the mindfulness intervention primarily exerted a positive influence on intrinsic motivation within the realm of sports motivation, while having limited effects on extrinsic motivation and amotivation.

## Discussion

### Study1

Middle school is a critical period for the formation of students' worldview, outlook on life, and values. With the development of cognitive abilities, middle school students gradually acquire independent thinking and moral judgment skills. Meanwhile, as they undergo physical and psychological maturation, their interest in sports and attitudes toward participation undergo noticeable changes. Notably, significant individual differences emerge in students' preferences for sports activities, influenced primarily by factors such as age, gender, physical fitness, and proficiency in motor skills. These factors not only directly affect students' sports participation behaviors but also profoundly shape their emotional experiences and intrinsic motivation in physical activities. Thus, individual differences serve as a core determinant of internal drive in midde school students' sports engagemen.

In the realm of academic research, it has been observed that a segment of students exhibit relatively low levels of participation motivation and sports efficacy during physical activities. The underlying factors contributing to this phenomenon are multifaceted. Primarily, these students lack a genuine interest in sports, perceive their own sports capabilities as inadequate through self - assessment, possess a relatively weak physical constitution, and have limited access to regular exercise opportunities.

As a consequence, these students tend to develop a negative self - perception, perpetually remaining in a state of low sports efficacy. Additionally, a certain subset of students demonstrates selective sports efficacy. They display a high degree of self - confidence in sports events where they excel, while adopting a negative stance towards those in which they struggle. Moreover, this cognitive pattern has proven to be rather stable over time.

Of particular significance is the fact that the diminishing interest in sports among some students is closely intertwined with the teaching approaches employed. When the learning process places excessive emphasis on external control mechanisms, fails to provide sufficient room for autonomous decision - making, and neglects to create opportunities for collaborative learning and interpersonal interaction, it undermines students' subjective experiences. This, in turn, can readily lead to a natural ebb in their enthusiasm for sports(Yu & Houcheng, 2011).

Gender Differences in Sports Participation Motivation Among Middle School Students and Influencing Factors Analysis.

Gender Differences in Sports Participation Motivation:Empirical data reveal significant gender disparities in adolescents' sports participation motivation. Male students demonstrate higher levels of both intrinsic motivation (e.g., interest, enjoyment) and extrinstic motivation (e.g., rewards, recognition) compared to their female counterparts. Behavioral observations indicate that male students predominantly engage in dynamic physical activities (e.g., basketball, running) during leisure time, whereas female students show a preference for sedentary social interactions (e.g., chatting, handicrafts). This divergence stems from two primary dimensions:

Psychological Dimension: Male students generally exhibit greater activity-oriented tendencies, perceiving sports as a platform for socialization and self-expression. In contrast, female students favor low-intensity recreational activities with stronger entertainment value.

Physiological Dimension: males students experience peak physical growth periods where exercise needs align with developmental requirements. Conversely, female students' periodic avoidance behaviors due to menstrual cycles may lead to a gradual decline in sports interest over time.

Individual Differences in Epistemic Motivation:Epistemic motivation in sports participation manifests as curiosity and skill exploration, directly determining engagement sustainability. According to Self-Determination Theory, when students

internalize sports participation as interest-driven, it establishes a virtuous cycle of "interest-engagement-achievement-reinforcement":

High epistemic motivation: Proactive training and competitive participation, with performance feedback enhancing motivation.

Low epistemic motivation: Cognitive bias of "sports futility" leading to participation avoidance

Gender comparisons reveal significantly stronger epistemic motivation in male students ($p<0.05$), correlating with traditional gender-role socialization effects on sports preferences.

Cognitive Biases Under Exam-Oriented Education:The current educational evaluation system has induced systematic cognitive distortions regarding sports value.

Instrumentalization: Reducing physical education to exam utility while neglecting health promotion functions.

Academic Bias: The misconception that "only academic subjects constitute real learning," undervaluing motor skill acquisition.

Time Displacement Effect: Even when facing PE entrance exams, ninth graders perceive exercise as "encroaching on academic study time".

This cognitive bias fundamentally reflects the structural conflict between "physical health" and "academic achievement" in adolescent development objectives, necessitating dual interventions through educational reform and health literacy cultivation.

**Study2**

Mindfulness, in the field of psychology, is defined as a mental state characterized by a non-judgmental and non-reactive attitude towards the present experience (Brown & Ryan, 2003; Kabat-Zinn, 1990). This concept is theoretically related to "savoring", which specifically refers to the process of an individual's attention, appreciation and enhancement of current positive experiences (Bryant & Smith, 2015).

