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Cultural Orientations and Self-Control in Chinese Samples

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1 General Introduction

In order to pursue our own goals but also in order to adhere to others' expectation we need to regulate or control ourselves. College students want to achieve academic excellence, but need to develop a detailed study plan, or athletes who want to achieve better sports performance, need to control their eating habits to maintain optimal physical condition. Self-control positively affects individuals' success, health, and well-being in daily life (Baumeister et al., 2007; Tangney et al., 2004). Successful self-control is typically associated with excellent academic performance, high levels of athletic performance, happiness, and good interpersonal relationships (De Ridder et al., 2012; Liang et al., 2022; Tangney et al., 2004). In contrast, self-control failure leads to numerous personal and social problems such as mental health problems, smartphone addiction, criminal behavior, and drug use (Conner et al., 2009; Kim et al., 2018; Kim et al., 2022). Therefore, self-control has broad and lasting effects on individuals. How can self-control be enhanced and promoted? What factors influence self-control? These questions have garnered the interest of researchers. Individual self-control is influenced by many factors, such as genetic, psychological and environmental factors (Boisvert et al., 2013; Vazsonyi & Belliston, 2007; Willems et al., 2018). Bronfenbrenner (Bronfenbrenner, 1979) has introduced ecological systems theory that highlights the different layers of systems affecting individual development ranging from microsystem (e.g. genetic factors) to mesosystem (e.g. family, school, and peer factors) to ecosystem (e.g. environmental factors) to macrosystem (e.g.

cultural factors). Based on Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979), researchers have explored the influences of cultural orientation on self-control in different populations (Kacen & Lee, 2002; Li et al., 2018; Pokhrel et al., 2018; Rubin et al., 2006). Cross-national comparisons of individual self-control revealed mixed results (Delvecchio et al., 2015; Li et al., 2015; Li et al., 2018; Pokhrel et al., 2018). In this dissertation I will look a “dimension” of culture, the cultural orientation of individualism-collectivism and investigate its relation with self-control, I conduct three studies: In study 1, I use A systematic review and meta-analysis to explore the relationship between individualism-collectivism and self-control. In study 2, I prepare for a larger study to collect own data and first evaluated the Psychological Collectivism Questionnaire (PCQ). In study 3, I compare the relationship between psychological collectivism and trait self-control using different Chinese samples. Culture is an important factor influencing individual cognition, emotion, and motivation (Markus & Kitayama, 1991; Triandis & Suh, 2002). Individualism-collectivism is among the main dimensions of culture (Geert Hofstede, 1980; Markus & Kitayama, 1991) and is often used in the study of cultural and individual psychological functioning (Oyserman, Coon, et al., 2002).Collectivism is the dominant cultural orientation in the East, which emphasizes the relationship between the self and others (interdependent self-construal) and puts the interests of the group above those of the individual; in contrast, individualism is the dominant cultural orientation in the West, which emphasizes the separation of the self from

others (independent self-construal), and puts the interests of the individual above those of the group (Markus & Kitayama, 1991). First, I review self-control and cultural orientations (self-construal, individualism-collectivism, and psychological collectivism) and their measurements as well as theories. Then, based on the gaps in the literature, I propose the aim and research questions of this study. Second, in the Part 2 section, I describe in detail a review and two empirical studies. Finally, In the Part 3 section, three studies are generally discussed. Implications, limitations, future research, and conclusions are presented.

2 Literature Review

2.1 Self-control

In this section, I describe the four parts of self-control, such as the definition of self-control, different types of self-control, theories of self-control, and measures of self-control.

2.1.1 Definition of self-control

Self-control is the ability of an individual to restrain impulses, desires, and habitual reactions such that their behavior conforms to social norms and long-term goals are achieved (Baumeister et al., 2007). Some researchers have defined self-control as the reaction of consciously altering or suppressing one's strengths in order to regulate one's thoughts, feelings, and behaviors in order to conform to personally set goals and standards (De Ridder et al., 2012; Duckworth & Kern, 2011). As an important psychological function in human development, self-control is particularly important for maintaining good health, achieving success and happiness, and enhancing environmental adaptability (Galla & Duckworth, 2015; Tangney et al., 2004). Self-control has become a topic of interest in various fields of research such as personality studies, social psychology, cultural psychology, and sports science (Li et al., 2018; Liang et al., 2022; Vohs & Baumeister, 2004). Previous research has found that individuals with low self-control often exhibit psychosocial problems such as depression (Özdemir et al., 2014), obesity (Adriaanse et al., 2014), impulse buying

(Vohs & Faber, 2007), substance abuse (Baumeister & Vonasch, 2015), and aggression (Achterberg et al., 2016). In contrast, individuals with higher self-control show better ability to regulate their emotions, and suppress irrational impulses (De Ridder et al., 2012). Empirical research also supports the idea that individuals with high self-control typically exhibit better behaviors, such as superior academic performance (Tangney et al., 2004), healthy eating habits (Hankonen et al., 2014; Privitera et al., 2015), better athletic performance (Liang et al., 2022), and fewer behavioral problems (e.g., aggression and impulse buying)(Denson et al., 2012; Sultan et al., 2012), and are more effective in resolving psychological conflicts (Balliet et al., 2011; Gailliot et al., 2006). This indicates that self-control in daily life positively affects mental health and long-term development. In this study, self-control is defined as a relatively stable personality trait, specifically the ability to control the temptations of impulsivity and restraint.

2.1.2 Self-control theory

Theories of self-control are the strength model of self-control (Baumeister et al., 2007), the hot/cool-system model (Metcalfe & Mischel, 1999), the dual system mode (Hofmann et al., 2009), and the two-stage model (Myrseth & Fishbach, 2009). The strength model of self-control suggests that the execution of self-control consumes a limited amount of mental energy (Baumeister et al., 2007). When individuals perform self-control tasks, their original resources and energy are gradually reduced,

decreasing self-control and leading to ego depletion (Baumeister et al., 2007). Previous studies have found that ego depletion can have a negative impact on individuals, such as behaving less prosaically (Osgood & Muraven, 2015), being more violent (Finkel et al., 2009), and promoting unethical behavior (Gino et al., 2011). The depletion of resources and energy is short-lived and can be restored by rest or glucose supplementation (Gailliot, Baumeister, et al., 2007). The hot/cool-system model assumes that self-control is executed by both the hot and cool systems (Metcalfe & Mischel, 1999). Specifically, the hot system requires individuals to engage in impulsive behaviors to achieve their desires, and is responsible for the processing of information during cognitive control that leads individuals to make sound decisions that are consistent with long-term goals (Casey et al., 2011). The dual-systems model introduced by Hofmann et al. (Hofmann et al., 2009) proposed a dual-system model, which suggests that self-control consists of an impulsive system and a reflective system. The impulsive system is more sensitive to individual emotional situations, requires less planning and regulation, and is less influenced by the self-regulatory load; the reflective system suggests that individuals tend to be more deliberate, slow, and dependent on cognitive resources, information processing, and regulatory control (Hofmann et al., 2009; Strack & Deutsch, 2004). Myrseth and Fishbach (Myrseth & Fishbach, 2009) proposed the two-stage model based on individual self-control conflict, which mainly consists of identifying problems in the self-control conflict stage and resolving problems in the self-control conflict stage. When individuals face

many temptations in the pursuit of long-term goals, the accurate identification of self-control conflicts and the adoption of effective self-control strategies to resist temptations will enter the self-control conflict resolution stage, and if indulged in temptation, will lead to self-control failure (Myrseth & Fishbach, 2009). Prior empirical studies have shown that practicing self-control individuals exhibit better self-control (Gailliot, Plant, et al., 2007; Oaten & Cheng, 2006a, 2006b).

2.1.3 Trait and state self-control

Self-control is usually categorized into two types , such as trait self-control and state self-control (De Ridder et al., 2012; Tangney et al., 2004). Different researchers have different criteria for distinguishing states and traits (Fridhandler, 1986; Hamaker et al., 2007). The criterion based on temporal duration is best known in psychology, which considers states to be of short duration, and traits to be highly stable conditions, even life-long (Cattell, 1966). Trait self-control is a relatively stable personality trait that is relatively consistent across time and contexts, reflecting differences in self-control across individuals (Tangney et al., 2004). Individuals with high trait self-control are generally better able to overcome their inherent, instinctive tendency to respond to tempting situations and avoid environmental and informational cues that trigger instinctual impulses (Ent et al., 2015).

Previous research has found that high trait self-control is associated with positive outcomes, such as greater well-being and life satisfaction (De Ridder & Gillebaart,

2017; Hofmann et al., 2014), a healthier lifestyle (Wills et al., 2007), effectively resolving psychological conflicts (Balliet et al., 2011; Gailliot et al., 2006), and making rational dietary decisions (Haws & Redden, 2013). Conversely, some studies found that low trait self-control is associated with personal and social problems, including obesity (Tsukayama et al., 2010), academic failure, and underachievement (Duckworth & Seligman, 2005). State self-control is a transient behavioral manifestation of the individual, which makes them more susceptible to environmental, temporal, and emotional factors such as the ego-depletion effect (Ackerman et al., 2009). Previous research has shown that there are numerous factors affecting state self-control, such as positive mood (Tice et al., 2007), motivation (Ampel et al., 2016), pressure (Englert & Bertrams, 2016), humility (Tong et al., 2016), and aerobic exercise (Zou et al., 2016).

2.1.4 Measurements of self-control

Measures of self-control mainly focus on questionnaires and behavioral tasks (Duckworth & Kern, 2011). Questionnaires assess an individual's level of attitudinal self-control. Previous studies have used other scales to measure individual self-control, please **see Table 1**.

Name of Scales	Authors and years	Items	Structure (factors)
Low Self-Control Scale	Grasmick et al., 1993	24	Unidimensional structure
Barratt's Impulsiveness Scale	Patton et al., 1995	30	1. Attention 2. Motor impulsiveness 3. Self-control 4. Cognitive complexity 5. Perseverance 6. Cognitive instability
Self-Control Scale	Tangney et al., 2004	36	1. Self-discipline 2. Deliberate/No impulsive action 3. Healthy habits 4. Work ethic 5. Reliability
Brief self-control scale	Tangney et al., 2004	13	1.Impulsivity 2. Self-discipline
Dispositional Self-Control Scale	Ein-Gar & Sagiv, 2014	17	1.Yielding doing right 2. Yielding not doing right 3. Overcoming doing right 4.Overcoming not doing right
Brief Multidimensional Self-Control Scale	Nilsen et al., 2020	8	1. Inhibition 2. Initiation

Table 1 Characteristics of self-control scales.

The one most commonly used is the Self-Control Scale developed by Tangney et al. (Tangney et al., 2004), which assesses an individual's failure of self-control over thoughts, emotions, and impulsive behaviors as well as regulating their own behavior and overcoming bad habits, namely, trait self-control. The Self-Control Scale was divided into 36 items for the full version and 13 items for the brief version, each item being rated on a 5-point scale ("1 = Not at all," "5 = Very much"), with higher individual ratings indicating higher levels of trait self-control. The Self-Control Scale has been widely used in Greece (Papanikolopoulos et al., 2022), Germany (Bertrams & Dickhäuser, 2009; Lindner et al., 2015), Italy (Mancinelli et al., 2021), France (Brevers et al., 2017), Turkey (Nebioglu et al., 2012), and China (Unger et al., 2016) and has been validated and used with athletes and college students, showing good psychometric properties (Liang et al., 2022; Wolff et al., 2019). Recently, Liang and

colleagues (Liang et al., 2022) developed the Chinese version of the 8-item Brief Self-Control Scale by translating and modifying the original version of the 13-item Brief Self-Control Scale to assess Chinese athletes and college students, such as “I have a hard time breaking bad habits ” and “Sometimes I can’t stop myself from doing something, even if I know it is wrong”. This scale has two dimensions, which are restraint and non-impulsivity. Restraint is disciplined control over responses and actions, and non-impulsivity is the tendency to be spontaneous (Maloney et al., 2012). The Chinese version of the 8-item Brief Self-Control Scale shows good psychometric properties in Chinese athletes and college students (Kuang et al., 2023; Liang et al., 2022).

Behavioral tasks measure an individual's level of self-control at the levels of cognitive control, emotional regulation, and behavioral inhibition. Common experimental cognitive control tasks include the Stroop (Egner & Hirsch, 2005; Stroop, 1992), Simon (Simon & Rudell, 1967; Zhao et al., 2010), flanker (Chen et al., 2009), Go/No-Go (Newman et al., 1985), and stop-signal tasks (Tian et al., 2012). For example, in the Stroop task, participants were asked to respond to the color of the stimulus (i.e., red, green, or blue) and press the corresponding button on the keyboard as quickly as possible within a set amount of time. Thus, participants need to inhibit the dominant response to the stimuli to respond correctly depending on the study. The Go/No-go task required participants to make both fast and accurate key press responses to the Go task stimulus and no response to the No-go task stimulus, and the response time to

the Go task stimulus and the rate of correctness to the No-go task stimulus were recorded as a measure of the individual's level of behavioral inhibition.

Questionnaires and behavioral tasks help researchers explore and understand individual self-control from multiple perspectives. A meta-analysis revealed little association between self-control questionnaires and behavioral tasks (Duckworth & Kern, 2011). Therefore, to better assess the structure of individual self-control, both self-control questionnaires and behavioral tasks should be considered (Duckworth & Kern, 2011). In addition, some researchers have suggested that self-report and behavioral measures of self-control cannot assess the same self-control (Allom et al., 2016).

2.2 Culture

According to Bronfenbrenner's ecological systems theory, different layers affect our development and should also affect the development of self-control. At an outer layer Bronfenbrenner's ecological systems theory identified "culture" as an important factor that influences cognition, emotion, and motivation (Markus & Kitayama, 1991; Triandis & Suh, 2002). In recent years, cultural influences on individual self-control have been a topic of interest to researchers (Li et al., 2018; Pokhrel et al., 2018; Zhao et al., 2021). First, I define self-construal, individualism-collectivism, and psychological collectivism. Then, measurements of self-construal, individualism-collectivism, and psychological collectivism are introduced in detail.

2.2.1 Definition of self-construal

Self-construal is how individuals view themselves in relation to others and society (Markus & Kitayama, 1991) and is divided into two categories: interdependent and independent. Markus and Kitayama (Markus & Kitayama, 1991) theory believes that different types of self-construal affect individual cognition, emotion, and motivation. Individuals with independent self-construal emphasize autonomy and uniqueness, whereas those with interdependent self-construal emphasize connections with others (Cross et al., 2011). Vignoles and colleagues (Vignoles et al., 2016) developed 7-dimensional to describe cultural differences in selfhood based on Markus and Kitayama's theory. Selfhood is both an important aspect of an individual and a main theme of psychology (Smith, 1978). Not only can Markus and Kitayama's (Markus & Kitayama, 1991) theory test more accurately global variation in cultural models of selfhood, but it also reminds researchers of the need to revisit the plausibility of the two dimensions of independence and interdependence of self-construals. This study uses the latest version of the measurement self-construal has been expanded from the original seven dimensions to eight dimensions (Krys et al., 2021; Yang, 2018).

2.2.2 Definition of individualism-collectivism and psychological collectivism

In this section, a detailed review of the previous literature is presented, the country-level and individual-level individualism-collectivism, as well as the multidimensional psychological collectivism. Individualism emphasizes the independent self-construal

of the individual, whereas collectivism places more emphasis on the interdependent self-construal of the individual (Markus & Kitayama, 1991). Hofstede (Hofstede, 2001, p. 225) described the bipolar dimension of individualism-collectivism as a key characteristic of cultures and societies: “a society is individualistic where individuals are loosely connected, and collectivistic is a society where individuals are united and cooperated.” Thus, a collectivistic society can be described as one in which individuals are integrated into strong and cohesive ingroups from birth. A collectivistic society continues to protect people throughout their lifetime in exchange for unconditional loyalty (Hofstede, 1991). Hofstede proposed that societies in different countries can be characterized by their extent of individualism and collectivism. For instance, the US is often perceived as a representative of an individualistic culture, whereas China is commonly deemed a classic example of a collectivistic culture. Scholars have researched and explored individualism-collectivism by approaching it from two angles: the individual level (Markus & Kitayama, 1991; Probst et al., 1999; Wagner, 1995) and the country level (Hofstede, 1980). Hofstede (Hofstede, 2001) believed that collectivism and individualism (as characteristics of society) are mutually opposing ends of the same cultural dimension. Hofstede and colleagues (Hofstede et al., 2005) developed a classification of individualism and collectivism by the level of individualism scores in different countries. For example, China has a lower individualism score, indicating a collectivist culture, whereas a higher score for individualism in the United States

indicates an individualistic culture. Country-level individualism-collectivism may change over time; for example, if a country's economic status increases, it has the potential to become individualistic (Santos et al., 2017). Advancing the understanding of individualism and collectivism, Triandis (Triandis, 2001) developed a model that treats individualism and collectivism as two dimensions at the individual level, and an individual may have both individualistic and collectivistic values. Based on the individual level, Triandis and Gelfand (Triandis & Gelfand, 1998) divided individualism-collectivism into vertical collectivism, vertical individualism, horizontal collectivism, and horizontal individualism. Horizontal individualism represents people's tendency to possess an independent self-concept to make independent decisions and value uniqueness, whereas vertical individualism emphasizes the significance of competition. Horizontal collectivism focuses on valuing social associations with equals, while vertical collectivism asserts social links with superiors, including parents (Schimmack et al., 2005).

Psychological collectivism introduced by Hui et al. in 1991(Hui et al., 1991), considered psychological collectivism as an attitude and behavior based on the belief that the smallest unit of existence is the collective rather than the individual (Hui et al., 1991). Psychological collectivism originates from the fact that sociocultural dimensions are more likely to change individual attitudes and behavioral patterns through interactions with other factors (Hui et al., 2003). To better assess the differences in individual collectivism, Jackson et al. (Jackson et al., 2006) developed a

multidimensional construct for assessing individual psychological collectivism. Individuals with high psychological collectivism enjoy helping team members and are willing to accept their help (Jackson et al., 2006). An empirical study also found that psychological collectivism significantly predicts team performance (Dierdorff et al., 2011; Jackson et al., 2006). In recent years, psychological collectivism has become a topic of interest for sports psychology researchers (Donkers et al., 2018; Partikova, 2019b) and is considered closely related to sports group cohesion and mental toughness (Gu & Xue, 2022; Partikova, 2019a).

2.2.3 Measurements of individualism–collectivism

The measurement of individualism-collectivism shows a diversity of approaches, usually differentiating individualism-collectivism at the country-level and individual-level. Prior studies have used different scales to measure individual individualism-collectivism, see **Table 2.**

Name of Measurements	Authors and years	Items	Structure (factors)
Country-level individualism-collectivism	Hofstede, 1980	Individualistic country (USA) and collectivistic country (China)	1.Individualism 2.Collectivism
The Horizontal and Vertical Individualism and Collectivism Scale	Triandis & Gelfand, 1998	16	1.Horizontal and vertical individualism 2.Horizontal and vertical collectivism
Psychological Collectivism Questionnaire	Jackson et al., 2006	15	1.Preference 2.Reliance 3.Concern 4.Norm acceptance 5.Goal priority
Self-Construal Scale Version 3	Krys et al., 2021; Yang, 2018	48	1.Difference versus Similarity 2. Self-Containment versus Connectedness to Others 3. Self-Direction versus Receptiveness to Influence 4.Self-Reliance versus Dependence on Others 5. Self-Expression versus Harmony 6. Self-Interest versus Commitment to Others 7. Consistency versus Variability 8. Decontextualized versus Contextualized Self

Table 2 Measurements of individualism-collectivism.

The Psychological Collectivism Questionnaire was developed by Jackson et al. in 2006 (Jackson et al., 2006) and contains 15 items divided across five facets, such as “I preferred to work in those groups rather than working alone” and “The health of those groups was important to me” . The Psychological Collectivism Questionnaire is a five-point Likert score (1=Strongly Disagree to 5=Strongly Agree), with higher scores indicating higher levels of psychological collectivism. The Psychological Collectivism Questionnaire has been widely cited in studies and has good reliability in

different samples (Dierdorff et al., 2011; Donkers et al., 2018; Gu & Xue, 2022). In this study, the Psychological Collectivism Questionnaire measured the psychological collectivism facets of Chinese samples.

