Brawn and Brains: An Exploration of Personality in Strength Sports Athletes

John Black

A dissertation submitted to the Auckland University of Technology

in partial fulfilment of the Master of Sport, Exercise and Health (MSEH)

2023

School of Sport and Recreation

Primary Supervisor: Dr Aaron Uthoff

Abstract

Strength sports athletes partake in resistance training behaviours to excel in subtly different strength disciplines. This subgroup of athletes provides an opportunity to discern nuanced differences in personality within a population that consistently adheres to resistance training. Therefore, the aim of this dissertation was to explore the personality dimensions of strength sports athletes to understand whether distinct characteristics are present. Chapter 2 presents a narrative review of the current knowledge about the personality of strength sports athletes from personality and adjacent psychological research. The findings from the review suggested that personality differences are likely expected amongst different strength sports, both dimensionally and at the facet level. However, the review also highlights the dearth of information pertaining to personality research in strength sports athletes, thus indicating further research is warranted. Consequently, chapter 3 explored the personality of five strength sport athlete groups: bodybuilding, powerlifting, weightlifting, strongman/strongwoman athletes, and CrossFit® athletes. It was found that CrossFit® athletes ranked significantly lower on neuroticism ($p < 0.01$). Additionally, significant facet level differences in artistic interest ($p < 0.01$), liberalism ($p = 0.05$), orderliness ($p = 0.05$), cautiousness ($p = 0.04$), immoderation ($p < 0.01$) and vulnerability ($p = 0.02$) were observed among strength sports athletes. The discussions and conclusion in Chapter 4 contain important limitations and practical recommendations. Specifically, CrossFit® athletes ranked lower on neuroticism and vulnerability, which may indicate that either adopting this style of training has a positive influence on affect and personality or that this sport attracts individuals with lower neuroticism and vulnerability. Furthermore, bodybuilders ranked higher on artistic interest and cautiousness, which may indicate that individuals who are aesthetics-orientated and/or injury-avoidant may prefer this style of training. These findings suggest that a facet-level analysis provides more information about the personality characteristics of different strength sports athletes than the more common dimensional approach. However, additional research exploring the personality of strength athletes over time is needed to further the understanding of this phenomenon.

Table of Contents

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgments, nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Chapters 2 and 3 represent two individual manuscripts that have either been submitted or are in preparation to be submitted to peer-reviewed journals for publication. My contribution to these works as well as the co-author contributions are outlined on the following pages. The co-author has approved the inclusion of joint work in this master's dissertation.

Declaration of authorship and co-authorship

Student: John Black

Signature:

Co-author 1: Dr Aaron Uthoff

Signature:

Candidate Contributions

The student was the main contributor of the research in this dissertation to the minimum requirement of 80%. The student was also the main contributor to the writing of ethics applications and necessary progress reports for the completion of the dissertation.

Chapter 2

Black, J. Uthoff, A. *Brawn and Brains: Personality in strength sports athletes – Narrative Review.*

(90%) Black, J

(10%) Uthoff, A

To be submitted to *The Sport Psychologist.*

Chapter 3

Black, J. Uthoff, A. *Brawn and Brains: An exploration of personality differences between strength sports athletes – Cross-Sectional Study.*

(90%) Black, J

(10%) Uthoff, A

To be submitted to the *Journal of Sport and Exercise Psychology.*

I, the undersigned, hereby agree to the percentages of participation to the chapters identified above:

Supervisors

Dr. Aaron Uthoff,
Primary

Acknowledgements

Firstly, I would like to express my sincere appreciation and gratitude to Aaron Uthoff for his outstanding supervision. Despite the inherent ambiguity and ambitious nature of my project, you took a leap of faith and provided exceptional support. It is remarkable how seamlessly you offered guidance despite the geographical distance between us. Although we have never had the opportunity to meet face-to-face, I consider you a great friend and it was a privilege to have collaborated with you on this project.

Secondly, I would like to extend my thanks to Eric Helms for his guidance and generosity. Without your help, it would have been unlikely for this study to reach such a substantial sample size. I look forward to the possibility of furthering the understanding of strength sports athletes with your expertise.

Finally, I would like to extend my heartfelt acknowledgment to my wife, Melinda, who has been my source of support throughout my research journey. Thank you for believing in me, patiently enduring my moments of stress, and serving as the voice of reason whenever I veered off course. Your presence has been my anchor, and I am deeply grateful for your unwavering love and encouragement.

Ethical Approval

Approved by the Auckland University of Technology Ethics Committee on the 27 September 2022. AUTEC reference number 22/215.

List of Figures and Tables

List of Figures

List of Tables

Chapter 1

Introduction and Rationale

1.1 Background

Strength sports are characterised by exerting force on a range of implements which fundamentally distinguishes them from other sports, as training primarily revolves around resistance. However, though relatively similar, the psychological and physiological demands for each discipline of strength sport subtly differ. These differences are associated with the performance outcomes of each of the sports and can be categorised as aesthetic, single lift, and hybrid. Aesthetic-based strength sports, such as bodybuilding, prioritise the development of physiques (IFBB, 2021), while single-lift strength sports, such as powerlifting and weightlifting, aim to achieve maximum lifts for a single repetition (IPF, 2023; IWF, 2022). Meanwhile, hybrid strength sports, like CrossFit® and strongman/strongwoman, involve athletes competing in a diverse range of events that encompass a wide range of physiological demands (IFFF, 2023; WSF, 2021). Therefore, as these sports prioritise different outcomes and unique training-related behaviours, it is plausible that subtle personality differences may exist between athletes competing in the various disciplines.