From the perspective of individual differences, the academic community further distinguishes mindfulness into:

Trait mindfulness: As a relatively stable personality trait.

State mindfulness: a psychological state that can be enhanced through systematic training (Brown & Ryan, 2003; Kiken, Garland, Bluth, Palsson, & Gaylord, 2015).

Empirical research indicates that mindfulness training can significantly enhance an individual's meta-awareness, enabling practitioners to observe their internal experiences (such as emotions and feelings) more clearly, thereby strengthening autonomous motivation in daily life. Ryan and Deci (Richard M Ryan & Deci, 2017b) provide an authoritative explanation within the framework of their Self-Determination Theory: "Mindfulness is conceptualized as the open and accepting awareness of one's current experience of self and environment. This awareness not only promotes the development of psychological autonomy but also facilitates the functional integration of the self-regulatory system" (Isbel, Lagopoulos, Hermens, & Summers, 2019).

The concept of sport motivation serves as the psychological driving force behind an individual's participation in physical activities, fulfilling a dual function: it acts both as a decision-making criterion for selecting sports and as an intrinsic motivational mechanism that sustains long-term engagement in exercise. Exercise behaviors driven by motivation can satisfy individuals' multi-level needs, ranging from physiological requirements to self-actualization (Richard M Ryan & Deci, 2017b).

Chinese sports psychology expert Zhu Beili defines exercise motivation as "a psychological impetus stemming from the need for movement, with its core function being to stimulate and maintain individuals' engagement in physical training." This definition emphasizes the dual role of motivation in initiating and sustaining sports participation, resonating with Deci and Ryan's (1985) theory of basic psychological needs.

Currently, the classification system for exercise motivation primarily adopts a dimensional framework based on sources, with a tripartite model widely recognized within academia:

1. Intrinsic Motivation: Driven by the enjoyment and satisfaction derived from the activity itself.

2. Extrinsic Motivation: Influenced by external factors such as rewards or recognition.

3. Amotivation: A state characterized by a lack of behavioral intention.

This classification aligns closely with the continuum model of motivation proposed by Self-Determination Theory, providing theoretical tools for understanding different types of sport participation behaviors.

Self-Determination Theory (SDT) underscores the pivotal role of mindfulness in cultivating autonomous motivation(Richard M Ryan & Deci, 2017a). This form of motivation is characterized by a sense of volition and self-endorsement, reflecting an individual's genuine recognition and acceptance of their behaviors(Levesque & Brown, 2007).

Within this theoretical framework, mindfulness facilitates the internalization of motivation through a dual pathway:

Enhanced Internal Awareness: Improving metacognitive monitoring of internal psychological phenomena such as impulses, emotions, and fundamental psychological needs.

External Awareness Optimization: Enhancing adaptive assessment of external environmental cues including temptations, goal conflicts, and stressors.

It is essential to emphasize that mindfulness does not directly generate motivation; rather, it establishes psychological conditions conducive to non-defensive awareness. This enables individuals to make more profound reflective choices. It promotes the identification of behaviors that resonate with one's authentic self. Additionally, it mitigates the interference caused by automatic responses on decision-making processes.This mechanism aligns closely with the Basic Psychological Needs Theory (BPNT) proposed by SDT: Mindfulness provides the necessary psychological space for the internalization process of motivation by satisfying the need for autonomy (Deci et al., 2017).

Mindfulness training can be viewed as an "enabling tool" for fostering autonomous motivation. Its significance lies not in directly instigating behavioral changes but rather in:Breaking cognitive deadlocks associated with experiential avoidance,Strengthening the foundational awareness required for self-determined behavior,Facilitating the transition from external regulation to integrated regulation.

Ryan et al(Richard M. Ryan, Donald, & Bradshaw, 2021) the self-determination theory proposed a continuum of motivation, ranging from low autonomy (e.g., no motivation, external regulation) to high autonomy (e.g., identification regulation, intrinsic motivation). Mindfulness is more closely related to motivation with high autonomy, as it promotes the integration of the individual's internal interests and values. At the same time mindfulness makes individuals more likely to make self-consistent decisions by reducing their reliance on automatic responses, defenses, and clinging. The relationship between mindfulness and motivation has been supported across multiple domains (e.g., mental health, exercise performance). However, the meta-analysis published found a (Li et al., 2023)consistent positive relationship between mindfulness and motivation, especially in terms of the improvement of intrinsic motivation. The promotion effect of mindfulness intervention on motivation was small but significant. Research has proved that mindfulness can enhance athletes' intrinsic motivation(Amemiya & Sakairi, 2019) .