2.3 Culture and self-control

First, factors influencing self-control are summarized. Then, I briefly introduce Bronfenbrenner's ecological systems theory. Finally, the findings on the relationship between cultural orientations and self-control in different countries and different samples are summarized.

2.3.1 Factors influencing self-control

The formation and development of individual self-control are influenced by many factors, and existing studies have mainly explored the factors influencing self-control through genetics, personality, and environmental factors (e.g., family and school). Genetic factors explain 30%–70% of the variance in individual self-control (Boisvert et al., 2013; Willems et al., 2020). Previous studies have found that serotonin transporter polymorphism (5-HTTLPR) is associated with low self-control and risky behavior (Kuhnen & Chiao, 2009; Pener-Tessler et al., 2013). Congdon and colleagues (Congdon et al., 2008) found that dopaminergic gene polymorphisms are associated with impulsivity and inhibitory control.

From the personality psychology perspective, conscientiousness and agreeableness

are important factors that influence individual self-control (Hoyle, 2006; Roberts et al., 2014; Stavrova & Kokkoris, 2019). Researchers found a high correlation between conscientiousness and self-control (Tangney et al., 2004; Werner et al., 2019). Sansone et al. suggested that individuals with high conscientiousness persist longer on specific tasks (Sansone et al., 1999). People high in conscientiousness are good self-discipline (Costa Jr et al., 1991). Individuals with high agreeableness are better able to control their impulsive behavior in interpersonal interactions and cope with interpersonal conflicts (Graziano et al., 1996). Individuals with higher levels of agreeableness performed better on the self-control tasks (Jensen-Campbell et al., 2002).

Environmental factors (Beaver, Ratchford, et al., 2009) play an important role in shaping and developing an individual's self-control, such as family factors (Vazsonyi & Belliston, 2007) and school factors (Willems et al., 2018). Parents can optimize their individual self-control by adopting positive parenting styles (Lewallen & Neece, 2015). A positive parent-child relationship is conducive to enhancing children's self-control (Lewallen & Neece, 2015). Abedini et al. (Abedini et al., 2012) found that parenting style affects the self-control of secondary school students. A longitudinal study found that classroom characteristics could influence self-control among kindergarten and first-grade students (Beaver et al., 2008).

2.3.2 Self-construal and self-control

The self-construal theory (Markus & Kitayama, 1991) suggests that culture can influence individual personality and behavior. Individuals with interdependent self-construal define themselves through group identity and social roles, desire a wide range of interpersonal relationships, and emphasize values that promote intra-group well-being; individuals with independent self-construal see themselves as separate from others and focus on individual autonomy and independence (Markus & Kitayama, 2010; Oyserman, Kemmelmeier, et al., 2002; Triandis et al., 1990). Furthermore, previous research has found that self-construal may affect an individual's self-control through other mechanisms (Steinmetz & Mussweiler, 2017). Specifically, self-construal may enhance self-control through the abstract versus concrete construal of temptations (Fujita et al., 2006; Lee et al., 2011). Steinmetz and colleagues experimentally found that interdependent self-construal significantly and positively predicted behavioral self-control, while independent self-construal did not (Steinmetz & Mussweiler, 2017). Several cross-sectional studies have performed correlational analyses on the strong relationship between self-construal and self-control (Tu et al., 2021), and found that interdependent self-construal was significantly and positively associated with self-control (Chen et al., 2022). These findings support the view that individuals with interdependent self-construal exhibit better self-control.

2.3.3 Individualism-collectivism and self-control

Findings of inconsistent results based on cross-cultural comparisons of self-control across samples. For example, American college students were found to have higher attitudinal self-control than Chinese college students and Chinese college students to have higher behavioral self-control than American college students (Li et al., 2018). Rubin and colleagues found that young children raised in Australia and Italy performed better on behavioral self-control than those raised in China and Korea (Rubin et al., 2006). Studies have found that Chinese adults are less sensitive to self-control over resource consumption (Seeley & Gardner, 2003) and have less impulse buying behavior compared to Americans (Kacen & Lee, 2002). In addition, an empirical study found that Italian adolescents had higher trait self-control scores than Polish and Chinese adolescents (Mancinelli et al., 2021). Delvecchio (Delvecchio et al., 2015) and colleagues also found that Chinese adolescents scored significantly higher on the self-control scale than Italian adolescents. However, some studies have found that Chinese adolescents have the same self-control ability as Italian adolescents (Li et al., 2015). Furthermore, several empirical studies supported by these theoretical considerations also confirm a negative relationship between individualism and self-control (Miconi et al., 2019; Pokhrel et al., 2018), and collectivism and self-control are significantly positively correlated (Kim et al., 2015; Li et al., 2018; Mooijman et al., 2018).

2.3.4 Bronfenbrenner's ecological systems theory

The ecological systems theory emphasizes that human psychological development is the result of the interaction between environmental and individual factors

(Bronfenbrenner, 2005). The theory proposes five systems (Bronfenbrenner, 1979) to explain the developmental process of an individual, such as microsystem, mesosystem, exosystem, macrosystem, and chronosystem. These systems interact with each other. Specifically, microsystem generally refers to an individual's immediate environment (e.g., family, school, and peers); mesosystems are made up of connections between immediate environments, such as an individual's family and school; exosystem refers to external environmental conditions that are indirectly influenced, such as media and neighbourhood; Macrosystem generally refers to different cultural contexts, such as values, social norms, cultural orientations, and religion. Chronosystem refers to environmental events and lifestyle changes over time.

Although empirical studies (Boisvert et al., 2013; Willems et al., 2020) have demonstrated that genetics, personality, and environmental factors influence the development of individual self-control. However, there is a relative lack of research on how cultural orientation affects individual self-control, which is why the topic is so important. Therefore, in order to better clarify the relationship between cultural orientation and self-control, this study will explore the issue based on Bronfenbrenner's ecological systems theory

2.4 The present study

First, empirical studies have found that the strength of the relationship between individualism-collectivism and self-control varies across studies and samples (Kim et al., 2015; Li et al., 2018; Miconi et al., 2019; Pokhrel et al., 2018). Second,

Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979) suggests that culture is an important factor affecting individual development and behavior. Morality and social norms serve as sources of guidance that impel people to act in a socially responsible manner (DeBono et al., 2011). This implies that morality and social norms work as sources of self-control for people (Baumeister et al., 2007; Buckholtz, 2015; DeBono et al., 2011). Kim and colleagues found that individuals from collectivism cultures were more willing to conform to social norms than individuals from individualism cultures (Kim et al., 1994). Collectivistic cultures, placing high demands on loyalty and conformity, are thought to foster self-regulation. For these reasons, collectivism may be an important predictor of individual self-control. So far, the relationship between individualism-collectivism and self-control has not been clarified. Therefore, it is necessary to conduct a systematic review and meta-analysis on individualism–collectivism and self-control. The existing literature gap treats collectivism more as a single-dimensional structural examination of the relationship with self-control. Collectivism is a complex construct, and it may be particularly important to explore the relationship between multi-dimensional collectivism and self-control.

2.5 Research questions

Given these gaps in the literature, this study aimed to investigate the association between cultural orientation and self-control in Chinese samples. Specifically, two research questions were examined.

Research Question 1: *How are individualism and collectivism related to self-control, and what are possible factors that influenced the results*?

Study 1 was to use meta-analysis to quantitatively synthesize the results of previous studies, to examine the relationship between individualism-collectivism and self-control, and to identify the moderating factors that affect the relationship between the two, in order to draw more general and accurate conclusions.

Research Question 2: *What is the relationship between psychological collectivism and trait self-control in Chinese samples*? Specifically, assess collectivism with a good and reliable questionnaire and relate it to self-control in Chinese samples.

Study 2 was to investigate the factorial and construct validity of the Chinese Psychological Collectivism Questionnaire (CPCQ) among Chinese samples.

Study 3 was to use network analysis to explore psychological collectivism and trait self-control in Chinese adult athletes and college students.

3 A Review and Two Empirical Studies

3.1 Study 1 The relationship between individualism-collectivism and self-control: A meta-analysis and systemic review

Background

Self-control refers to the ability of the person to regulate and restrain impulsive thoughts, emotions, and behaviors, and to monitor and adjust otherwise habitual responses, which aid in the process of achieving goals against embedded instincts (Tangney et al., 2004; Vohs et al., 2005). Being able to exert self-control is seen as a determinant of individual success and well-being; for example, high self-control yields different positive outcomes in life such as better health, fewer maladaptive adjustments, higher academic achievements, and more interpersonal success (Baumeister et al., 2007; Rothbart et al., 2000; Tangney et al., 2004). In contrast, low individual self-control is linked with alcohol and drug abuse, crime, violence, or low life satisfaction (Duckworth & Seligman, 2005; Hofmann et al., 2014; Vazsonyi et al., 2017; Vohs & Faber, 2007). While research has provided evidence for the importance of self-control in different domains of functioning, it is, of course, also of interest in terms of which factors influence self-control and which factors affect the development or acquisition of self-control. Although some genetic predispositions and environmental factors are discussed (Beaver, Eagle Schutt, et al., 2009; Willems et al., 2018) it seems that developmental conditions like parenting behavior (Vazsonyi & Belliston, 2007) or cultural background and cultural orientation play an important part (Trommsdorff, 2009). The ecological systems theory posits that cultural orientations that put more or less emphasis on the individual's responsibilities and behaviors within a collective or society may indeed affect individual self-control and its

development (Bronfenbrenner, 1979). Cultural orientations of individualism and collectivism have been found to have an impact on self-regulation, motivation, cognition, emotion, and underlying brain mechanisms (Cross et al., 2011; Han & Northoff, 2008; Han et al., 2013). Individualism–collectivism as a cultural-/societal-level construct represents a shared meaning system that recognizes the wider culture as a societal/cultural construct (Erez & Gati, 2004; Gelfand et al., 2004). Empirical studies have shown an inconsistent association between individualism-collectivism and self-control (Kim et al., 2015; Li et al., 2018; Miconi et al., 2019; Pokhrel et al., 2018) which has hindered further exploration of the relationship. Meta-analysis allows a comprehensive statistical analysis of multiple independent studies on a specific topic, and can determine factors that influence associations, thus deepening insight into apparently inconsistent findings (Camisón-Zornoza et al., 2004). Here, a meta-analysis was conducted to assess the relationship between individualism–collectivism and self-control and clarify the roles of demographic variables (e.g., culture, age, and gender) as well as methodological moderator variables (e.g., measures of individualism–collectivism and self-control). This provides an understanding of the association between culture and self-control, furthering insight into differences in self-control between individuals.

Factors potentially influencing associations between cultural orientation and self-control

Demographic factors

Both gender and age may influence the association between individualism–collectivism and self-control. The self-control theory of crime, commonly termed the

general theory of crime proposed by Gottfredson and Hirschi (Gottfredson & Hirschi, 1990), asserts that self-control is higher in women. This has been confirmed by empirical research (Higgins & Tewksbury, 2006; Shoenberger & Rocheleau, 2017; Størksen et al., 2015). In addition, many studies have shown that women's collectivism is higher than that of men; contrarily, some studies have found that men's individualism is higher than women's (Cross & Madson, 1997; Lampridis & Papastylianou, 2017; Wood & Eagly, 2002). Thus, gender may also influence the relationship between the two variables.

Previous research suggests that older adults have higher levels of self-control compared to the younger population (Gibson et al., 2010; McCabe et al., 2004; Silverman, 2003). A self-control survey of adolescents and adults found that the self-control score of adults was higher than that of adolescents (Oliva et al., 2019). Studies have also found that older adults are less individualistic than the younger population, which may be due to differences in living environments and different groups of people (Mishra, 1994). Thus, there might be a dynamic association between individualism–collectivism and self-control. Based on the abovementioned literature, we hypothesized that gender and age might moderate the association between individualism–collectivism and self-control.

Measurement tools (individualism–collectivism and self-control)

Self-reporting and observed behavioral tasks are the most commonly adopted measures of self-control. The Social Self-Control Scale [SSCS] (Sussman et al., 2003) and the Brief Self-Control Scale [BSCS](Tangney et al., 2004) are two important measurement tools that assess self-reported self-control as an ability. Behavioral tasks,

including the Hearts & Flowers version of the Dots Task (Davidson et al., 2006) and the Stroop Task (Job et al., 2013), also assess individual differences in self-control as an ability. A modest relationship was reported between the behavioral tasks and self-reporting informant self-control questionnaires by a meta-analysis summarizing the overall validity of the measures used (Duckworth & Kern, 2011). Researchers suggest that it is best to include self-controlled measures of attitudes and behaviors to better understand the structure and emphasize the inclusion of both behavioral and attitudinal measures. Hence, this study tested differences in assessments of self-control and individualism–collectivism in terms of measures of self-control.

Moreover, individualism–collectivism measurement tools primarily comprise the HVICS (Triandis & Gelfand, 1998), the I-CS (Wagner III, 1995), the SSCS (Singelis, 1994), and the Korean American Acculturation (KAA; (Lee, 2007), and the Asian American Values Scale-Multidimensional (AAVS-M) (Kim et al., 2005). The HVICS comprises 16 items graded on a 9-point Likert-type scale, comprising four components, namely, horizontal collectivism (HC), horizontal individualism (HI), vertical collectivism (VC), and vertical individualism (VI). The I-CS consists of 20 items graded on a 5-point scale and is a Therapy Attitude and Process Questionnaire used to assess attitudes in terms of social- or self-oriented values. The SSCS comprises 30 items rated on a 7-point scale, consisting of two components: independent and interdependent components. The KAAS and AAVS-M only measure collectivism. Hence, this study assesses the correlation differences between individualism–collectivism and self-control in terms of measures of individualism–collectivism.

Diversity of cultural backgrounds

Culture can considered a collective programming of an individual's mind, resulting in distinctions between members of different groups (Hofstede, 2011), and is passed on from generation to generation (Matsumoto et al., 2008). It consists of a set of meanings and practices that inform and guide an individual's interactions with the social environment, thereby shaping the individual's experiences and behaviors in the social sphere (Campos & Kim, 2017; Kitayama, 2002). Culture operates on various levels, from specific cultures associated with teams to organizations to nations (Erez, 2011), and provides a social identity for members of a particular group (Leung & Bond, 2004).When investigating the effect of individualism–collectivism, studies often compare samples from different countries as representatives of different cultures. While such comparisons make comparison groups more distinctive, each sample is also likely to be rather homogeneous. Other studies compare groups with different ethnic backgrounds, but within a country (e.g., Asian-Americans vs. Caucasian-Americans). Groups are likely less distinctive because they share more of the same culture; groups are likely more heterogeneous within. Thus, this research study hypothesizes that the correlation between individualism–collectivism and self-control also will be affected by the heterogeneity of the (assumed) sample subgroups.

Methods

This study conducted a literature search based on the standards declared by PRISMA (Liberati et al., 2009).

Literature search

We retrieved studies relating to individualism, collectivism, and self-control from the PubMed, Scopus, PsycINFO, and Web of Science databases. The keywords used for searching were ("individualism" OR "collectivism" OR "collectivistic" OR "individualistic" OR "independence" OR "interdependence" OR "self-construal" OR "allocentrism" OR "idiocentrism") AND ("self-control" OR "self-regulation" OR "effortful control" OR "self-discipline" OR "inhibitory control" OR "executive function"). Studies had to evaluate self-control or a closely associated parameter, including the study had to assess self-control or a concept closely related to self-control, such as self-control, effortful control, self-regulation, self-discipline, inhibitory control, and executive function (Duckworth & Kern, 2011; Nigg, 2017; Whiteside & Lynam, 2001). The literature search was conducted in August 2022.

The inclusion criteria were: (1) studies in English, published in peer-reviewed journals, with full-text availability; (2) they should be studies with individualism–collectivism-related variables, measured by either questionnaire; (3) quantitative studies, which report the relationship or an effect size in individualism–collectivism and self-control. Unpublished material, book chapters, reviews, dissertations, and conference proceedings were excluded, as these findings are often published later in peer-reviewed journals. Inclusion of peer-reviewed publications only is a widely accepted practice in meta-analyses (Joiner & Wagner, 1995; Karreman et al., 2006; Lovejoy et al., 2000; Slagt et al., 2016). The choice to exclude unpublished material was made due to the lack of peer review of these studies and thus concerns about the quality of the work (Cook et al., 1993). In addition, it has also been found that publication bias is as common in meta-analyses that exclude unpublished studies as in those that do not (Ferguson & Brannick, 2012). Three persons independently screened

the articles, and disagreements over the inclusion or exclusion of studies were resolved by arriving at a consensus with the corresponding author. In the case of duplicate studies, only one version was considered. For the literature search and screening flowchart see **Figure 1.**

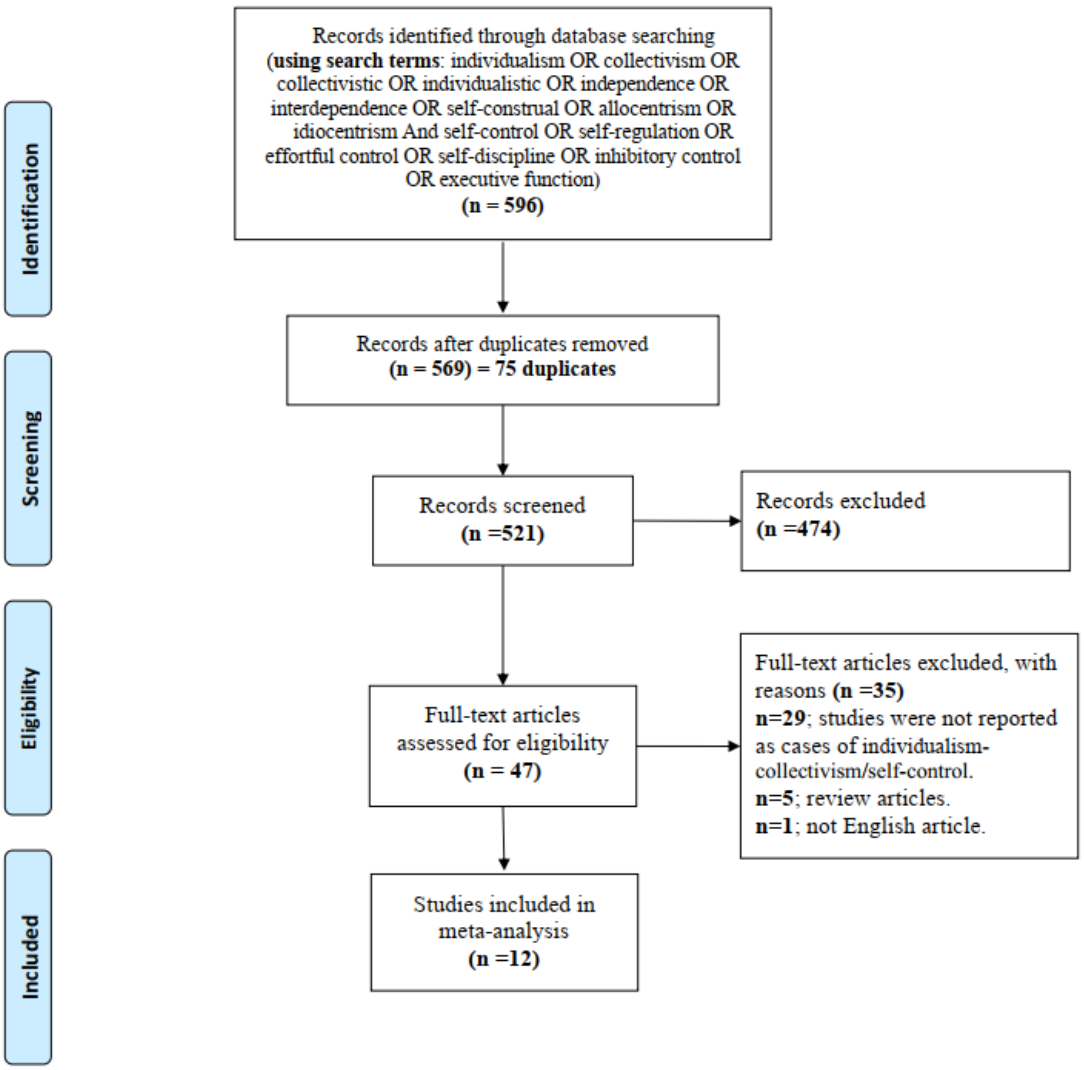


Figure 1 Flow diagram of each stage of the study selection.

Data extraction

Information was extracted from the articles and coded for analysis. Data were extracted and coded by two authors, with any disagreements resolved through negotiations with the corresponding author to determine the final code. The coding

content of this study included the names of authors, publication year, gender of participants, cultural background of participants (heterogeneous and homogeneous), sample size, participants (adolescents: [under 18], and adults: [19–60 years old]), measurement tools, and reported correlation coefficients in terms of individualism–collectivism and self-control. Among these, the generation of correlation coefficients was based on the independent samples, and for once, each independent sample was coded. The articles were coded separately when there were multiple independent samples in the articles. **Table 3** indicates that all those independent samples that fulfilled the above inclusion criteria were coded.

Study	N	Age	Male (%)	I-C[b]	SC[c]	Cultural Backgrounds	I-S(*r*)	C-S(*r*)
Kim et al. 2005	189	2	41.27%	3	1	1	*NR*	0.30
Park et al. 2008	346	2	43.64%	3	1	1	*NR*	0.21
Wong et al. 2012	214	2	30.40%	3	1	1	*NR*	0.44
Kim et al. 2015	443	2	50.60%	3	1	1	*NR*	0.34
Pokhrel et al. 2017	716	1	48.50%	2	1	2	−0.22	0.06
Miconi et al. 2017-a	116	1	60.30%	1	2	1	0.05	−0.10
Miconi et al. 2017-b	124	1	50.80%	1	2	1	−0.04	0.01
Miconi et al. 2017-c	248	1	52.80%	1	2	2	0.06	−0.11
Li et al. 2018-a	542	2	38.93%	2	1	2	−0.087	0.080
Li et al. 2018-b	446	2	24.44%	2	1	2	−0.074	0.150
Li et al. 2018-c	510	2	39.22%	2	2	2	−0.016	−0.105
Li et al. 2018-d	412	2	22.82%	2	2	2	−0.046	−0.054
Mooijman et al. 2018	1486	2	66.55%	2	1	2	0.02	0.38
Benga et al. 2019-a	40	2	*NR*	1	1	2	0.17	0.02
Benga et al. 2019-b	40	2	*NR*	1	1	2	0.36	0.06
Huang et al. 2021-a	422	2	68.50%	1	1	2	−0.01	*NR*
Huang et al. 2021-b	180	2	62.70%	1	1	2	0.42	*NR*
Castellanos et al. 2022	221	2	27.15%	3	1	1	*NR*	0.34
Chen et al. 2022	1124	2	100%	1	1	2	*NR*	0.37

Table 3 Effect sizes and study characteristics.
***Notes*:** [a]1= Adolescents (under 18); 2 = Adults (19–60 years old). [b]1 = Self-Construal Scale; 2 = IND-COL-Scale; 3 = Asian American Values Scale, and Korean American Acculturation Scale. [c]1 = Self-report; 2 = Behavioral task. [d]1 = Heterogenous; 2 =

Homogenous. NR = No report.

Quality assessment

The Effective Public Health Practice Project (EPHPP) scale was used to examine the risk of bias to ensure the quality assessment. This is because the EPHPP scale is generally used to evaluate the quality of the research as a whole and can better evaluate cross-sectional studies, before-and-after comparative studies, and randomized controlled trial studies (Armijo-Olivo et al., 2012). The EPHPP scale contains evaluations of selection bias, blinding, confounding factors, study design, data collection, and inclusion and exclusion criteria. The comprehensive evaluation is divided into three levels: strong, medium, and weak. Two authors assessed the study quality aligned with the EPHPP scale (Armijo-Olivo et al., 2012; Thomas et al., 2004).

A summarized report of the quality assessment is presented in **Table 4**. Any disagreements were discussed with the reviewers until agreement was reached.

Author	Year	Selection bias	Study design	Confounders	Blinding	Data collection methods	Withdrawal and drop-outs	Total score
Kim et al.	2005	2	3	3	1	1	2	Moderate
Park et al.	2008	2	3	3	1	1	2	Moderate
Wong et al.	2012	2	3	3	1	1	3	Moderate
Kim et al.	2015	1	3	3	1	1	2	Moderate
Pokhrel et al.	2017	1	3	3	1	1	2	Strong
Miconi et al.- a	2017	2	3	3	1	1	2	Moderate
Miconi et al. -b	2017	2	3	3	1	1	2	Moderate
Miconi et al. -c	2017	2	3	3	1	1	2	Moderate
Li et al. -a	2018	1	3	2	1	1	2	Moderate
Li et al. -b	2018	1	3	2	1	1	2	Moderate
Li et al. -c	2018	1	3	2	1	1	2	Moderate
Li et al. -d	2018	1	3	2	1	1	2	Moderate
Mooijman et al. Study 5	2018	1	3	3	1	1	3	Moderate
Benga et al. -a	2019	2	3	3	1	1	2	Moderate
Benga et al. -b	2019	2	3	3	1	1	2	Moderate
Huang et al.-a	2021	2	3	1	2	2	3	Moderate
Huang et al. -b	2021	2	3	1	2	2	3	Moderate
Castellanos et al.	2022	3	3	2	1	1	3	Moderate
Chen et al.	2022	2	2	3	3	1	2	Moderate

Table 4 Quality assessment of included studies.
***Notes*:** 1 Strong; 2 Moderate; 3 Weak.

Data analysis

A Comprehensive Meta-Analysis 2.0 was applied in this study for data analysis. Taking the correlation coefficient r as the effect size, the criteria used were($r \leq 0.10$

indicating small, $r \geqslant 0.40$ large, and $0.10 < r < 0.4$ medium (Lipsey & Wilson, 2001).

Furthermore, a heterogeneity test (Q test) was undertaken to determine variations in effect sizes among different studies. A random-effects model for heterogeneous effects was proposed by Hedges and Vevea (Hedges & Vevea, 1998) where an I^2 of 75% indicates high heterogeneity, an I^2 of 50% medium heterogeneity, and an I^2 of 25% low heterogeneity. Contrary to this, a fixed-effects model was selected when the homogeneity hypothesis was accepted. A random-effects model was considered more appropriate as the current meta-analysis aimed to evaluate the influence of moderating variables from the perspective of the individualism–collectivism/ self-control relationship.

The I^2 values for self-control indicators of individualism and collectivism were 85.714% and 94.025%, respectively. This highlights that the observed variances accounted for 81% and 90%, respectively, of the total effective-size variance. The random-effects model was adopted since both variances exceeded the common criteria set for high-level (75%) heterogeneity (Borenstein et al., 2007).

The term publication bias indicates that the publication is not a systematic and comprehensive representation of the overall research in a field (Rothstein et al., 2005). Funnel plots (Khoury et al., 2013) were first use to assess the risk of publication bias, followed by Egger linear regression (Egger et al., 1997). Funnel plots allow the subjective evaluation of publication bias with symmetric data distribution and concentration of the data in the middle and above sections indicative of a low risk of bias. However, this method usually requires a minimum of 10 studies (Morgan et al., 2018). In Egger linear regression, non-significant intercepts close to 0 indicate low risk of publication bias (Egger et al., 1997).

Results

Study characteristics

In total, 12 research articles (with k = 30 independent samples) were acquired based on rigorous filtering and an extensive review of the literature. There were a total of 7,819 participants, with the number of independent samples in each study ranging from 1 to 3. In terms of the effect sizes, the correlations between individualism and self-control were 13 (43%), and 17 (57%) between collectivism and self-control, respectively.

Overall relation

The mean *r* value for the association between individualism and self-control was 0.020 (z = 0.494, p > 0.05, k = 13, 95% CI = −0.059, 0.099), while that between collectivism and self-control was 0.153 (z = 3.019, p < 0.01, k = 17, 95% CI = 0.054, 0.249). (Please see **Table 5**).

Self-control	*K*	*N*	Mean *r* effect size	95% CI for r		Test of null (2-tail)	
				LL	UL	*z*-Value	*p*-Value
Individualism	13	5282	0.020	−0.059	0.099	0.494	0.621
Collectivism	17	7217	0.153	0.054	0.249	3.019	0.003

Table 5 Random model of the correlation between individualism–collectivism and self-control.

Moderator analysis

The potential moderators of the individualism-collectivism/self-control association were analyzed for the 13 (individualism and self-control) and 17 (collectivism and self-control) independent samples using two heterogeneity tests. The result for individualism and self-control showed that QT (13) = 84.001, p < 0.001 while the

result for collectivism and self-control was QT (17) = 267.788, $p < 0.001$. As already stated, this study plans to assess the five moderators: age, gender, type of self-control measure, type of individualism–collectivism measure, and diversity of cultural background (see **Tables 6–10**).

Age. Age did not influence the correlation between individualism and self-control significantly (Q(bet) = 1.399, $p > 0.05$) but did have a significant effect on the association between collectivism and self-control (Q(bet) = 4.878, $p < 0.05$.) While the mean correlation between collectivism and self-control was non-significant for adolescents (r = −0.032, 95% CI = −0.219, 0.157), it was significant for adults (r = 0.210, 95% CI = 0.107,0.308).

Self-control	Between-groups Homogeneity Test		*K*	*N*	Mean *r* effect size	95% CI for *r*		Test of Null (2-tailed)	
	Q(BET)	*p*-Value				Lower Limit	Upper Limit	*z*-Value	*p*-Value
Individualism	1.399	0.237							
Adolescents			4	1204	−0.051	−0.188	0.088	−0.720	0.471
Adults			9	4078	0.050	−0.043	0.141	1.054	0.292
Collectivism	4.878	0.027							
Adolescents			4	1204	−0.032	−0.219	0.157	−0.334	0.738
Adults			13	6013	0.210	0.107	0.308	3.965	0.000

Table 6 Age as a moderator of the correlation between individualism–collectivism and self-control.

Type of self-control measures. The heterogeneity tests did not find a significant effects of self-control measures on the association between individualism and self-control is insignificant (Q(bet) = 0.169, $p > 0.05$). However, significant effects were observed on the impact of two forms of measures on the relationship between collectivism and self-control (Q(bet) = 17.642, $p < 0.001$). These were self-reporting (r = 0.251, 95% CI [0.171, 0.327], $p < 0.001$) and a stronger effect by the behavioral task (r = −0.074, 95% CI [−0.201, 0.055], $p > 0.05$).

Self-control	Between-groups Homogeneity Test		K	N	Mean r effect size	95% CI for r		Test of Null (2-tailed)	
	Q(BET)	p-Value				Lower Limit	Upper Limit	z-Value	p-Value
Individualism	0.169	0.681							
Self-reporting			8	3872	0.036	−0.071	0.141	0.658	0.511
Behavioral task			5	1410	0.000	−0.132	0.132	0.001	0.999
Collectivism	17.642	0.000							
Self-reporting			12	5807	0.251	0.171	0.327	6.023	0.000
Behavioral task			5	1410	−0.074	−0.201	0.055	−1.121	0.262

Table 7 The type of self-control measure as a moderator of the correlation between individualism–collectivism and self-control.

The type of individualism–collectivism measures. The heterogeneity tests indicated that three measures of individualism-collectivism affected the mean correlation between individualism and self-control (Q(bet) = 7.239, p < 0.01). The mean correlation between individualism and self-control is significant for the S-C Scale group (r = 0.127, 95% CI [0.019, 0.232], p < 0.05) but none of the correlations involving the I-C Scale were found to be significant (p > 0.05). The correlation between collectivism and self-control was not significant Q(bet) = 6.281, p > 0.05. Particularly, the mean correlation between collectivism and self-control is significant for the AAV-KAA Scale group (r = 0.327, 95% CI [0.148, 0.486], p < 0.01) but none of the correlations involving the S-C Scale or the I-C Scale were significant (p > 0.05).

Self-control	Between-groups Homogeneity Test		*K*	*N*	Mean *r* effect size	95% CI for *r*		Test of Null (2-tailed)	
	Q(BET)	*p*-Value				Lower Limit	Upper Limit	*z*-Value	*p*-Value
Individualism	7.239	0.007							
S-C Scale			7	1170	0.127	0.019	0.232	2.309	0.021
I-C Scale			6	4112	−0.071	−0.165	0.025	−1.450	0.147
Collectivism	5.366	0.069							
S-C Scale			6	1692	0.053	−0.132	0.235	0.558	0.577
I-C Scale			6	4112	0.090	−0.079	0.254	1.043	0.297
AAV-KAA Scale			5	1413	0.327	0.148	0.486	3.500	0.001

Table 8 The type of individualism–collectivism measures as a moderator of the correlation between individualism–collectivism and self-control.
***Note*:** S-C Scale = Self-Construal Scale, I-C Scale = Individualism–Collectivism Scale, and AAV-KAA Scale = Asian American Values Scale, and Korean American Acculturation Scale.

Diversity of cultural background. The cultural background did not affect the association between individualism–collectivism and self-control significantly (Q(bet) = 0.024, $p > 0.05$, for association between individualism and self-control, and Q(bet) = 1.793 ($p > 0.05$) for that between collectivism and self-control. The mean correlation between collectivism and self-control was significant for the heterogeneous group ($r = 0.233$, 95% CI [0.078, 0.377], $p < 0.01$).

Self-control	Between-groups Homogeneity Test		*K*	*N*	Mean *r* effect size	95% CI for *r*		Test of Null (2-tailed)	
	Q(BET)	*p*-Value				Lower Limit	Upper Limit	*z*-Value	*p*-Value
Individualism	0.024	0.878							
Heterogeneous			2	240	0.004	−0.213	0.221	0.040	0.968
Homogeneous			11	5042	0.023	−0.063	0.109	0.523	0.601
Collectivism	1.793	0.181							
Heterogeneous			7	1653	0.233	0.078	0.377	2.930	0.003
Homogeneous			10	5564	0.096	−0.037	0.225	1.412	0.158

Table 9 Diversity of cultural background as a moderator of the correlation between individualism–collectivism and self-control.
Note: Heterogeneous-immigrant groups, such as Asian Americans; Homogeneous-native groups, such as Chinese and Americans.

Gender. Meta-regression was performed on the *r-effect* size on the proportion of male participants to determine whether the relationship between individualism–collectivism and self-control is influenced by gender. The association was found to be significantly moderated by gender as illustrated in **Table 10** (Model [1, $k = 13$] = 84.001, $p < 0.001$ for individualism–self-control, and Model [1, $k = 17$] = 267.788, $p < 0.001$ for collectivism–self-control). The extrapolation of this finding to extremes as would apply to single-gender samples indicated that the expected relationship between individualism and self-control was higher for an all-male sample ($r = 0.177$) compared to an all-female sample ($r = 0.065$), with a similar result found between collectivism and self-control for all-male ($r = 0.448$) and all-female ($r = 0.418$) samples.

Self-control	Parameter	Estimate	*SE*	*Z*-Value	95% CI for β		*p*-Value
					Lower Limit	Upper Limit	
Individualism	*Slope*	0.177	0.082	2.165	0.017	0.337	0.030
	Intercept	−0.112	0.043	−2.610	−0.028	−2.610	0.009
	Model (1, k = 13) = 84.001, p < 0.001						
Collectivism	*Slope*	0.448	0.049	9.203	0.353	0.544	0.000
	Intercept	−0.030	0.029	−1.017	−0.086	0.027	0.309
	Model (1, k = 17) = 267.788, p < 0.001						

Table 10 Meta-regression analyses with the effect size regressed onto the percentage of male participants.

Publication bias

We applied Egger's regression test (Egger et al., 1997) with standard error as a predictor to examine statistically the issue of publication bias. The funnel plot showed that individualism and self-control indicator effect values converged at the top of the plot with an even distribution on both sides of the total effect; the Egger regression showed no significance, with an intercept of 2.343 (SE = 1.627, 95% CI [−1.238, 5.923], p = 0.178). This showed that the results of the meta-analysis of individualism and self-control indicators were relatively stable, and there was less possibility of serious publication bias. Please see **Figure 2.** The values for collectivism and self-control showed a similar distribution, with concentration at the top of the funnel plot and even distribution on both sides of the total effect, while the Egger regression results were not significant with an intercept of −3.745 (*SE* = 2.273, 95% CI [−8.589, 1.099], p = 0.120). This showed that the results of the meta-analysis of collectivism and self-control indicators were relatively stable and there was less possibility of serious publication bias. Please see **Figure 3.**

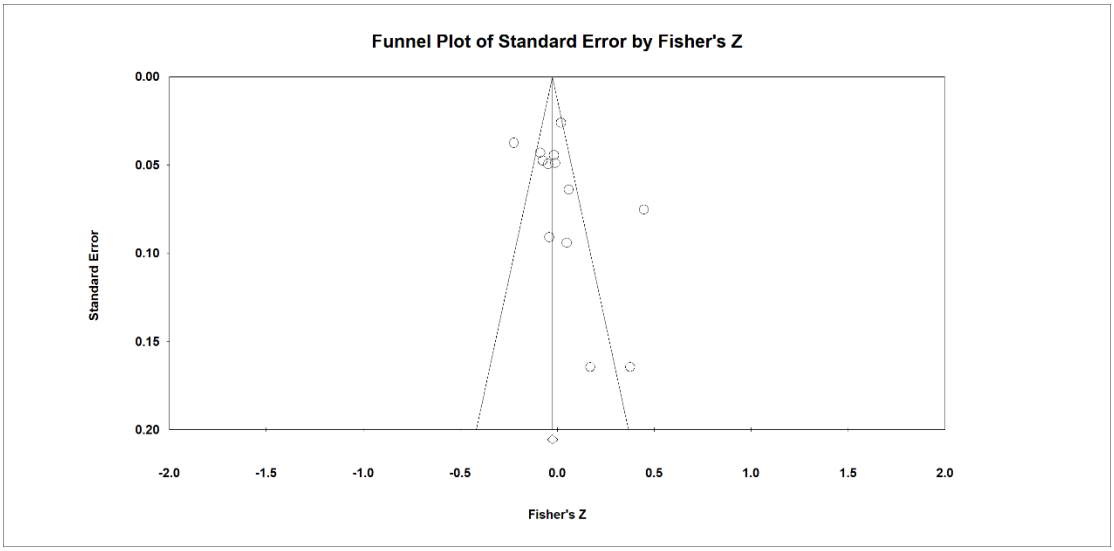


Figure 2 Funnel plot of effect sizes of the correlation between individualism and self-control.

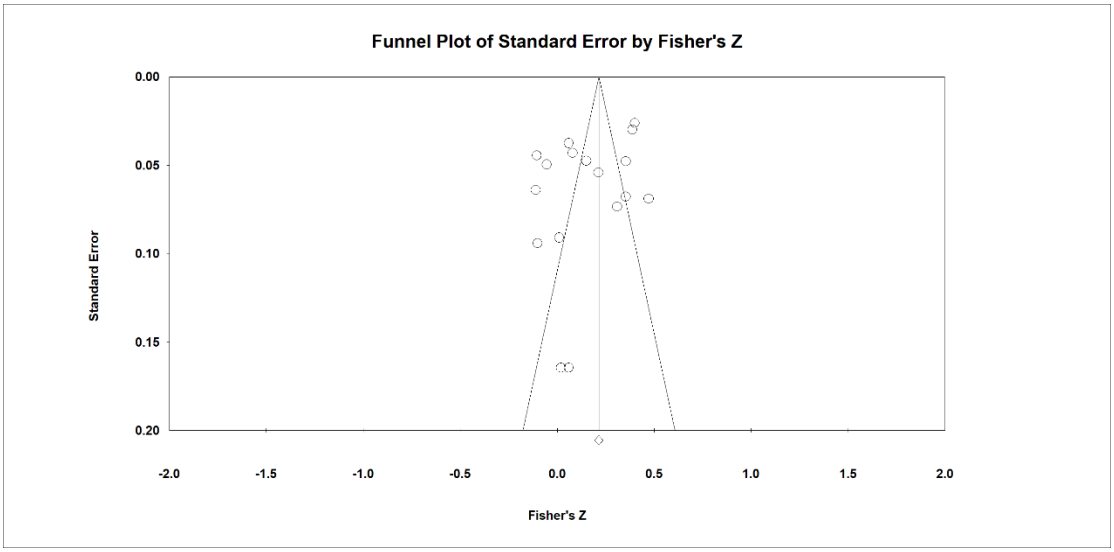


Figure 3 Funnel plot of effect sizes of the correlation between collectivism and self-control.