Savannah et al(Neace, Hicks, DeCaro, & Salmon, 2022) explored the unique contributions of Trait Mindfulness and Intrinsic Exercise Motivation to Exercise Self-Efficacy in college students.Conventional wisdom emphasizes the long-term health benefits of exercise on exercise motivation, but these extrinsic motivators seem insufficient to motivate college students to engage in exercise. Researchers have proposed that mindfulness, as a kind of present awareness ability, may be related to exercise motivation and self-efficacy.

According to the results of this study, mindfulness can enhance internal motivation in sports motivation of middle school students. The study also found that among middle school students, the method was also effective in enhancing their internal

motivation. This suggests that mindfulness, as a positive psychology approach, may not only facilitate the development of learning in the field of education, but also has potential in physical training, especially when combined with physical education.

**Suggestion**

**1.Recommendations for Educational Practice**

**1.1 Integrating Mindfulness Training into School Physical Education Curriculum**

Research findings indicate that mindfulness training can significantly enhance the exercise motivation of middle school students (including intrinsic and extrinsic motivation). It is recommended that schools incorporate mindfulness practices (such as breathing exercises, body scans, and mindful walking) into physical education classes or extracurricular activities to foster students' interest in sports and their persistence in participation.

Mindfulness exercises can be designed as brief 5-10 minute sessions during warm-up or relaxation periods in physical education classes to help students improve focus and reduce exercise-related anxiety.

**1.2 Strengthening Professional Training for Physical Education Teachers**

It is advisable for educational authorities or schools to organize mindfulness teaching training for physical education teachers, enabling them to master basic mindfulness facilitation techniques for effective application in sports instruction.

Inviting psychological experts or mindfulness coaches to conduct workshops at schools could assist teachers in integrating mindfulness with athletic training.

**1.3 Addressing Differential Interventions Among Various Groups**

If research reveals differing responses to mindfulness among students based on gender, grade level, or athletic ability, it may be beneficial to:

Design more targeted mindfulness intervention programs specifically for female students or those with low exercise motivation. Enhance mindfulness training

during early adolescence (the onset of puberty) to promote the development of consistent exercise habits.

**2. Recommendations for Families and Society**

**2.1 Parental Involvement in Mindful Exercise Promotion Programs**

Encouraging parents to engage in mindful exercises alongside their children (such as yoga and mindful running) can create a family-oriented atmosphere conducive to enhancing children's motivation toward physical activity.Schools could utilize parent-teacher meetings or online courses to educate parents about the positive impact of mindfulness on sports psychology.

**2.2 Support from Community and Sports Organizations**

It is suggested that community sports centers and youth sports clubs integrate elements of mindfulness into their training programs, assisting young athletes in improving psychological resilience while reducing burnout associated with sport participation.The development of an app combining "mindfulness + exercise" features or online courses would facilitate daily practice opportunities for students.

**3. Recommendations for Future Research**

**3.1 Expanding Sample Scope to Enhance Representativeness**

This study may have limitations related to sample size or regional distribution; future research should consider conducting large-scale surveys across multiple regions and schools to increase the generalizability of results.

**3.2 Employing Longitudinal Tracking Studies**

Current research may rely on cross-sectional data; future studies should adopt long-term tracking experiments (e.g., 3-6 months of mindfulness interventions), observing the sustained effects of mindfulness on sports motivation over time.

**3.3 Exploring Underlying Mechanisms by Which Mindfulness Influences Exercise Motivation**

Further investigation into mediating variables (such as psychological resilience and self-efficacy beliefs), along with moderating factors (like personality traits and social support), will provide deeper insights into how mindfulness affects exercise motivation.

### 3.4Incorporating Neuroscience or Physiological Indicators

Future studies could integrate physiological measures such as EEG (electroencephalography), HRV (heart rate variability), etc., exploring the direct impacts of mindfulness training on brain function and bodily responses.

## Research limitations

This study did not conduct follow-up due to time limitation, which makes it difficult to understand the sustained effects of exercise motivation of mindfulness.This study did not conduct the detection of cranial nerves, so it is difficult to understand the effect of mindfulness on brain structure and function. Related research can be continued in the future.

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