Discussion

Although previous studies have suggested that individualism–collectivism is closely related to self-control, analyses of the relationship between individualism–collectivism and self-control are not comprehensive, and the necessary meta-analytical research is found to be lacking. In this study, we used meta-analysis to

integrate and consider research related to individualism–collectivism and self-control. Simultaneously, we considered the impact of age, gender, the type of measures used to assess self-control and individualism–collectivism among other moderator variables on the association between individualism–collectivism and self-control, with the aim of assessing this relationship objectively and comprehensively.

Individualism–collectivism and self-control

It was found that individualism and self-control were not related, and that collectivism and self-control were positively related. Although this study cannot confirm a causal relationship between individualism–collectivism and self-control, it suggests that individuals with higher levels of collectivism will show greater self-control and that individualism may not be a predictive factor for self-control. This implication is aligned with the ecological systems theory that states that an individual's development is affected by their culture (Bronfenbrenner, 1979) and that cultural orientation affects individual self-control (Trommsdorff, 2010). First, we find a medium-sized significant linear correlation between collectivism and self-control. The core of collectivism is intra-group interdependence, emphasizing harmonious intra-group relationships, and behavior based primarily on intra-group norms that place intra-group goals above the pursuit of individual goals. To retain compliance with the norms of ingroups, collectivist cultural values teach self-control to control emotions and inhibit personal desires and self-interest (Triandis, 2001). Collectivism is considered to be more motivating than individualism for daily self-control (Seeley & Gardner, 2003). It has been suggested that frequent use of self-control improves its strength over time (Muraven et al., 1999). In this sense, collectivism may facilitate the recruitment and

development of self-control in the person. Our meta-analysis confirms these assumptions about the link between collectivism and self-control. Second, our findings further support the separation of individualism and collectivism into two dimensions, also validating Triandis's model (Triandis, 2001), despite not verifying the relationship between individualism and self-control. A possible explanation is that individuals are taught from childhood the need to curb self-interest and control emotions in social life. As a result, collectivism individuals exercise self-control. Seeley and Gardner (Seeley & Gardner, 2003) also found that collectivism was associated with greater motivation to be more self-controlled than individualists. In contrast, individualism with individuals lacks this opportunity to exercise self-control, which in turn leads to individualism being irrelevant to self-control.

Age

Age was found to moderate the association between collectivism and self-control, with a stronger relationship seen in adults compared with adolescents. Contrarily, age did not moderate the relationship between individualism and self-control. An explanation for this moderation could be found in brain maturation. Cortical thickness has been shown to be reduced, affecting the function of the anterior insula, during development, and may be linked to pruning in this area (Chechik et al., 1998; Huttenlocher & Dabholkar, 1997). These changes correspond to alterations in the degree of impulsivity occurring adolescence and early adulthood (Steinberg et al., 2008), leading to increased self-control in adults (Kasen et al., 2011; Steinberg et al., 2008). Previous studies have shown that insula thickness and function are related to impulsivity, as plasticity in this region is associated with developmental processes

during adolescence (Churchwell & Yurgelun-Todd, 2013). When individuals perform a task that involves risky decisions, insula activity increases in highly-impulsive persons compared to low-impulsive subjects (Lee et al., 2008). This greater variation in self-control among adults may thereby allow for a stronger relationship between collectivism and self-control. However, it should be noted that most of the studies included (9 out of 13) were with adults, which might partially explain the significant moderating effect among adult subgroups.

Furthermore, our finding was that age did not moderate the association between individualism and self-control. According to the previous discussion (Churchwell & Yurgelun-Todd, 2013), adolescence is a transition period and a fluctuating period in self-control development, which may be different from adult groups. Individualism–collectivism is a comparatively stable personal attribute (Triandis, 2001). Oyserman and colleagues (Oyserman, Coon, et al., 2002) argue that collectivism represents a broader range of attitudes, values, and behaviors than individualism. Individualists are independent of their group, emphasize competition and self-reliance, act primarily according to their attitudes rather than the norms of the group, and prioritize individual goals over group goals. The lack of in-group norms as a guide among the people hinders the improvement of self-control. Hence, individualism may not be related to self-control in either adolescents or adults. Therefore, future studies can test whether the association between individualism and self-control in the adult group is significantly different from other groups.

Gender

Gender moderated the link individualism–collectivism and self-control. A stronger

effect size was witnessed as there was an increase in the proportion of males in the sample. This finding supports the notion that males depend more on their own self-control compared to females (Charness & Rustichini, 2011). In addition, Wang and colleagues (Wang et al., 2017) found that males reported significantly greater good self-control than females in Chinese populations, but were inconsistent with findings in Western populations (Dvorak & Simons, 2009; Wills et al., 2001), suggesting that gender role exhibits a difference between cultural settings. Wanless and colleagues (Wanless et al., 2013) found that while American girls showed greater behavioral regulation relative to boys, these gender differences were not apparent in any Asian societies. Additionally, recent studies confirmed that boys scored higher on self-control than girls (Hu & Wang, 2022). It is also possible that most of the studies included in this study were surveys of adults, and that females often showed higher self-control before puberty, while males' self-control increased after adulthood. Therefore, future research should investigate the gender-related differences between individualism–collectivism and self-control.

Measurement tools

Individualism–collectivism

In this meta-analysis, we found that various tools that measure individualism–collectivism significantly moderated the correlation between individualism–collectivism and self-control. The correlation coefficients as measured by the Korean American Acculturation Scale and the Asian American Values Scale-Multidimensional were higher, and the correlation coefficients as measured by the self-construal and individualism–collectivism scales were lower, indicating that the

measurement tools used can cause differences in the measurement results. Individualism–collectivism in individuals is commonly evaluated through self-reporting questionnaires, including the Individualism and Collectivism Scale (I-C-scale) proposed by Triandis & Gelfand (Triandis & Gelfand, 1998) and the Self-Construal Scale (S-C- Scale) proposed by Singelis (Singelis, 1994). In addition, there were some questionnaires to measure collectivism in individuals, such as the KAA scale developed by Lee (Lee, 2007), and the AAVS-M developed by (Kim et al., 2005). Therefore, the correlation coefficients as measured by the S-C and I-C scales were low. The high correlation coefficients as measured by the KAA scale and the AAVS-M Scale may be because these scales only assess the level of individual collectivism and try to avoid multidimensional mutual influence, and the KAA scale and the compilation and development of the AAVS-M Scale involve selected Asian groups, which can reflect the orientation characteristics and patterns of individual collectivism more comprehensively and accurately. Our results suggest that a more comprehensive scale should be selected when using individualism–collectivism measurement tools in the future, for example, addressing seven dimensions to explain cultural differences related to selfhood (Vignoles et al., 2016).

Self-control

We found that different self-control measurement tools significantly moderated the correlation between collectivism and self-control but did not moderate the correlation between individualism and self-control. Two main tools are currently used for assessing self-control, namely, questionnaires and behavioral tasks. Self-control questionnaires mainly evaluate individual social/attitudinal self-control (Sussman et

al., 2003; Tangney et al., 2004), and self-control behavioral tasks evaluate individual behavioral self-control in a laboratory setting (Davidson et al., 2006; Job et al., 2013). We found that the correlation between collectivism and self-control as measured by self-reporting was relatively higher compared to when self-control was measured through a behavioral task. The reason for this result could lie in the social nature of collectivism. A person with high levels of collectivism holds higher expectations about how they or other persons should behave in a social context (e.g. when working together in a group). Consequently, a more positive attitude toward self-control in such contexts results, as reported via questionnaires. When we measure the links between individualism–collectivism and attitudes toward behavioral self-control, self-reporting is probably the most effective measure. Actual self-control of behaviors, however, is usually examined using specialized laboratory cognitive tasks, and without (much) social interaction. As such, individuals also require more control of information processing and action organization than controlled social interaction. Collectivism, therefore, might be expected to be related only to behavioral tasks that take place within a social context. Finding no link between collectivism and self-control in behavioral tasks also does not support the model of strength of self-control, but offers a new perspective for the follow-up of individual self-control. Thus, future research needs to select more appropriate measurement instruments to explore the underlying mechanisms of individual collectivism and not only attitudes toward it but also actual behavioral self-control.

Diversity of cultural background

This study established that the diversity of cultural backgrounds of subjects did not

significantly moderate the association between individualism–collectivism and self-control. Previous studies have also shown that there is no difference in individual self-control between samples from a country considered to reflect an individualist culture (Italy) and a "collectivistic" country like China (Delvecchio et al., 2015). These results explain that the level of individual self-control is less affected by representatives of different cultures. Another possible explanation is the globalization effect of culture, which tends to diminish differences as global economies and societies evolve. Although the hypothesis of this study was not supported, we need to treat this result with caution because there is a lack of empirical research to prove that diversity of cultural background can affect the relationship between individualism–collectivism and self-control. Future studies may consider adding different samples from different countries to further investigate the association.

Conclusion

The current meta-analysis focuses on the present state of research relevant to the link between individualism–collectivism and self-control. The findings indicate the importance of the influence of collectivism when evaluating the development of self-control. This study also supports Bronfenbrenner's ecological system theory that cultural factors may be among those potentially influencing individual self-control. In the future, researchers can not only explore the causal link between collectivism and self-control through longitudinal studies but also delve into the neural mechanisms underlying the effects of collectivism on self-control in experiments. This will provide more theoretical support for this field of research. Moreover, researchers believe that collectivism is complex constructs and even broader concept (Bellah et al., 1985;

Markus & Kitayama, 1991; Oyserman, Coon, et al., 2002). A single dimension of collectivism is too simplistic to better measure and assess an individual's level of collectivism (Freeman & Bordia, 2001; Green et al., 2005). This study found that the questionnaire used to measure the link between collectivism and self-control to measure the level of collectivism is mainly based on a single dimension. In order to better reveal this association, future research should consider using a multidimensional collectivism questionnaire.

Study 1 showed a positive association of collectivism with self-control. The Psychological Collectivism Questionnaire has been shown to be reliably valid in Western populations (Donkers et al., 2018; Jackson et al., 2006). The Psychological Collectivism Questionnaire has been widely cited in studies and has good reliability in athletes and college students (Dierdorff et al., 2011; Donkers et al., 2018; Gu & Xue, 2022).

3.2 Study 2 The Psychological Collectivism Questionnaire (PCQ): Factorial and construct validity across Chinese samples

Background

Researchers have developed many questionnaires to measure collectivism, but most are unidimensional (Oyserman, Coon, et al., 2002). The Psychological Collectivism Questionnaire (Jackson et al., 2006) is a multidimensional questionnaire developed based on the unidimensional collectivism questionnaire, which better assesses the diversity of collectivism in individuals. Chinese adult athletes and college students

may exhibit different collectivism compared to populations from other cultural backgrounds. To better understand the collectivism of Chinese adult athletes and college students, a valid measure to assess this construct accurately is necessary. Given the above, in order to assess the links between multidimensional collectivism and self-control in college students and adult athletes in Study 3, the study examined the factorial and construct validity the Psychological Collectivism Questionnaire across Chinese samples.

Therefore, the first aim of Study A was to evaluate the factorial validity of the Chinese Psychological Collectivism Questionnaire (CPCQ) among Chinese samples (boxing, non-boxing athletes, and college students). In Study B, the second aim was to assess the construct validity of the CPCQ in Chinese samples (team athletes and college students). To this aim we collected data in two sub-studies from two different samples: Specifically, sub-study A examined the factorial validity of the Chinese-translated CPCQ, applying network analysis, confirmatory factor analysis, and internal reliability analysis. Sub-Study B examined the construct and convergent validity of the CPCQ via correlational analyses of the relationships among psychological collectivism, self-control, and self-construal.

Method

Samples

The present study was a cross-sectional survey, using convenience sampling for the

collection of self-reported information from Chinese universities, sports clubs, and sports centers. A total of 1,140 participants completed the online survey (Sojump). However, 14 surveys are incomplete. Therefore, the final sample comprised 1126 participants. The total samples (N = 1126, males = 640, females = 486) were divided into two subsamples to evaluate the factorial validity of the Chinese Psychological Collectivism Questionnaire across Chinese samples. Sample 1 Confirmatory factor analysis, internal reliability analysis, and network analysis were performed among 566 participants (boxing, n=186; non-boxing athletes, n=190; and college students, n=190) in Sub-Study A. Sample 2 Convergent validity correlations analysis was performed among 560 participants (team athletes, n=280; and college students, n=280) in Sub-Study B.

Procedures and Material

Before performing the survey, every participant was told of the study's objective, and the informed consent form was also acquired. The freedom to stop the study procedure or to stop participating at any point is emphasized to participants. The survey consists of the following questionnaires: demographic information, the Chinese versions of the Psychological Collectivism Questionnaire, the Chinese versions of Brief Self-Control, and the Chinese versions of the Self-construal Scale. The approximate time to answer was 20 minutes.

Measures

Translation of the Psychological Collectivism Questionnaire into Chinese

First, Chinese students who were taking a German major translated the Chinese version of the Psychological Collectivism Questionnaire (Lan, 2018) into a first German version. Second, four German speakers discussed this German version of the Psychological Collectivism Questionnaire until they reached a consensus on all items, leading to a final German version. Third, the final German version of the Psychological Collectivism Questionnaire was back-translated into a second Chinese version by two Chinese German majors, the original English psychological collectivism questionnaire (Jackson et al., 2006) was also used as a reference. Finally, this second Chinese version of the Psychological Collectivism Questionnaire was developed by a professor from China with a German master's degree. The whole translation procedure is based on the back-translation procedure (Brislin, 1970).

The Chinese version of the Brief Self-Control Scale

The 8-item Brief Self-Control Scale was translated and adapted from the 13-item Brief Self-Control Scale (Liang et al., 2022). The scale includes 8 items graded on a 5-point scale (“1 = not at all like me”, “5 = very much like me”), such as “I wish I had more self-discipline” and “Pleasure and fun sometimes keep me from getting work done”. This scale has two dimensions, such as restraint and non-impulsivity. Higher sum scores reflect greater self-control. The scale has been validated and used to assess

adult Chinese athletes and college students, showing good psychometric properties (Kuang et al., 2023; Liang et al., 2022). The Cronbach's alpha and McDonald's omega for the Sub-Study B was team athletes (α= .704 and ω=.747) and college students (α= .703. and ω=.712).

The Chinese versions of the Self-Construal Scale

The Culture and Identity Research Network Self-Construal Scale Version 3 (CIRN-SCS-3) (Krys et al., 2021; Yang, 2018) was used for measuring various dimensions of self-construal. The measurement included eight dimensions, with six items in each. These were (1) difference vs. similarity, (2) self-containment vs. connectedness to others, (3) self-direction vs. receptiveness to influence, (4) self-reliance vs. dependence on others, (5) consistency vs. variability, (6) self-expression vs. harmony, (7) self-interest vs. commitment to others, and (8) de-contextualized vs. contextualized self. The items were randomly arranged and were graded using a 5-point scale, ranging from 1 = does not describe me at all to 5 = describes me exactly, such as "You try to avoid being the same as others" and "You try to adapt to people around you, even if it means hiding your feelings". Using a large sample across countries, Vignoles and colleagues (Vignoles et al., 2016) found that dimensions 1, 3, 6, and 7 were associated with collectivist cultures. This scale showed good internal consistency in the Chinese sample (Krys et al., 2021; Yang, 2018). The CIRN-SCS-3 represents the eight dimensions in a bipolar manner, reversing the items associated

with interdependence, resulting in higher scores indicating greater independence and reduced interdependence. Items for acquiescent response style were ipsatized before the calculation of the scale score.

Data Analysis

Descriptive analysis and internal reliability (Cronbach's alpha and McDonald's omega) were conducted utilizing *SPSS* 22. The Confirmatory factor analysis (CFA) fit indices were assessed by comparative-fit index (CFI), root mean square error of approximation (RMSEA), Tucker-Lewis Index (TLI), and standardized root mean square residual (SRMSR). According to the general rule of thumb (Hu & Bentler, 1999) a good model fit by CFA and TLI > .90, RMSEA ≤..06 and SRMSR ≤.08. CFA was conducted utilizing *Mplus* 8.0. Recently, network analysis has been used by researchers to explore the factorial and construct of questionnaires (Lecuona et al., 2021; Li, Mamun, et al., 2022; Li, Niu, et al., 2022; Schönenberg et al., 2023). The EBICglasso model was used for assessment of the network structure and characteristics according to the suggestion of Epskamp and Fried (Epskamp & Fried, 2018), using the least absolute shrinkage and selection operator (LASSO) algorithm (Friedman et al., 2008) and the Extended Bayesian Information Criterion (EBIC) (Chen & Chen, 2008). This study uses EBICglasso Network Analysis to test the factorial structure of the Psychological Collectivism Questionnaire in different Chinese samples. Network analysis was conducted utilizing *JASP* 0.16.0.

Ethics

All procedures in this study were in accordance with the Declaration of Helsinki, and the study protocol was approved by the Ethics Committee of Technische Universität München (2022-397-S-KK). Informed consent was provided by all participants.

Sub-Study A: Testing of factorial structure

Results

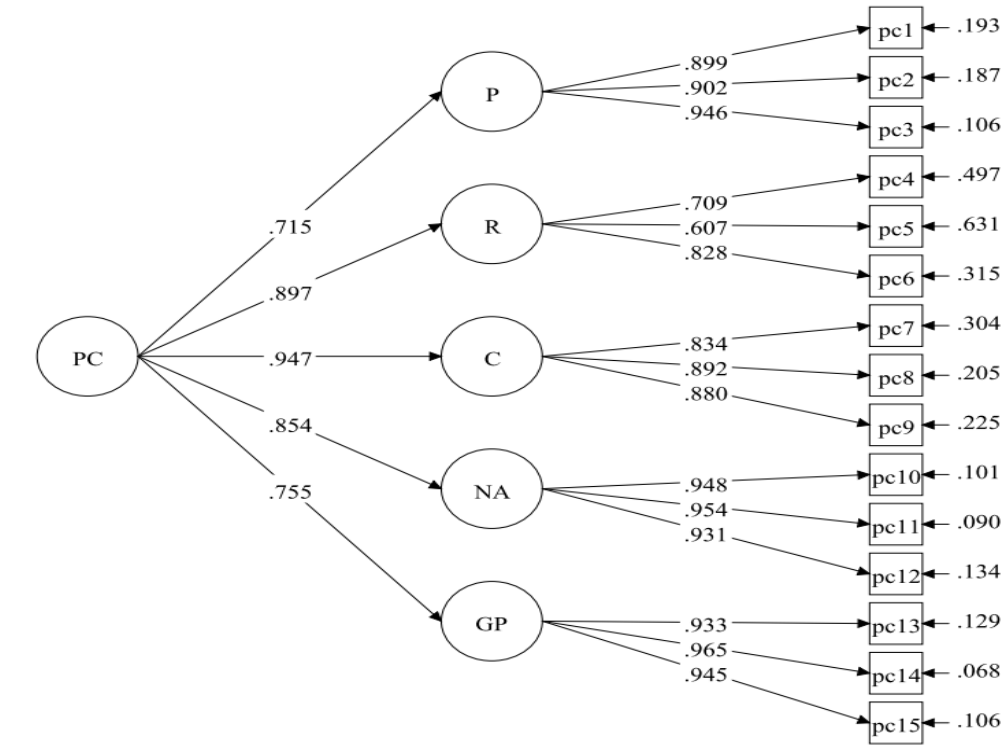
Confirmatory factor analysis (CFA)

First, confirmatory factor analysis calculated the original five facets of CPCQ in Chinese samples, and our results show that the values of SRMSR of non-boxing athletes and the values of RMSE and SRMSR of College students were lower than the general rule of thumb for acceptability (Hu & Bentler, 1999). Moreover, our results also found that the original five facets of CPCQ's reliance facet had a factor loading value lower than 0.7 in the Chinese sample. Hair and colleagues (Hair et al., 2011) suggested that the measurements with a factor loading higher than 0.7 should be accepted. Then, using confirmatory factor analysis again calculated the four facets of CPCQ in Chinese samples. Although our results found that the value of RMSEA is lower in college students, other CFA indicators and factor loading are acceptable. Thus, A confirmatory factor analysis of the four facets of CPCQ is superior to the original five facets of CPCQ.

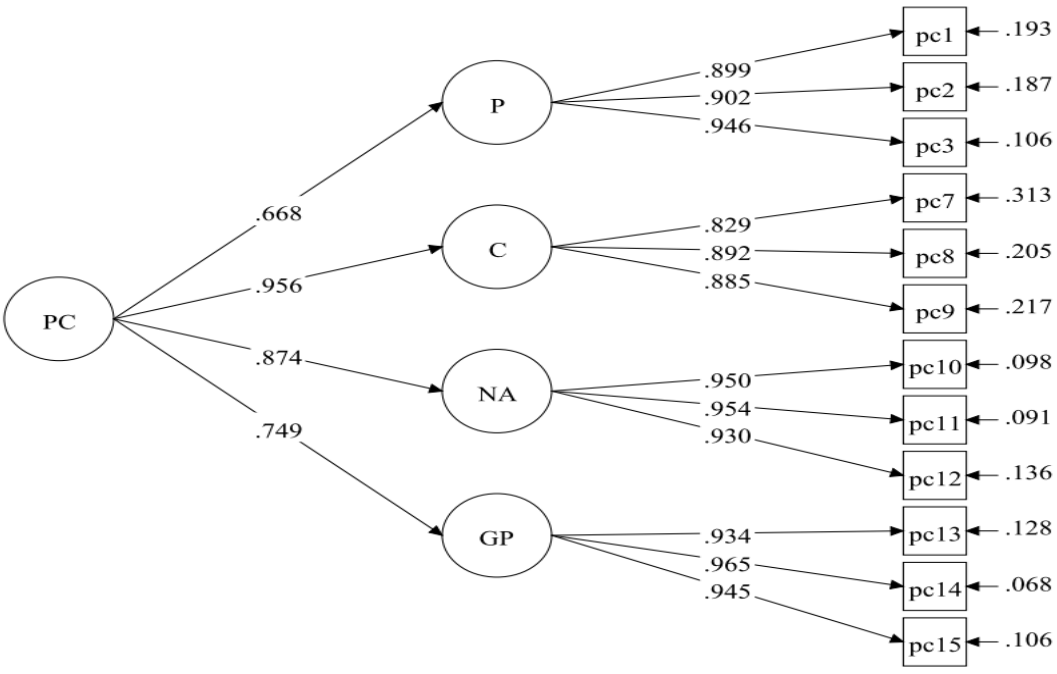
As shown in **Table 11** and **Figures 4-7**.

	Samples	$\chi 2$	*df*	$\chi 2/df$	CFI	TLI	RMSEA	RMSEA 90% CI	SRMSR
The five facets of CPCQ	Total participants	379.934	85	4.450	.967	.959	.078	.070 ~ .086	.049
	Boxing	183.740	85	2.162	.961	.951	.079	.063 ~ .095	.054
	Non-boxing athletes	244.067	85	2.871	.950	.938	.099	.085~ .114	.073
	College students	348.730	85	4.103	.921	.902	.128	.114~.142	.074
The four facets of CPCQ	Total participants	124.380	50	2.488	.990	.987	.051	.040 ~ .063	.024
	Boxing	56.819	50	1.136	.997	.966	.027	.000 ~ .056	.036
	Non-boxing athletes	82.479	50	1.650	.988	.985	.058	.035 ~ .080	.037
	College students	168.71	50	3.374	.959	.946	.112	.093 ~ .130	.059

Table 11 Goodness-of-fit indices of the five facets of CPCQ and the four facets of CPCQ among total participants (n=566), boxing (n=186), non-boxing athletes (n=190), and college students(n=190). ***Note*****:** $\chi 2$= maximum likelihood robust adjusted chi-square, *df* = degrees of freedom; $\chi 2/df$ = robust chi-square to degrees of freedom ration, CFI = comparative-fit index, TLI = tucker-Lewis Index, RMSEA 90% CI = root mean square error of approximation and its 90% confidence interval, and SRMSR=standardised root mean square residual.

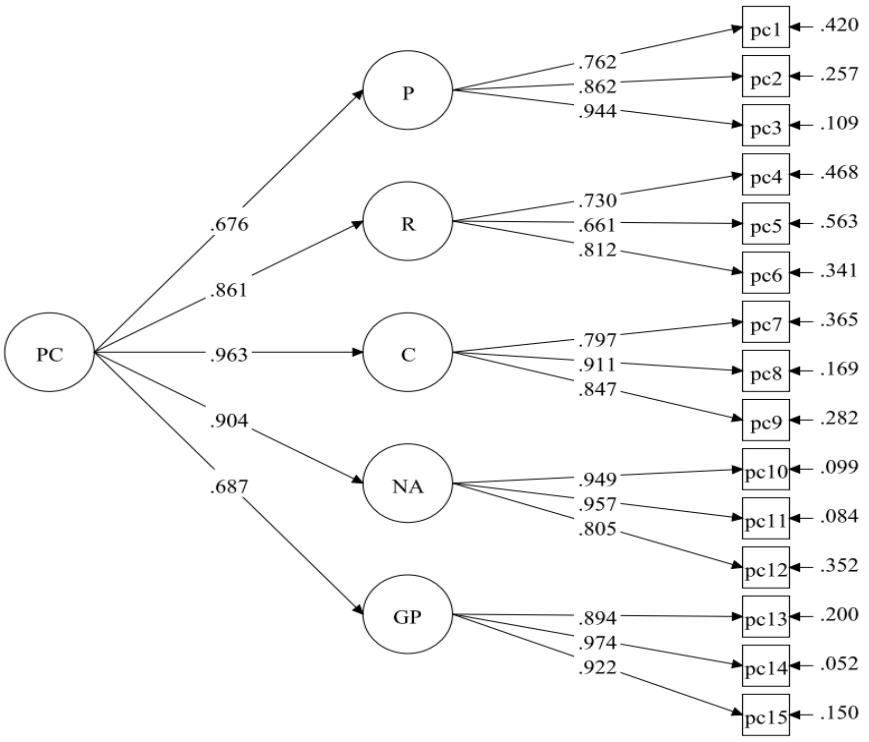


A

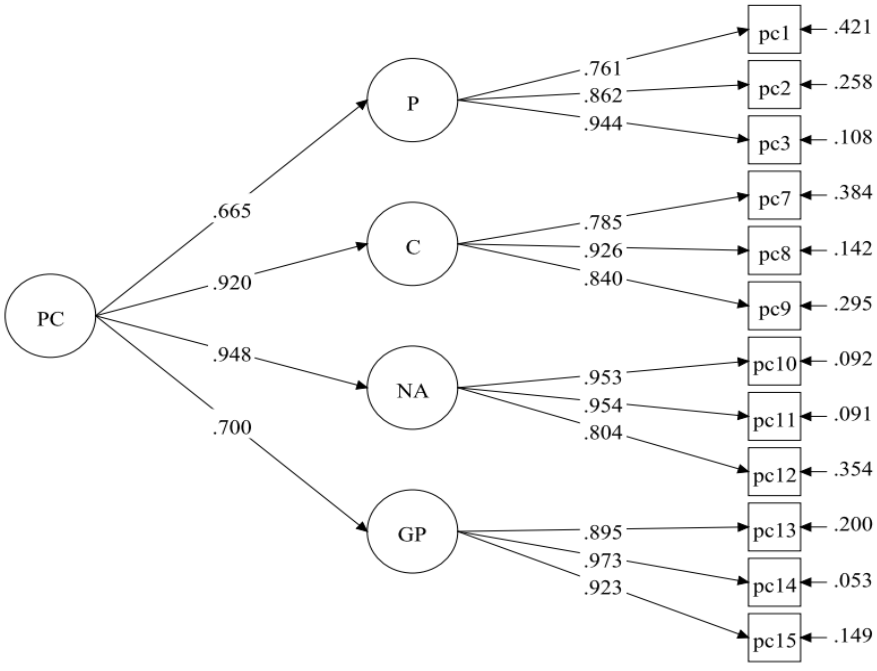


B

Figure 4 Confirmatory factor analysis according to the five facets of CPCQ (A) and the four facets of CPCQ (B) among total participants (n=566). ***Note*:** PC= Psychological collectivism, P= Preference, R= Reliance, C= Concern, NA= Norm acceptance, and GP= Goal priority.

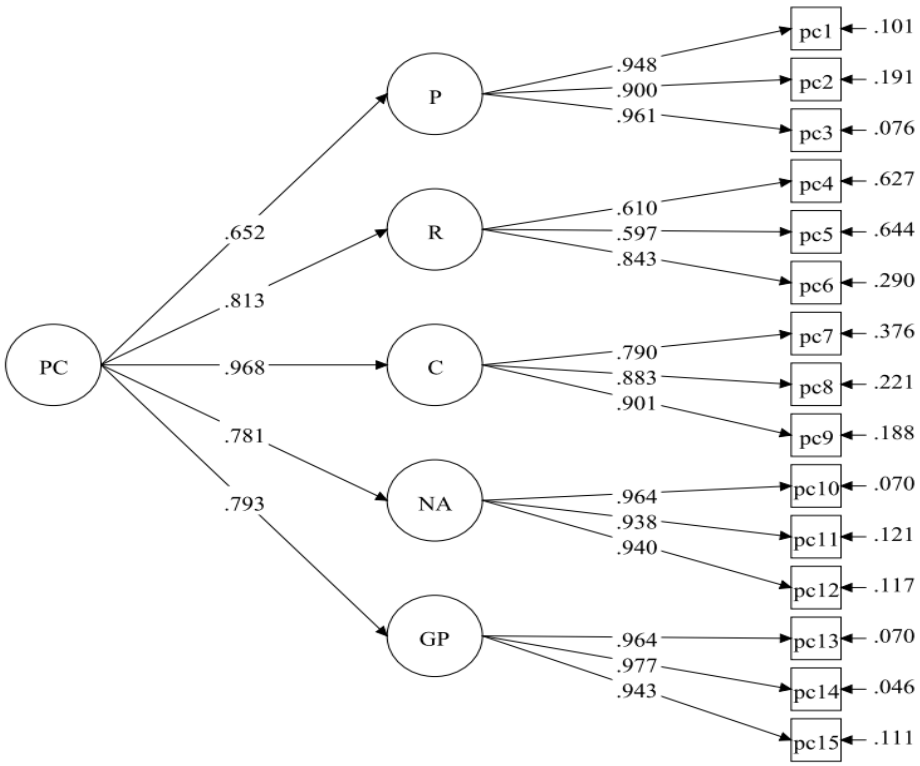


A

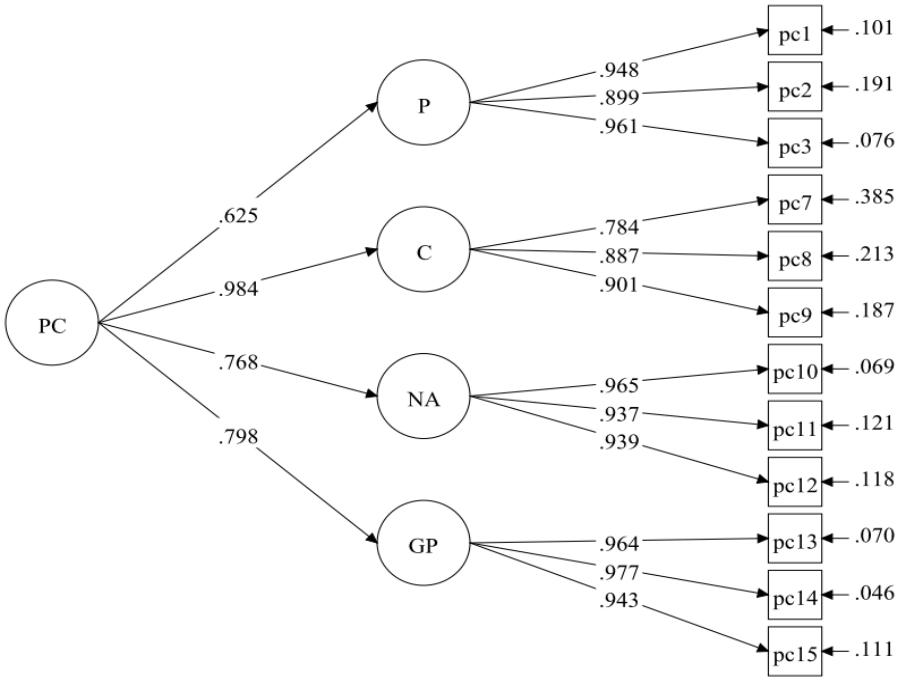


B

Figure 5 Confirmatory factor analysis according to the five facets of CPCQ (A) and the four facets of CPCQ (B) among boxing (n=186). ***Note*:** PC= Psychological collectivism, P= Preference, R= Reliance, C= Concern, NA= Norm acceptance, and GP= Goal priority.

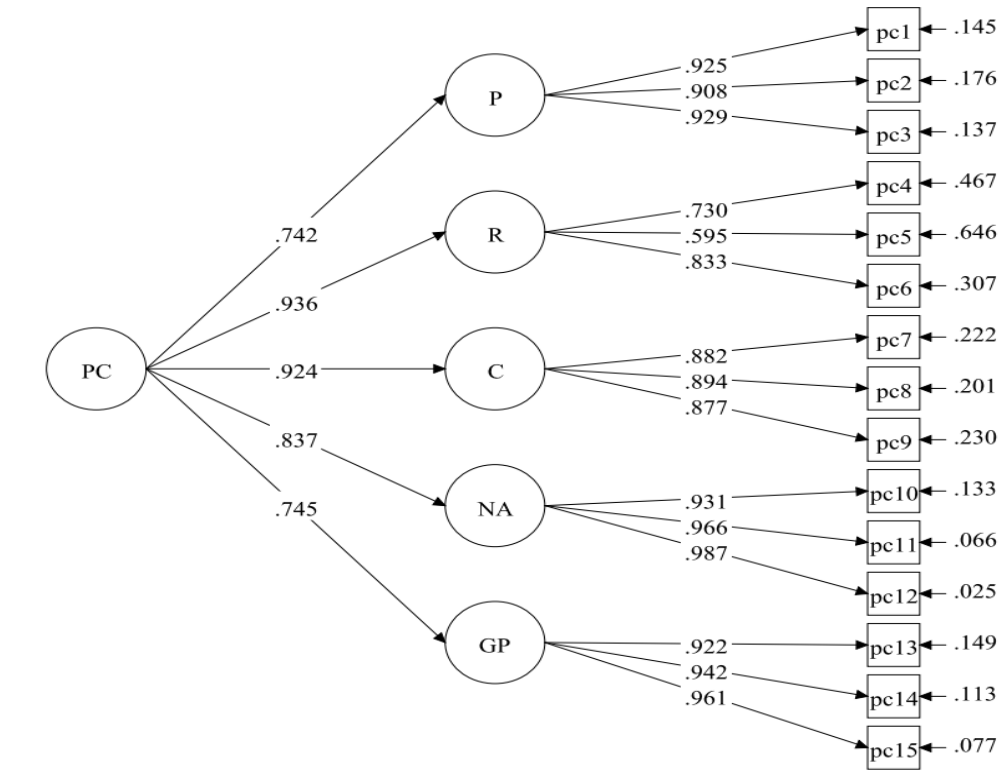


A

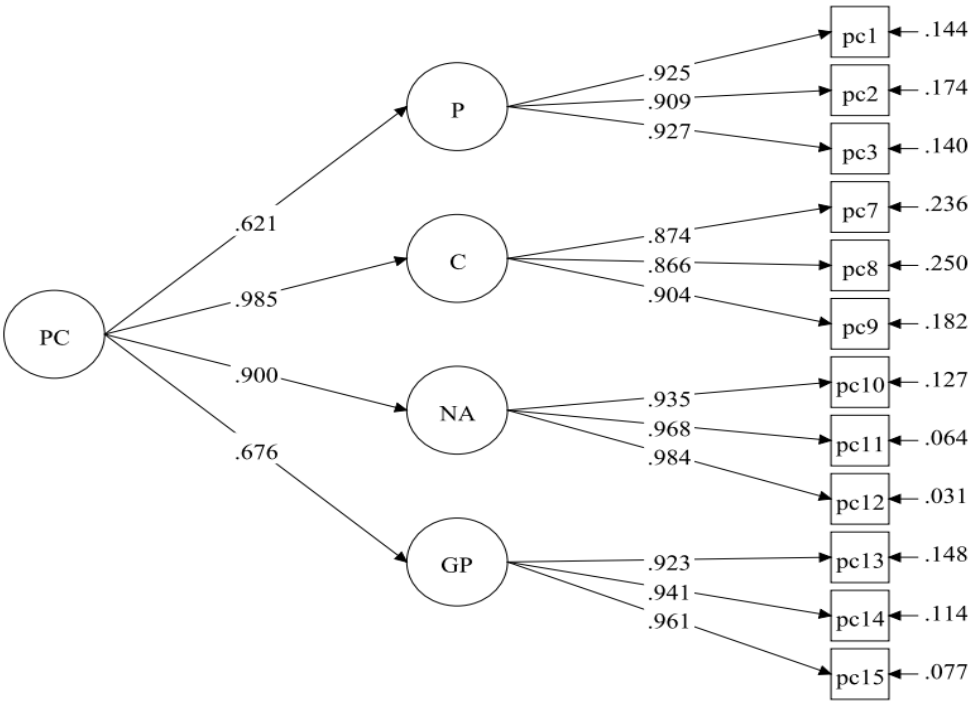


B

Figure 6 Confirmatory factor analysis according to the five facets of CPCQ (A) and the four facets of CPCQ (B) among non-boxing athletes (n=190). ***Note*:** PC= Psychological collectivism, P= Preference, R= Reliance, C= Concern, NA= Norm acceptance, and GP= Goal priority.



A



B

Figure 7 Confirmatory factor analysis according to the five facets of CPCQ (A) and the four facets of CPCQ (B) among college students(n=190). ***Note*:** PC= Psychological collectivism, P= Preference, R= Reliance, C= Concern, NA= Norm acceptance, and GP= Goal priority.

Internal reliability

Internal reliability and consistency were evaluated using Cronbach's alpha (α) and McDonald's omega (ω) (Hayes & Coutts, 2020). This showed good internal consistency in the CPCQ for the preference, norm acceptance, concern, and goal priority subscales for the overall participants as well as for non-boxing athletes and college students, as summarized in **Table 12.**

Subscale	Samples	McDonald's omega	Cronbach's Alpha
	Total participants	ω	α
Preference		.940	.939
Reliance		.750	.750
Concern		.902	.901
Norm acceptance		.961	.961
Goal priority		.964	.964
	Boxing		
Preference		.895	.892
Reliance		.762	.757
Concern		.888	.886
Norm acceptance		.934	.929
Goal priority		.950	.949
	Non-boxing athletes		
		ω	α
Preference		.955	.955
Reliance		.706	.702
Concern		.895	.891
Norm acceptance		.963	.963
Goal priority		.973	.973
	College students		
		ω	α
Preference		.943	.943
Reliance		.763	.759
Concern		.915	.915
Norm acceptance		.973	.973
Goal priority		.959	.959

Table 12 Descriptive Statistics, McDonald's omega(ω) and Cronbach's Alpha (α) Reliability Coefficients for the CPCQ among total participants (n=566), boxing (n=186), non-boxing athletes (n=190), and college students(n=190).

Network Analysis

Regarding the network structure, as in **Figures 8-11**, it can be seen visually that preference (items 1-3), concern (items 7-9), norm acceptance (items 10-12), and goal priority (items 13-15) form separate groups. Network analysis was used instead of CFA for better characterization of the data, forecasting associations between items, and clarifying the factor structure of the four CPCQ facets.

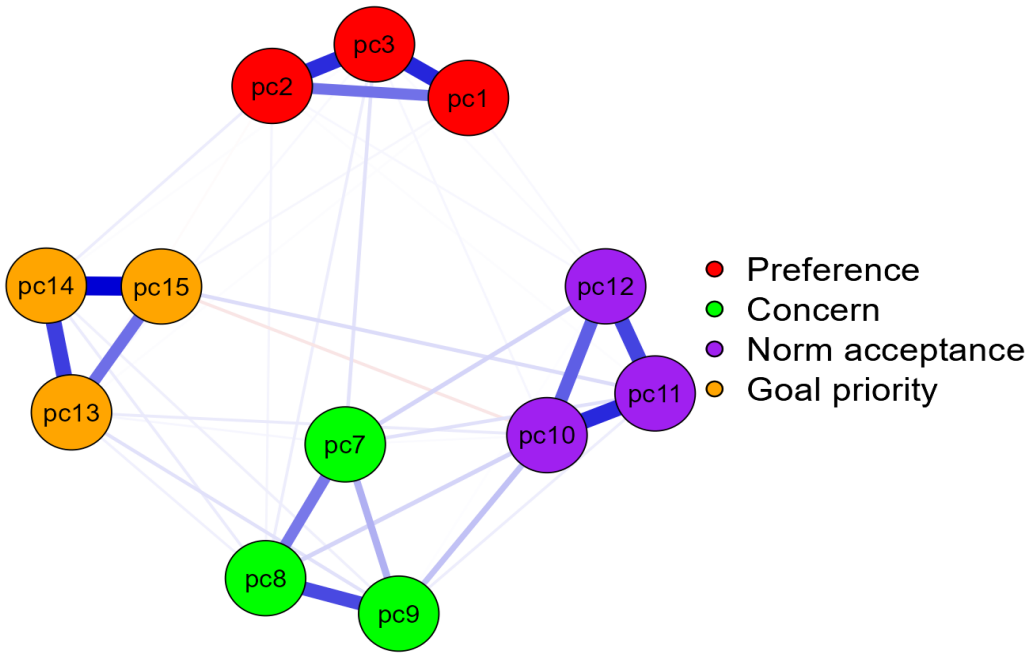


Figure 8 EBICglasso model based on network analysis according to the four facets of CPCQ among total participants (n=566). ***Note*:** Blue lines represent positive partial correlations between nodes, red lines represent negative partial correlations between nodes, and thicker lines represent higher partial correlations.

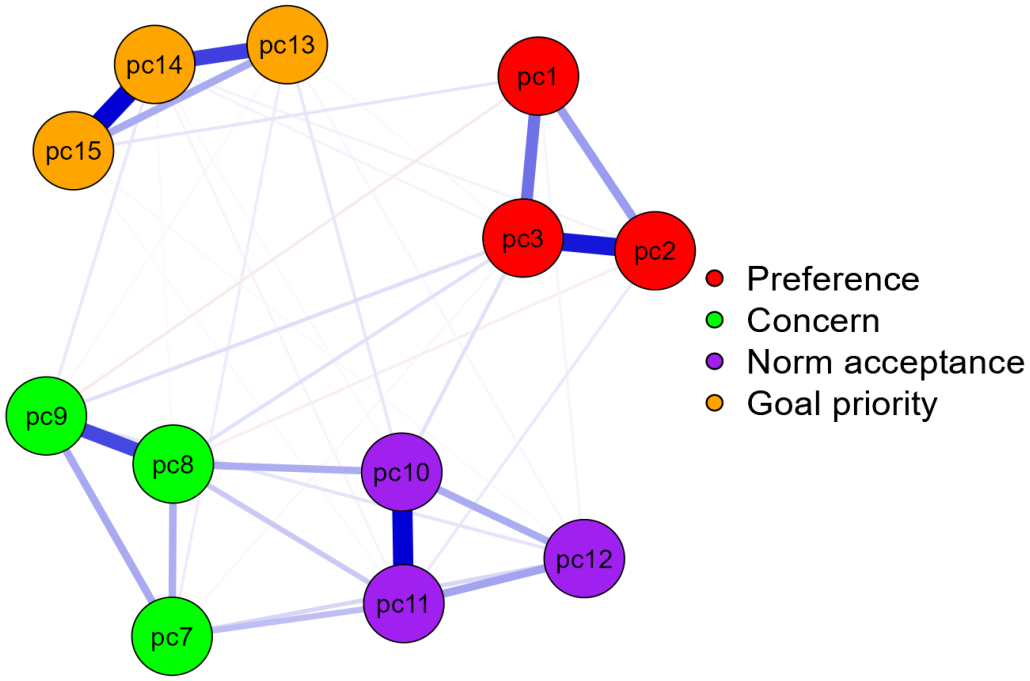


Figure 9 EBICglasso model based on network analysis according to the four facets of CPCQ among boxing (n=186).

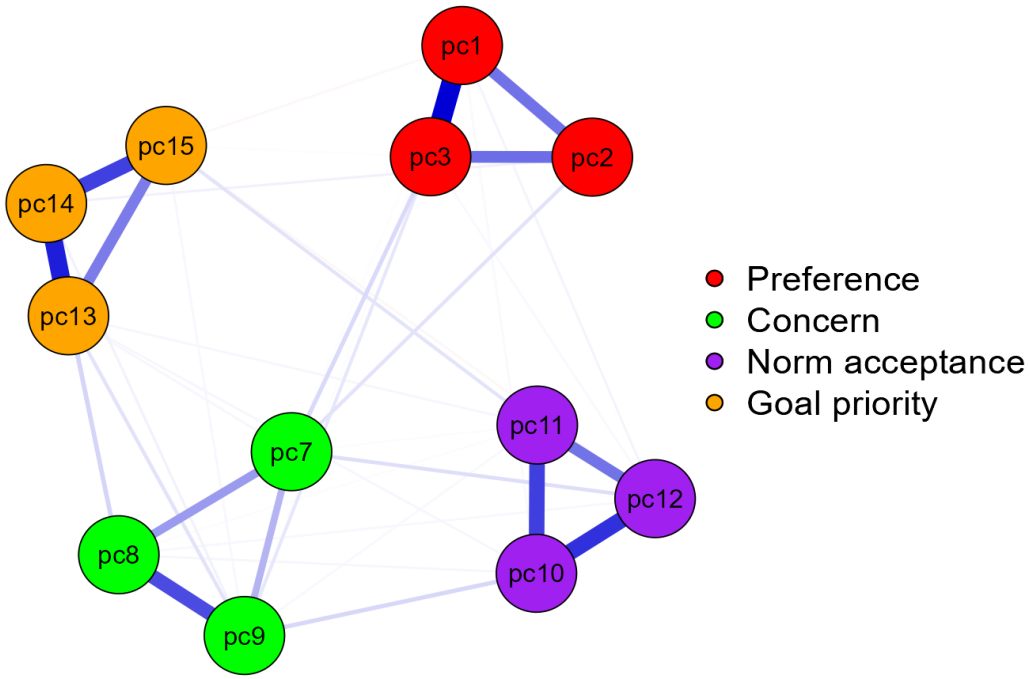


Figure 10 EBICglasso model based on network analysis according to the four facets of CPCQ among non-boxing athletes(n=190).

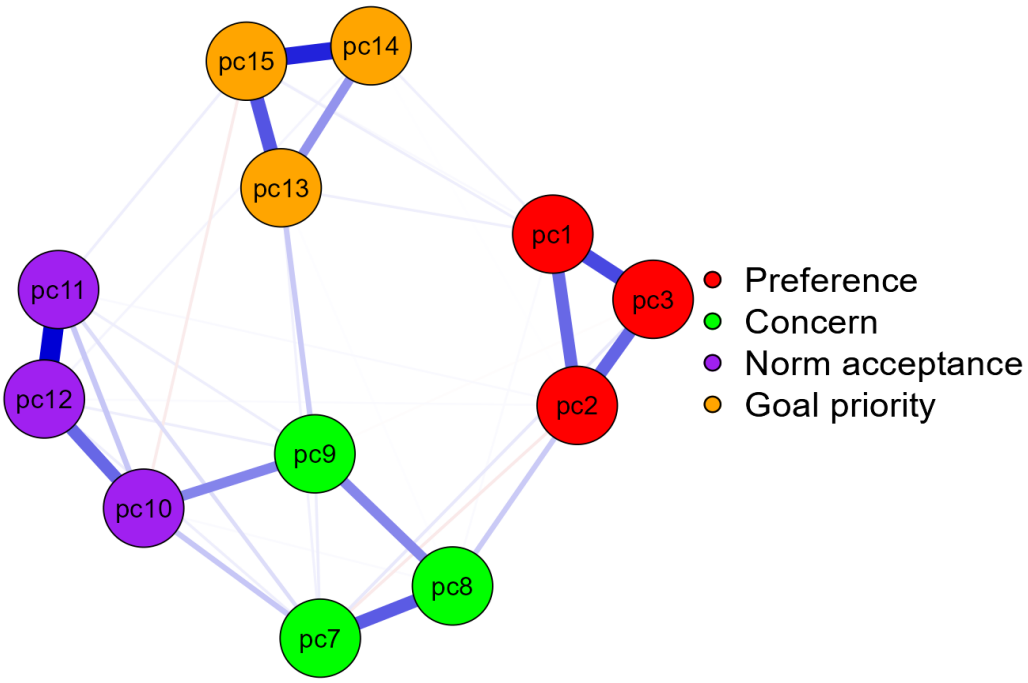


Figure 11 EBICglasso model based on network analysis according to the four facets of CPCQ among college students(n=190).

Sub-Study B Testing of the construct and convergent validity of the CPCQ

Results

Convergent validity

To further examine the CPCQ validity, convergent validity was determined by examination of correlations between the CPCQ Facets and other constructs, specifically, with self-control and self-construal in team athletes and college students. The results indicate that the CPCQ facets have satisfactory construct validity in team athletes and college students. More specifically, the CPCQ facets have good convergent validity, and psychological collectivism was positively correlated with self-control in team athletes and college students. In addition, self-expression vs.

harmony, and self-interest vs. commitment to others were negatively correlated with self-control among team athletes and college students. Please see **Table 13-14**.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1.Psychological collectivism	-											
2.Preference	.746***	-										
3.Concern	.913***	.530***	-									
4.Norm acceptance	.875***	.478***	.836***	-								
5.Goal priority	.842***	.395***	.773***	.705***	-							
6.Self-control	.263***	.057	.269***	.317***	.282***	-						
7.Restraint	.453**	.205**	.474***	.442***	.447***	.667***	-					
8.Non-impulsivity	.068	-.049	.064	.145*	.097	.895***	.263***	-				
9.Difference vs. Similarity	-.014	-.032	-.017	.048	-.034	.245***	-.031	.336***	-			
10.Self-direction vs. Receptiveness to influence	-.008	-.094	.002	.071	.021	.286***	.010	.376***	.493***	-		
11.Self-expression vs. Harmony	-.205**	-.088	-.193**	-.201**	- .224***	-.091	- .252***	.033	.112	.218***	-	
12.Self-interest vs. Commitment to others	- .310***	- .228***	- .287***	- .265***	- .267***	-.135*	- .229***	-.038	.079	.136*	.301***	-

Table 13 Convergent Validity Correlations in team athletes (n=280).
***Note*: *** p <.05, **p <.01, *** p <.001.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1.Psychological collectivism	-											
2.Preference	.764***	-										
3.Concern	.767***	.402***	-									
4.Norm acceptance	.726***	.322***	.658***	-								
5.Goal priority	.766***	.431***	.425***	.386***	-							
6.Self-control	.349***	.180**	.276***	.334***	.295***	-						
7.Restraint	.401***	.205**	.354***	.403***	.301***	.844***	-					
8.Non-impulsivity	.218***	.114	.140*	.192**	.218***	.888***	.502***	-				
9.Difference vs. Similarity	-.072	-.116	-.054	-.037	.000	.166***	.073	.206**	-			
10.Self-direction vs. Receptiveness to influence	-.137*	-.069	-.157**	-.175**	-.050	.078	.040	.092	.098	-		
11.Self-expression vs. Harmony	-.051	.136*	-.159**	-.149*	-.064	-.067	-.109	-.015	.029	.238***	-	
12.Self-interest vs. Commitment to others	-.275***	-.131*	-.238***	-.151*	-.317***	-.125*	-.174**	-.051	-.054	.135*	.157**	-

Table 14 Convergent Validity Correlations in college students (n=280).
***Note*: * p <.05, **p <.01, *** p <.001.**

Discussion

The principal objective of this study was to examine the factorial and construct validity of the CPCQ among Chinese athletes and college students. Network analysis showed unexpected relationships between facets of differing strengths between samples. Confirmatory factor analysis showed that the four facets of the CPCQ had a good fit among boxing and non-boxing athletes, and college students. Internal reliability analysis indicated good reliability of the four CPCQ facets in boxing and non-boxing athletes and college students. Correlational analyses indicated that the four facets of the CPCQ had satisfactory construct validity among team athletes and college students. Thus, for the CPCQ, four facets (preference, concern, norm acceptance, and goal priority) were identified, which appear to combine to form a reliable and valid measurement of psychological collectivism in Chinese samples.

Confirmatory factor analysis and network analysis

Confirmatory factor analysis shows that, among Chinese samples, a model of the CPCQ with four facets had better fitness than a model with five facets. The results are not consistent with the model fit of the original five facets (Jackson et al., 2006) of the Psychological Collectivism Questionnaire. The original five facets of the Psychological Collectivism Questionnaire were developed based on data from full-time employees in the United States (Jackson et al., 2006). The participants in this study were Chinese college students and adult athletes. The original five facets of the

Psychological Collectivism Questionnaire were not fully applicable to the Chinese sample because of cultural differences between China and the USA, differences in test participants, and biases in understanding across participants. Furthermore, the factor loading of the reliance facet item, "I was not bothered by the need to rely on group members," in the Chinese sample was lower than 0.7. When performing confirmatory factor analysis, the general factor loading value needs to be greater than 0.7 to meet the standard (Hair et al., 2010). Therefore, the reliance facet of the Psychological Collectivism Questionnaire was deleted from the Chinese sample. Overall, our results support the development of the new four-facet model of the CPCQ for testing Chinese college students and adult athletes. Moreover, this study's EBICglasso model, based on network analysis, checks the item distribution of the CPCQ in Chinese samples. Network analysis has become an important method used by researchers to assess the structure of scales (Lecuona et al., 2021; Li, Niu, et al., 2022). The findings of the network analysis also support the four-facet model of the CPCQ among Chinese samples.

Internal consistency

The results showed that the internal consistency of the CPCQ was good (α =.938 and ω =.933 in boxing, α =.941 and ω =.940 non-boxing athletes, and α =.939 and ω =.951 college students). The CPCQ met the psychometric requirements for all indicators of internal consistency in the Chinese sample (Cortina, 1993; Streiner,

2003). In addition, the internal consistency of the CPCQ results was consistent with those of athletes (Gu & Xue, 2022) in China and similar to those of the original version of the Psychological Collectivism Questionnaire (Jackson et al., 2006). Thus, the CPCQ has shown good stability and consistency across groups. Furthermore, the Psychological Collectivism Questionnaire shows cross-cultural applicability, and the CPCQ can be used as a reliable measurement tool to assess psychological collectivism in Chinese college students and athletes.

Convergent validity

Correlation analysis revealed that the four facets of the CPCQ were significantly correlated in the Chinese sample, which is consistent with the results of the original PCQ (Jackson et al., 2006). Regarding the convergent validity of the CPCQ, this study used the Chinese Self-Construal Scale (Vignoles et al., 2016) and the Chinese Brief Self-Control Scale (Liang et al., 2022). Our findings suggest that psychological collectivism is correlated with different dimensions of self-construal in different Chinese samples, a result similar to that of Vignoles et al.(Vignoles et al., 2016). These correlation results not only support the convergent validity of the CPCQ, but the differences in the two correlations across Chinese samples also reflect its good discriminant validity. In addition, this study also observed that psychological collectivism was significantly and positively linked with self-control in Chinese samples. These results support ecological systems theory (Bronfenbrenner, 1979), but

also provide new evidence for the findings of previous studies (Li et al., 2018; Pokhrel et al., 2018).

Conclusion

The CPCQ appears to consist of not five but only four facets. We recommend using the four facets questionnaire in the future.

3.3 Study 3 Psychological collectivism and trait self-control in Chinese adult athletes and college students: A network analysis

Background

Being able to exert self-control is seen as a determinant of individual success and well-being; for example, high self-control yields different positive outcomes in life such as better health, less maladaptive adjustments, higher academic achievements, and more interpersonal success (Baumeister et al., 2007; Rothbart et al., 2000; Tangney et al., 2004). Conversely, low self-control has been linked with numerous social and psychological problems, such as obesity (Tsukayama et al., 2010), academic failure (Duckworth & Seligman, 2005), impulsive spending (Vohs & Faber, 2007), substance abuse (Baumeister & Vonasch, 2015), aggression (Achterberg et al., 2016), and depression (Özdemir et al., 2014). In recent years, self-control has become one of the topics of interest for researchers in sports psychology (Liang et al., 2022; Shubert et al., 2022; Yun et al., 2022). A positive correlation between self-control and

sports performance has been established (Liang et al., 2022; Toering & Jordet, 2015). Successful self-control can help athletes focus on achieving excellent competition results in high-pressure environments (Englert, 2017). Other researchers have found that elite athletes have higher levels of self-control than non-elite athletes (Martin et al., 2016). While research has provided evidence for the significance of self-control in different domains of functioning, it is, of course, also of interest in terms of which factors influence self-control and which factors affect the development or acquisition of self-control. Based on Hofstede's model (Hofstede, 1980) China individualism score is 20 and it is a country with a typical collectivist culture. Triandis argues that people in a collectivist culture are likely to be collectivism (Triandis, 2001). In general, Chinese children grow up and live with their parents or other family members, and they develop concepts that prioritize the goals of the internal group (especially the family) and maintain the harmony of the social environment, which are reflective of collectivism (Hofstede, 1980; Markus & Kitayama, 1991; Oyserman, 1993). Also, from the perspective of the diversity of samples, the different living environments of college students and athletes may affect the level of collectivism. Athletes will be taught to put team performance first in life and training, which will help develop athletes' collectivism. College students live and study more independently in an environment that lacks collectivist values.

First, evidence from Study 1 indicated that collectivism is positively linked with self-control. Second, Study 2 validated the Chinese version of the Four Facets

Psychological Collectivism Questionnaire as being both reliable and valid as a measure of psychological collectivism in Chinese adult athletes and college students. Psychological collectivism mainly follows the 4 facets of the multidimensional composition: 1. Preference: Collectivist individuals prefer to live within groups and maintain good relationships with group members. 2. Concern: The motivation of collectivists is not self-interest but concern for the well-being of the group and members of the group. 3. Norm acceptance: Collectivists abide by group norms and rules to actively maintain harmony within the group. 4. Goal priority: Collectivists think of the in-group interest first and foremost. In this section, the principal objective of the current study 3 was to investigate the association between different facets of psychological collectivism with trait self-control and examined the relationship varied among different Chinese samples. We collected data through self-reporting. In addition, we performed Confirmatory factor analysis, correlations analysis, network analysis, and independent samples t-test on the data.

Method

Samples

From 9 May to 25 July 2023, a total of 400 participants from Chinese universities, sports clubs, and sports centers took part in an online survey. The study design was cross-sectional and convenience sampling was used via an online survey (Sojump). After excluding 12 participants providing incomplete data, 188 adult athletes (78

males, 104 females, and 6 no report;18 to 33 years, M=21.88, SD=3.07) and 200 college students (44 males, 140 females, and 16 no report; 18 to 23 years, M=19.88, SD=1.25).

Procedures and Material

Before performing the survey, every participant was told of the study's objective, and the informed consent form was also acquired. The freedom to stop the study procedure or to stop participating at any point is emphasized to participants. The survey consists of the following questionnaires: demographic information, the Chinese versions of the Psychological Collectivism Questionnaire, and the Chinese versions of Brief Self-Control. The approximate time to answer was 10 minutes.

Measures

The Chinese version of the Brief Self-Control Scale

The Chinese version of the 8-item Brief Self-Control Scale was translated and adapted from the 13-item Brief Self-Control Scale (Liang et al., 2022). The scale has eight items graded on a 5-point scale (“1 = not at all like me”, “5 = very much like me”), such as “People would say that I have iron self-discipline” and “Pleasure and fun sometimes keep me from getting work done”. The scale has two dimensions, namely, restraint and non-impulsivity. Higher summed scores reflect greater self-control. The scale has been validated and used in Chinese adult athletes and college students,

showing good psychometric properties (Kuang et al., 2023; Liang et al., 2022). The Cronbach's alpha and McDonald's omega for study 3 was adult athletes and college students α=.669 ~.698, adult athletes and college students ω=.704 ~ .720.

The Chinese versions of the Psychological Collectivism Questionnaire from Study 2

This questionnaire assesses four facets of psychological collectivism, namely, preference, norm acceptance, concern, and goal priority. Twelve items are included, with each facet assessed by three items on a 5-point scale (1 = strongly disagree to 5 = strongly agree), such as "I followed the procedures used by those groups" and "Group goals were more important to me than my personal goals". In study 3, the total amount and each facet of Cronbach's alpha in adult athletes (α= .889 ~ .960) and college students (α= .849 ~ .950), and McDonald's omega in adult athletes (ω=.896 ~.960) and college students (ω= .814 ~ .950).

Statistical analyses

Descriptive analysis, internal reliability, Pearson's correlations analysis, and independent samples *t*-test were conducted utilizing SPSS 22.0. Confirmatory factor analysis (CFA) was performed with *Mplus* 8.0. In recent years, network analysis has been widely used in psychological research (Borsboom et al., 2021), such as social psychology (Dalege et al., 2018), personality psychology (Liu et al., 2023), clinical

psychology (Borsboom & Cramer, 2013), and sports psychology(Liebel et al., 2023). Network analysis is a graph-theoretic approach to establish a network of relationships between observed variables, and the interrelationships can be evaluated by calculating the centrality indices of the nodes and the weights of the connecting lines. The EBICglasso model was used for assessing network structures and characteristics, as suggested by Epskamp and Fried (Epskamp & Fried, 2018), using the least absolute shrinkage and selection operator (LASSO) (Friedman et al., 2008) and the Extended Bayesian Information Criterion (EBIC) (Chen & Chen, 2008). Solid lines indicate partial positive correlations between nodes, dashed lines indicate partial negative correlations between nodes, and thicker lines indicate higher partial correlations. We estimated the influence of the variables in the network via the expected influence measure. The method considers the effects of all variables within the network, and reduces associations that do not contribute relevant information to zero, thus using only the most relevant associations and penalizing weights on sample sizes to prevent false-positive associations (Foygel & Drton, 2010). The expected influence indicates the significance of a factor considering both positive and negative links between nodes, thus providing a more realistic assessment. Network analyses were performed in *JASP* 0.16.0.

Ethics

All procedures in this study were in accordance with the Declaration of Helsinki, and

the study protocol was approved by the Ethics Committee of Technische Universität München (2022-397-S-KK). Informed consent was provided by all participants.

Results

Cross-Validation of Factor Structure

An additional second-order confirmatory factor analysis was performed for further cross-validation of the four CPCQ facets in Study 2. The model showed a strong fit in adult athletes and college students: $\chi 2/df$=2.398, CFI= .971, TLI= .961, RMSEA= .086, RMSEA 90% CI=.067~.106, SRMSR=; and $\chi 2/df$= 2.269, CFI= .967, TLI= .957, RMSEA= .080, RMSEA 90% CI= .060 ~.099, SRMSR= .048. The internal reliability total amount and each facet of Cronbach's alpha in adult athletes (α= .889 ~ .960) and college students (α= .849 ~ .950), and McDonald's omega in adult athletes (ω=.896 ~.960) and college students (ω= .814 ~ .950).

Pearson's correlation analysis

Table 15 presents correlations between the relationships between psychological collectivism and trait self-control in adult athletes and college students.

Samples	Variables	1	2	3	4	5	6	7	8
Adult athletes	*M*	3.38	3.64	3.12	4.10	4.06	4.28	4.29	3.76
	SD	.56	.56	.82	.64	.92	.63	.64	.93
	1.SC	-							
	2.RE	.702***	-						
	3.NI	.875***	.269***	-					
	4.PC	.174*	.287***	.039	-				
	5.PR	.026	.156*	-.071	.800***	-			
	6.CO	.236***	.345***	.085	.837***	.546***	-		
	7.NA	.252***	.318***	.124	.837***	.543***	.760***	-	
	8.GP	.116	.181*	.034	.806***	.459***	.555***	.555****	-
College students	*M*	3.03	3.30	2.77	3.77	3.32	4.02	4.21	3.51
	SD	.45	.46	.64	.51	.89	.64	.54	.75
	1.SC	-							
	2.RE	.734***	-						
	3.NI	.871***	.307***	-					
	4.PC	.167*	.282***	.030	-				
	5.PR	.073	.196**	-.039	.728***	-			
	6.CO	.130	.204**	.034	.778***	.398***	-		
	7.NA	.098	.251***	-.044	.631***	.264***	.406***	-	
	8.GP	.183**	.175*	.131	.716***	.245***	.484***	.322***	

Table 15 The mean value, standard deviation, and correlations of study variables in adult athletes (n=188) and college students (n=200). ***Note*:** SC=Self-Control, RE=Restraint, NI=Non-impulsivity, PC=Psychological Collectivism, PR=Preference, CO=Concern, NA=Norm Acceptance, and GP=Goal Priority. *$p < .05$, ** $p < .01$, *** $p < .001$.

Network analysis

Figure 12 presents connections among variables in Chinese adult athletes. Restraint presented positive associations with concern and norm acceptance, and non-impulsivity presented negative associations with preference in adult athletes. **Figure 12** illustrates the expected influence of the network variables in adult Chinese athletes.

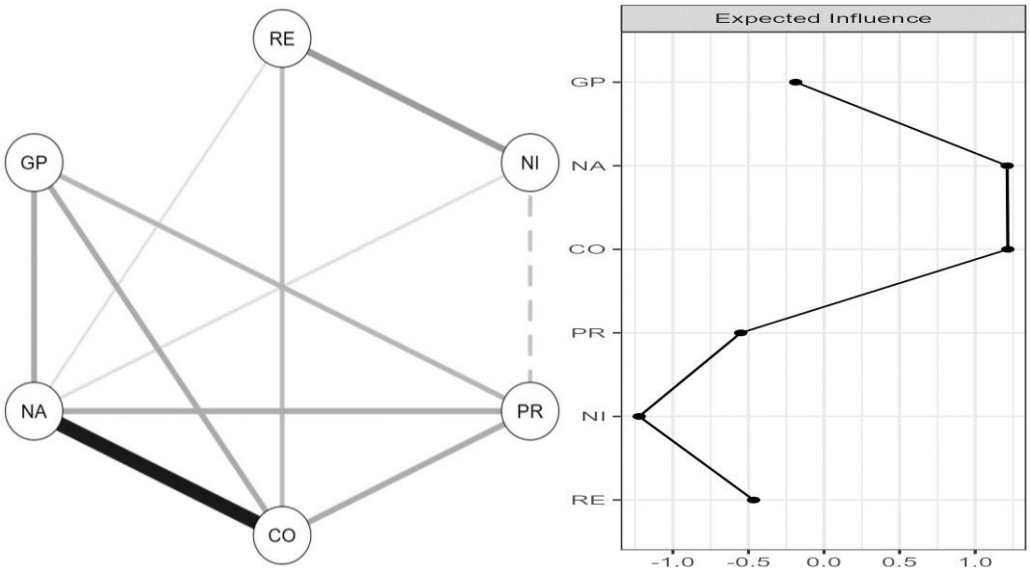


Figure 12 Network analysis representation in Chinese adult athletes and expected Influence of variables in the network. Solid lines represent positive partial correlations between nodes, dashed lines represent negative partial correlations between nodes, and thicker lines represent higher partial correlations. ***Note*:** RE=Restraint, NI=Non-impulsivity, PR=Preference, CO=Concern, NA=Norm Acceptance, and GP=Goal Priority.

Figure 13 presents connections among variables in Chinese college students. Restraint presented positive associations with preference, concern, norm acceptance, and goal priority, and non-impulsivity presented negative associations with preference and norm acceptance in college students. **Figure 13** illustrates the expected influence of network variables on Chinese college students.

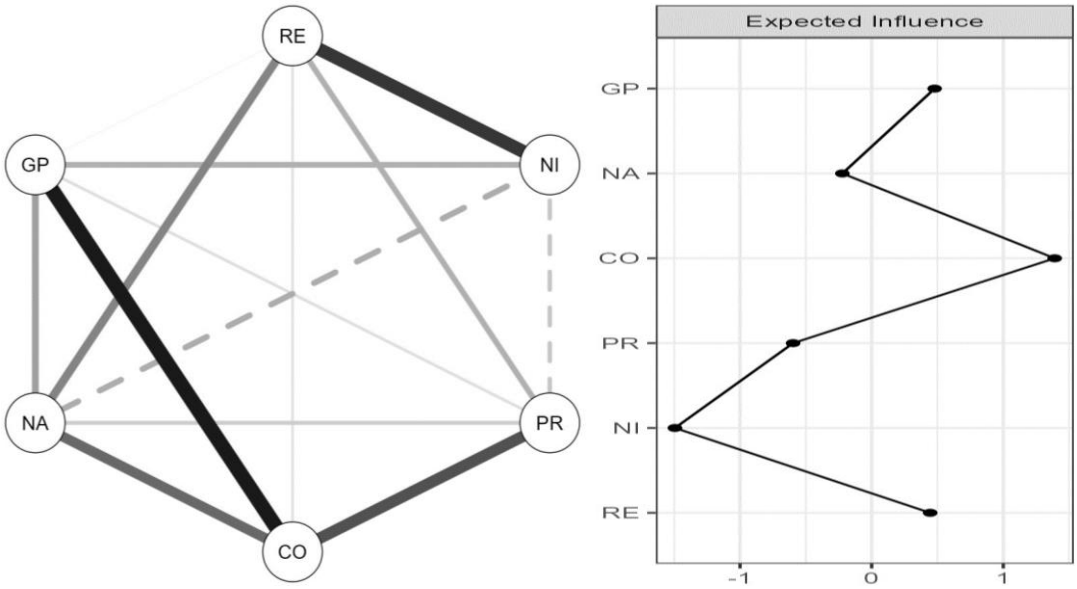


Figure 13 Network analysis representation in Chinese college students and expected Influence of variables in the network. Solid lines represent positive partial correlations between nodes, dashed lines represent negative partial correlations between nodes, and thicker lines represent higher partial correlations. ***Note*:** RE= Restraint, NI=Non-impulsivity, PR=Preference, CO=Concern, NA=Norm Acceptance, and GP=Goal Priority.

Independent-samples *t*-tests

The results indicated that the adult athletes' self-control, restraint, non-impulsivity, psychological collectivism, preference, concern, norm acceptance, and goal priority scores were significantly higher than those of college students (**Table 16).**

Variables	**Samples**	M	SD	Cohen's *d*	*t*	*p*
Self-control	Adult athletes	3.38	.56	.686	6.76***	<.001
	College students	3.03	.45			
Restraint	Adult athletes	3.64	.56	.676	6.65***	<.001
	College students	3.30	.46			
Non-impulsivity	Adult athletes	3.12	.82	.471	4.634***	<.001
	College students	2.77	.640			
Psychological Collectivism	Adult athletes	4.01	.64	.576	5.67***	<.001
	College students	3.77	.51			

Table 16 Independent sample t-test results of self-control, restraint, non-impulsivity, and psychological collectivism in adult athletes (n=188) and college students (n=200).

Discussion

Here, the influence of the facets of psychological collectivism on self-control in Chinese subjects was explored. First, a correlation analysis investigated the relationship between the facets of collectivism (preference, norm acceptance, concern, and goal priority) and self-control dimensions (restraint and non-impulsivity) in Chinese samples. Second, network analysis was used to investigate the relationships between the facets of collectivism and self-control in Chinese samples to identify variables that affect self-control dimensions. Finally, independent-sample t-tests were used to assess the differences in each variable between adult athletes and college students.

Correlation analysis

This showed that psychological collectivism was positively correlated with trait self-control among adult athletes and college students. These findings are consistent with the results of earlier studies (Li et al., 2018). Our results show that preference and goal priority are positively correlated with restraint, and concern and norm acceptance have a high positive correlation with restraint in adult athletes and college students. In a social environment, people need to accept the norms within the group to restraint their behavior in order to promote harmony within the group. In order to maintain good collective and harmonious relationships within the group, it is not only necessary to concern the interests of the group, but also to restrain individual desires

and control negative emotions. This study found a stable relationship between psychological collectivism facets (concern and norm acceptance) and restraint in different samples, further showing that this relationship is universal across samples. Therefore, intervening in psychological collectivism facets (concern and norm acceptance) may be an effective way to improve restraint.

Network analysis

Network analysis found that restraint had positive associations with concern and norm acceptance, and non-impulsivity had negative associations with preference in adult athletes. Furthermore, network analysis found that restraint had positive associations with preference, concern, norm acceptance, and goal priority, and non-impulsivity had negative associations with preference and norm acceptance in college students. This confirms the influence of psychological collectivism facets on trait self-control dimensions in different samples. Psychological collectivism facets (concern and norm acceptance) as stable cultural orientations in social norms, can regulate individual restraint. Therefore, this study identified a possible new intervention pathway, i.e. cultural orientation, for enhancing individual restraint from a new perspective.

The independent samples *t*-test

Comparison of the scores of psychological collectivism and self-control in adult athletes and college students showed that the psychological collectivism, restraint,

non-impulsivity, and trait self-control scores of adult athletes were significantly higher than those of college students; there were no differences in the other variables. One possible reason for this is that college students lack the influence of collectivist environments on their normal lives and studies. However, for athletes, it is necessary to establish the value of collectivism in training and life, and to train hard for the team's performance. Therefore, the psychological collectivism scores of adult athletes were higher than those of college students. By contrast, in previous empirical studies (Gu & Xue, 2022; Mayfield et al., 2016), athletes' psychological collectivism scores were higher than those of the general population. Earlier studies have also observed higher levels of self-control in adult Chinese athletes relative to adult students (Liang et al., 2022). Athletes not only need to face the pressure of life and study, but also need to think about improving their athletic performance in order to achieve excellent athletic performance, so they need to have stronger self-control.

Conclusion

Overall, this network analysis clarifies the association between psychological collectivism facets and trait self-control dimensions in Chinese samples. Our results show that concern, norm acceptance, and restraint are significantly and positively related among adult athletes and college students. Second, network analysis found that the link between psychological collectivism facets and trait self-control dimension was somewhat different in Chinese samples. These results clarify the links

between observed psychological collectivism facets (concern and norm acceptance) and restraint in Chinese samples, which may provide a potential theoretical basis for future interventions.

4 General Discussion

Based on Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979), this dissertation examined the influence of cultural orientation on self-control. This dissertation consists of three studies. Regarding the research question 1: "How are individualism and collectivism related to self-control, and what are possible factors that influenced the results?" Results of Study 1 showed that (1) individualism was not correlated with self-control, but collectivism was positively correlated with self-control, and (2) the higher the age of the sample, the stronger the relationship between collectivism and self-control, and (3) stronger relations for self-reported measures of self-control, also if the Asian-American values and Korean-American acculturation scale measure was used, and (4) a stronger association between individualism–collectivism and self-control was observed with an increase in the proportion of male respondents. With respect to the research question 2: "What is the relationship between psychological collectivism and trait self-control in Chinese samples?" This question was tested both in Study 2 and 3. Results of Study 2 showed that in the Chinese version of the Psychological Collectivism Questionnaire four facets were identified which appear to combine to are liable and valid measurement of psychological collectivism in Chinese samples. Study 2 provided a good and reliable collectivism questionnaire for Study 3 to assess the relationship between psychological collectivism facets and trait self-control dimensions in Chinese samples. Study 3 employed network analysis results to show that psychological collectivism

facets (concern and norm acceptance) and restraint are significantly positively correlated in Chinese adult athletes and college students, which may provide a potential theoretical basis for future interventions.

4.1 Study 1: The relationship between individualism-collectivism and self-control: A meta-analysis and systematic review

In recent years, there have been studies on individualism-collectivism and self-control, but these studies have found inconsistent results (Kim et al., 2015; Li et al., 2018; Miconi et al., 2019; Pokhrel et al., 2018).Therefore, to clarify and understand the relationship between individualism-collectivism and self-control, Study 1 used a meta-analysis and systematic review to explore the relationship between the two with possible moderating factors. The results of Study 1 indicated that collectivism was significantly and positively related to self-control, whereas individualism was not related to self-control. Although Study 1 was unable to confirm a causal relationship between collectivism and self-control, collectivism may be an important predictor of self-control. Interestingly, Study 2 and 3 found that psychological collectivism was positively related to trait self-control among Chinese adult athletes and college students. This finding not only validated Study 1 but also demonstrated the generalizability and stability of the relationship across samples.

The results of Study 1 support Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979) that posits culture and social norms affect the development of

individuals in microscopic systems. In social life, individuals must follow social norms to promote prosocial behavior and restrain antisocial behavior to promote social harmony. Previous studies have suggested that social norms are the source of self-control and that there is a close relationship between the two (Buckholtz, 2015; DeBono et al., 2011). Collectivist cultures emphasize the importance of placing the interests of the group above those of the individual, adhering to cultural and group norms that align the individual with the group, and harmonious relationships within the group. Collectivist social norms guide children in exercising self-control, suppressing personal desires, and controlling negative emotions to maintain good and harmonious relationships.

Seeley and Gardner (Seeley & Gardner, 2003) found through an experimental study that individuals with a collectivist orientation were more motivated to exercise self-control on a daily basis than individuals with an individualistic orientation. Previous studies have shown that self-control exercises are effective in improving self-control (Muraven, 2010; Muraven & Baumeister, 2000). Indeed, a meta-analysis found that individuals who practiced self-controlled tasks gained greater self-control (Friese et al., 2017). Furthermore, it is plausible that collectivist individuals must follow the social norms of their culture, and these social norms guide individuals to exercise self-control in conflict situations, which gradually leads to the capitalization of self-control behaviors, thus enhancing their self-control ability. By contrast, individualistic cultural tendencies emphasize the interests of the individual, and individualists' social

lives are less pressured by social norms and may exhibit lower self-control. Thus, the results of Study 1 indicating that collectivism is positively related to self-control, whereas individualism is not, is a valid conclusion. Moreover, it should be noted that the relationship between collectivism and self-control was moderated by age and gender. This result reminds us that we should consider these moderating variables when exploring the relationship between cultural orientation and self-control in the future, which in turn can better clarify and explain the relationship.

In summary, Study 1 clarified the relationship between individualism-collectivism and self-control. In particular, this study advances our understanding of the relationship between collectivism and attitudes toward self-control, not self-control ability. The findings of Study 1 provided empirical data and theoretical support for Study 2 and 3 and served as a guiding direction for the exploration of psychological collectivism and self-control in Study 2 and 3. Study 2 and 3 clarified whether the relationship between collectivism and self-control differed between Chinese adult athletes and college students.

4.2 Study 2: The Psychological Collectivism Questionnaire (PCQ): Factorial and construct validity across Chinese samples

Study 2 examined the factorial and construct validity of the Chinese-translated Psychological Collectivism Questionnaire (PCQ) among Chinese adult athletes and college students. Through confirmatory factor analysis, Study 2 found that four facets

of the Psychological Collectivism Questionnaire were applicable to the Chinese sample. Accordingly, the evaluation of internal consistency indicated the four facets also had good reliability. These findings are inconsistent with the five facets identified in the original Psychological Collectivism Questionnaire. This inconsistency with the original Psychological Collectivism Questionnaire maybe because it was developed on a U.S. sample, and cultural differences between the U.S. and China may have led to differences in participants' understanding of the items. Furthermore, although in a previous study the five facets demonstrated good internal consistency reliability in a Chinese sample (Gu & Xue, 2022), no study has evaluated the factorial and construct validity of the Psychological Collectivism Questionnaire in a Chinese sample. Therefore, Study 2 fills this gap and provides support for four facets of the Psychological Collectivism Questionnaire as applicable to Chinese samples.

Furthermore, using self-control and self-construal as criterion variables, this study found that the total score for psychological collectivism and each facet were significantly correlated with self-control and self-construal. Thus, the convergent and structural validity of the four facets of the Chinese-translated Psychological Collectivism Questionnaire is good. In sum, the results of Study 2 showed that four facets of the Psychological Collectivism Questionnaire were reliable and valid measures of psychological collectivism among Chinese adult athletes and college students. Therefore, the results of Study 2 provide a good and reliable collectivism questionnaire for Study 3 to explore the relationship between psychological

collectivism facets and trait self-control dimensions in Chinese adult athletes and college students.

4.3 Study 3: Psychological collectivism and trait self-control in Chinese adult athletes and college students: A network analysis

Study 3 used Pearson's correlation analysis, network analysis, and an independent samples t-test to explore the relationship between psychological collectivism and trait self-control among Chinese adult athletes and college students. Study 3 demonstrated the predictive validity of the Chinese version of the Psychological Collectivism Questionnaire using a different sample of Chinese adult athletes and college students. The results of Study 2 confirm that four facets of the Psychological Collectivism Questionnaire can be used to assess the level of collectivism in Chinese adult athletes and college students and, therefore, explore the relationship of psychological collectivism on trait self-control in Chinese samples.

First, the results of Study 3 found that psychological collectivism is positively related to trait self-control among Chinese adult athletes and college students. The results of Study 3 not only support the results of Study 1 and 2 but are also consistent with the results of previous studies (Li et al., 2018). Collectivist individuals place collective interests above personal interests and abide by social norms, so they need more self-control in social situations, which would explain why psychological collectivism can positively predict self-control. In addition, Study 3 also found that preference and goal

priority are positively correlated with restraint, and concern and norm acceptance have a high positive correlation with restraint in adult athletes and college students. This also reminds us that subsequent research should consider that different facets of psychological collectivism affect different dimensions of trait self-control in different samples.

Second, network analysis revealed that psychological collectivism facets (concern and norm acceptance) were positively correlated with the weights of trait self-control dimensions (restraint). Liang and colleagues (Liang et al., 2022) found that the restraint aspect of self-control was significantly and positively associated with athletic performance in Chinese adult athletes and significantly positively associated with academic performance in Chinese college students. Therefore, the results of Study 3 provide some value for the possibility of enhancing the athletic performance of Chinese adult athletes and the academic performance of Chinese college students. Researchers should conduct further studies on psychological collectivism and restraint and the underlying mechanism of their relationship.

Finally, the independent samples t-test found that Chinese adult athletes scored significantly higher on psychological collectivism, restraint, non-impulsivity, and trait self-control than Chinese college students. For Chinese adult athletes, a prolonged training and competition environment is conducive to the development of psychological collectivism, such as winning on behalf of the team and placing individual performance after the team. These perceptions are part of collectivism. By

contrast, Chinese college students tend to lack an environment that fosters this level of psychological collectivism, as they live free, relaxed, and independent lives. Therefore, we can conclude that Chinese adult athletes have a higher level of psychological collectivism than do Chinese college students. Furthermore, our results showed that Chinese adult athletes had significantly higher self-control than Chinese college students. Evidence from empirical studies suggests that physical activity and self-control are positively correlated (Pfeffer et al., 2020; Yu et al., 2022). In a longitudinal experimental study (Koepp & Gershoff, 2022), physical activity positively predicted executive function, attention, and social self-control. This shows that physical activity does not only improve physical health and strengthen muscle tissue, but physical activity can also effectively enhance individual self-control (Zhong et al., 2021). Thus, Chinese adult athletes who have been engaged in sports for a long time have greater self-control than Chinese college students.

Taken together, these findings suggest that collectivism is positively related to self-control, as supported by evidence from three studies, and that the Chinese version of the Psychological Collectivism Questionnaire can be used as a valid instrument to measure the psychological collectivism of Chinese samples, as supported by evidence from Study 2 and 3. Chinese adult athletes' and college students' psychological collectivism facets (concern and norm acceptance) were positively related to restraint, as supported by evidence from Study 3.

4.4 Theoretical implications

First, to avoid errors caused by single findings (Wilson & Lipsey, 2001), Study 1 used a meta-analysis to clarify the relationship between collectivism and self-control. Study 2 and 3 found that psychological collectivism and self-control were positively correlated among Chinese adult athletes and college students through empirical research investigations. The results of the three studies support Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979). This new evidence that cultural orientation influences the development of individual self-control provides a solid theoretical basis for researchers to study the relationship between collectivism and self-control.

Second, the results of Study 1, 2, and 3 provide new evidence supporting the current debate between country-level individualism-collectivism in Hofstede's model (Hofstede, 1980) and individual-level individualism-collectivism in Triandis's model (Triandis & Gelfand, 1998). Compared with country-level collectivism, individual-level collectivism, as a stable cultural value orientation, affects individuals' thoughts, feelings, and behaviors (Triandis, 2001). The findings of Study 2 and 3 verified the positive correlation between psychological collectivism and trait self-control in Chinese adult athletes and college students and provided an empirical basis for exploring individual development based on Triandis's model.

Third, the results of Study 2 and 3 indicated that psychological collectivism is significantly and positively related to restraint among Chinese adult athletes and

college students. An important attribute of collectivism is the power of social norms (Triandis, 1995). Study 2 and 3 demonstrate that the relationship between psychological collectivism and restraint can be applied to different Chinese samples, providing a reference for future research. Further, Study 2 and 3 add to the limited literature on cultural orientations and restraint.

4.5 Practical implications

First, the three studies clarified the importance of collectivism on self-control in Chinese adult athletes and college students through empirical data. Thus, clinical intervention studies on individual self-control enhancement should consider psychological collectivism. Second, the valid and reliable Chinese version of the Psychological Collectivism Questionnaire can serve as an instrument to assess the level of collectivism among adult Chinese athletes and college students, which will be useful for researchers and coaches. If individual collectivism scores were known in advance through self-report, it would be beneficial to promote the development of self-control. Finally, psychological collectivism facets (concern and norm acceptance) were found to be significantly and positively related to restraint, suggesting that collectivist individuals who follow social norms are more likely to practice restraint. The results provide new support for the issue of the relation between cultural orientations and self-control in the literature and a direction for future research.

4.6 Limitations and future research

This dissertation still has some limitations. First, the meta-analyses in Study 1 required the inclusion of as much research data as possible. Although we used retrieval tools to collect as much of the literature as possible, some data were inevitably missed. Second, Study 1 considered only the zero-order correlation coefficients of the two variables when extracting the original data. In the future, partial correlation coefficients should be investigated to identify the unique effects of individualism-collectivism on self-control. Additionally, the mediating moderating variables between individualism-collectivism and self-control should be explored.

The three studies used cross-sectional survey data. As such, the causal relationship between cultural orientation and self-control could not be determined. A combination of experimental and longitudinal studies is required to reveal the temporal dynamics between cultural orientation and self-control. Culture is multidimensional in composition, and the present study only considered individualism-collectivism, psychological collectivism, and self-control. Future research should explore the effects of other cultural dimensions on self-control, adding to the evidence that cultural orientation influences individual self-control.

Study 2 and 3 used a convenience sample collected from Chinese adult athletes and college students; therefore, it is uncertain whether the results of this study could be applied to other populations. Future research should verify and replicate our findings by recruiting a wider age range and more representative independent samples through

stratified sampling. In addition, studies that include participants in different cultural settings could investigate the cross-cultural applicability and stability of the findings. Another limitation is the use of self-report measures, which are susceptible to social desirability effects.

Finally, this study only explored the correlation between cultural orientation and self-control and did not explore the neural mechanisms underlying the effects of cultural orientation on self-control based on cognitive neuroscience. Future research could use event-related potential (ERP) measures and fMRI, with their highly refined temporal and spatial resolutions, to explore the neurophysiological mechanisms underlying the relationship between cultural orientation and self-control. This will help in understanding the mechanism of self-control by individual cultural orientation and provide more theoretical support for this in field research. Moreover, Study 2 and 3 measured only trait self-control. To better understand individual self-control, measuring both trait and behavioral self-control has been recommended (Duckworth & Kern, 2011). Therefore, Tangney et al.'s (Tangney et al., 2004) Brief Self-Control Scale and the Stroop task (Job et al., 2013) can be used to assess participants' self-control in future studies.

4.7 Conclusion

This dissertation, based on Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1979), examined the effect of cultural orientation on individual self-

control. The results of this study support the notion that cultural factors may be one of the potential factors influencing self-control. First, Study 1 clarified through a meta-analysis and systematic review that individualism is not associated with self-control, collectivism is positively associated with self-control, and moderating factors need to be considered. The results of this study suggest that collectivist individuals are highly influenced by social norms which is associated with higher self-control compared to individualist individuals, and that longitudinal studies are required to determine the causal relationships.

Second, in order to better assess the psychological collectivism of adult athletes and college students, the Psychological Collectivism Questionnaire was revised to create a Chinese version of the Psychological Collectivism Questionnaire that comprised four of the five facets of the original version (Jackson et al., 2006). The findings indicate the revised Psychological Collectivism Questionnaire is a reliable measurement tool for comparing the relationship between collectivism and self-control across samples. Furthermore, the results confirmed that psychological collectivism is positively correlated to self-control among Chinese adult athletes and college students. This finding supports Study 1 and demonstrates the validity of the relationship across the samples.

Third, Study 3 supported the predictive and discriminant validity of the Chinese version of the Psychological Collectivism Questionnaire using data from a different sample of Chinese adult athletes and college students. These findings support the

validity of psychological collectivism as a predictor of trait self-control and the positive correlations found in Study 1 and 2. The results of the independent samples t-test remind us of the need to differentiate between studies when exploring the relationship between psychological collectivism and self-control, which helps ensure the reliability of the findings across samples. In addition, network analysis provides a new direction for future research exploring the relationship between psychological collectivism facets (concern and norm acceptance) and restraint.

Finally, this dissertation was based on cultural orientation at the individual level, and it is necessary for future research to consider whether transient cultural orientation can alter an individual's self-control in the context of experimental manipulation.

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6 Appendix

心理集体主义问卷

指导语：下面一些问题关于您对团队学习和训练的看法。请你仔细阅读每一题，然后根据自己的实际情况，请准确地选择一个，并在相应的选项上划 “√”（“1”表示非常不同意 到 “5”表示非常同意）。

	非常不同意	不同意	不一定	同意	非常同意
1. 我更愿意在团队中学习或训练，而不是独自学习或训练。	1	2	3	4	5
2. 在团队中学习或训练，比独自学习或训练要好。	1	2	3	4	5
3. 我想和团队一起学习或训练，而不是独自学习或训练。	1	2	3	4	5
4. 依靠团队成员来完成学习或训练，我觉得很安心。	1	2	3	4	5
5. 我没有因为需要依靠团队成员而感到困扰。	1	2	3	4	5
6. 相信团队成员能完成他们的任务，让我感觉很好。	1	2	3	4	5
7. 团队的健康对我来说很重要。	1	2	3	4	5
8. 我十分关心团队的幸福感。	1	2	3	4	5
9. 我关心团队的需求。	1	2	3	4	5
10. 我遵循团队的规范。	1	2	3	4	5
11. 我遵循团队既有的工作流程。	1	2	3	4	5
12. 我接受团队的规章制度。	1	2	3	4	5
13. 对我来说，团队目标比我的个人目标更重要。	1	2	3	4	5
14. 与我的个人目标相比，我更重视团队目标。	1	2	3	4	5
15. 团队目标比我的个人目标更重要。	1	2	3	4	5

简式自我控制问卷

指导语：请你仔细阅读每一题，然后根据自己的实际情况，请准确地选择一个，并在相应的选项上划“√”。

	完全不符合	不符合	一般	符合	完全符合
1. 我能很好地抵抗诱惑。	1	2	3	4	5
2. 对我来说，改掉坏习惯是困难的。	1	2	3	4	5
3. 我很懒。	1	2	3	4	5
4. 我会说一些不合时宜的事。	1	2	3	4	5
5. 如果某些事情我觉得很有趣，即使它们对我不利我也会去做。	1	2	3	4	5
6. 我会拒绝做出对自己不利的事情。	1	2	3	4	5
7. 我希望自己能够更自律。	1	2	3	4	5
8. 人们会说我有严格的自律性。	1	2	3	4	5
9. 休闲娱乐有时会阻碍我完成训练或学习任务。	1	2	3	4	5
10. 我很难集中注意力。	1	2	3	4	5
11. 我能够为了长远目标而有效地训练或学习。	1	2	3	4	5
12. 有时候我会忍不住去做一些事情，即使我知道那样做是错的。	1	2	3	4	5
13. 做事时，我经常不进行全面考虑就采取了行动。	1	2	3	4	5

自我建构问卷

指导语： 以下是一些他人可能会用来形容您的表述。这些表述有些可能是准确的，有些可能不是很准确。请指出以下描述的准确程度，例如：完全不准确，请圈出 1；非常准确，请圈出 4，如果您无法从两个相邻的整数中做出决定，您可以圈出它们之间的数字（1½, 2½, 3½, 4½）。请你仔细阅读每一题，然后根据自己的实际情况，请准确地选择一个，

以下说法在多大程度上准确地描述了您本身？

完全不准确		有一点准确		比较准确		非常准确		完全准确
1	1½	2	2½	3	3½	4	4½	5

1.您喜欢和别人保持类似。	1	1½	2	2½	3	3½	4	4½	5
2.如果您的家人取得了成就，您会感到自豪，像是自己取得了成就。	1	1½	2	2½	3	3½	4	4½	5
3.对于重要的事，即使他人可能不赞成您的选择，您也一直自己做决定。	1	1½	2	2½	3	3½	4	4½	5
4.您会表达您的真实感受，即使它会妨碍您家庭关系的和谐。	1	1½	2	2½	3	3½	4	4½	5
5.即使在不同的社会环境中，您也一直以同样的方式看待自己。	1	1½	2	2½	3	3½	4	4½	5
6.您的快乐独立于您家人的快乐。	1	1½	2	2½	3	3½	4	4½	5
7.在做决定之前，您经常会征求您家人的同意。	1	1½	2	2½	3	3½	4	4½	5
8.不需要了解您的社会地位，有些人就可以了解您。	1	1½	2	2½	3	3½	4	4½	5
9.您倾向依赖您自己而不是向他人寻求帮助。	1	1½	2	2½	3	3½	4	4½	5
10.您更喜欢在关系中维持和谐，即使这意味着您不能表达您的真实感受。	1	1½	2	2½	3	3½	4	4½	5
11.在考虑他人的目标之前，您经常优先考虑自己的目标。	1	1½	2	2½	3	3½	4	4½	5
12.如果有人想要了解您，他们需要了解您生活的地方。	1	1½	2	2½	3	3½	4	4½	5
13.如果有人侮辱了您的一位家人，您不会感觉自己受到了侮辱。	1	1½	2	2½	3	3½	4	4½	5
14.在困境中，您倾向向他人寻求帮助而不是仅仅依赖自己。	1	1½	2	2½	3	3½	4	4½	5
15.在家里和在公众场合，您表现得差不多。	1	1½	2	2½	3	3½	4	4½	5
16.不需要了解您的家乡，有些人就能了解您。	1	1½	2	2½	3	3½	4	4½	5
17.您喜欢和别人不一样。	1	1½	2	2½	3	3½	4	4½	5
18.如果有人侮辱了您的一位家人，您会感觉好像自己受到了侮辱。	1	1½	2	2½	3	3½	4	4½	5

19.在做重要决定时，您经常听从他人的建议。	1	1½	2	2½	3	3½	4	4½	5
20.您会试图融入周围的人，即使这意味着隐藏您的情绪。	1	1½	2	2½	3	3½	4	4½	5
21.您的个人成功对您很重要，即使它会破坏您和他人的友谊。	1	1½	2	2½	3	3½	4	4½	5
22.在家里和在公众场合，您表现的会很不一致。	1	1½	2	2½	3	3½	4	4½	5
23.如果有人想要了解您，他们就需要了解您所在的社会团体。	1	1½	2	2½	3	3½	4	4½	5
24.您认为自己和别人差不多。	1	1½	2	2½	3	3½	4	4½	5
25.比起您的个人成就，您更看重和亲密的人的良好关系。	1	1½	2	2½	3	3½	4	4½	5
26.您认为自己是独一无二的，和他人不同的。	1	1½	2	2½	3	3½	4	4½	5
27.如果您的一位密友或家人感到悲伤，您会感同身受。	1	1½	2	2½	3	3½	4	4½	5
28.您会为自己决定要追求的目标，即使那些目标与您家人期待的非常不同。	1	1½	2	2½	3	3½	4	4½	5
29.能够依赖他人对您来说是很重要。	1	1½	2	2½	3	3½	4	4½	5
30.您保护您的个人利益，即使它有时可能会破坏您的家庭关系。	1	1½	2	2½	3	3½	4	4½	5
31.即使和不同的人在一起时，您也表现如一。	1	1½	2	2½	3	3½	4	4½	5
32.您情愿和别人一样，而不是不一样。	1	1½	2	2½	3	3½	4	4½	5
33.您经常会做别人期待您做的事，而不是自己做决定。	1	1½	2	2½	3	3½	4	4½	5
34.您更喜欢完全依赖自己而不是依赖他人。	1	1½	2	2½	3	3½	4	4½	5
35.您更喜欢公开地表达您的观点和感受，即使这有时可能会引起冲突。	1	1½	2	2½	3	3½	4	4½	5
36.您经常把优先权给别人而不是自己。	1	1½	2	2½	3	3½	4	4½	5
37.和不同的人在一起时，您表现得不一致。	1	1½	2	2½	3	3½	4	4½	5
38.如果有人想要了解您，他们就需要了解您的家乡。	1	1½	2	2½	3	3½	4	4½	5
39.您尽量避免和他人一样。	1	1½	2	2½	3	3½	4	4½	5
40.如果您的一位密友或家人很开心，您也会感同身受。	1	1½	2	2½	3	3½	4	4½	5
41.您经常为您自己的行为做决定，而不是遵从他人的期待。	1	1½	2	2½	3	3½	4	4½	5
42.不需要了解您所在的社会团体，有些人也能了解您。	1	1½	2	2½	3	3½	4	4½	5
43.您更喜欢向他人求助而非仅仅依赖自己。	1	1½	2	2½	3	3½	4	4½	5
44.您尽量不对您的家庭成员表示不赞	1	1½	2	2½	3	3½	4	4½	5

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45.您尽量避免依赖他人。	1	1½	2	2½	3	3½	4	4½	5
46.您喜欢讨论您自己的观点，即使这有时可能会使您周围的人心烦。	1	1½	2	2½	3	3½	4	4½	5
47.为了家人的利益，您会牺牲您自己的利益。	1	1½	2	2½	3	3½	4	4½	5
48.和不同的人在一起时，您对自身的看法也不一样。	1	1½	2	2½	3	3½	4	4½	5