In the 20th century, scholars in the domain of personality research discerned the existence of five discrete dimensions pertaining to personality, a construct now commonly referred to as the five-factor model (Goldberg, 1992; McCrae & Costa, 1987). These dimensions encompass the traits of openness, conscientiousness, extraversion, agreeableness, and neuroticism (Goldberg, 1992). Empirical explorations utilised this model to understand the relationship between personality and quality of life (Huang et al., 2017), health outcomes (Luchetti et al., 2014), obesity (Gerlach et al., 2015) and, levels of physical activity (Rhodes & Smith, 2006; Wilson & Dishman, 2015). Within the sports domain, research into personality has predominantly focused on its impact on performance (Morgan & Johnson, 1978) and participation (Dowd & Innes, 1981; Schurr et al., 1977). This research has included both team sports and individual sports, with competitive athletes showing higher extraversion, higher conscientiousness, and lower neuroticism (Piepiora, 2021; Steca et al., 2018). However, there has been a dearth of research examining the personalities of strength sports athletes, despite the unique physical and mental demands they face.

Strength sports athletes constitute a group of the population who consistently adhere to resistance training. Resistance training has been correlated with a decrease in all-cause mortality and incidence of cardiovascular disease, alongside an enhancement in physical functioning (El-Kotob et

al., 2020). Though the personality of athletes typically differ from the general population (Malinauskas et al., 2014), understanding the similarities and difference of strength sports athletes may shed light on resistance training preferences that are linked to different components of personality. Previous research in sport, and specifically strength sports, has either adopted a dimensional approach, looking at general personality, or focused narrowly on specifically on one or two facets (Laborde et al., 2020). This has left glaring gaps in the understanding of the personality of strength sports athletes and thus this dissertation seeks to bridge this empirical void. Therefore, this dissertation presents as a starting point for exploring the dimensions and facets of personality of strength sports athletes.

1.1 Purpose Statement

The primary purpose of this dissertation was to explore the personalities of strength sports athletes and understand whether the unique demands and environments of the different disciplines affected personality characteristics. This investigation included strength sports athletes as participants and was completed for the following reasons:

1. To date, there is a dearth of academic research exploring personalities of strength sports athletes.
2. To date, no research has conducted facet level analysis on personality as it pertains to strength sports athletes.
3. Strength sports athletes provide a unique sample of participants who focus predominately on resistance training.

1.2 Aims and Hypothesis

The aims of the dissertation were:

1. To examine the literature regarding the personality of strength sports athletes.
2. To gain insights into the personalities of athletes competing in various strength sport disciplines beyond the fundamental dimensions of the five-factor model.

The hypotheses of the dissertation was:

1. That bodybuilding athletes would present with higher levels of conscientiousness and neuroticism than other strength athletes.

2. That further differences in personality would be observed at the facet level between strength sports athletes which are undetectable at the dimensional level.

1.3 Structure of the Dissertation

A review and one experimental study were used to achieve the aims of the dissertation. Chapters two and three were written in a format of a published journal article to fulfil the Pathway Two dissertation requirements at AUT. Preludes are includedat the start of Chapter two and three, detailing how each chapter builds upon the next. The introductory chapter helps establish the rationale and structure of this dissertation. Chapter two is a narrative review of the current literature pertaining to the personalities of strength sports athletes. This review provides and outlines the expected personality similarities and differences of strength sports athletes based on adjacent fields of exercise and sport psychology. Chapter three is a cross-sectional study whereby the personality of strength sports athletes were assessed via the IPIP-120 personality inventory. Chapter four is the final chapter of this dissertation, and serves as a synopsis of the dissertation findings, providing a conclusion, preliminary practical recommendations, limitations, and direction for further research.

Chapter 2

Personality in Strength Sports Athletes – A Narrative Review

Prelude

Strength sports athletes compete in unique competitive environments that may suit or align with certain personality characteristics. The purpose of the following literature review was to examine the current understanding pertaining to the personality characteristics of strength sports athletes. Adjacent research from exercise and sport psychology was used to provide insights as limited direct personality research is available on strength sports athletes.

2.1 Introduction

Over the previous century, personality research has established a number of differences between individual characteristics by utilising personality models (Goldberg, 1993). In the domain of health and exercise, personality characteristics have been linked with quality of life (Huang et al., 2017), health outcomes (Luchetti et al., 2014), obesity (Gerlach et al., 2015), and physical activity levels (Rhodes & Smith, 2006; Wilson & Dishman, 2015). However, there has been little research exploring the personalities of athletes, despite their unique physical and mental demands. Most studies investigating personality in sport have focused on its influence over performance (Morgan & Johnson, 1978), and participation (Dowd & Innes, 1981; Schurr et al., 1977). Within sport personality research, the measures of personality vary including, broad descriptions of personality (Thune, 1949), traits and dimensions (McCrae & Costa Jr, 2004), and dimensional clusters of personality (Paulhus & Williams, 2002). These diverse approaches, though informative, provide a fragmented understanding of personality in sport. This narrative review aims to consolidate the current understanding of the personalities in strength sports athletes.

Strength sports can be categorised by physiological demands which dictate performance as being aesthetic, single lift, or hybrid. Aesthetic-based strength sports are concerned with the development of physiques (IFBB, 2021), single lift strength sports require athletes to lift maximally for a single repetition (IPF, 2023; IWF, 2022), and athletes in hybrid strength sports compete in a range of different events involving a variety of different movements (IFFF, 2023; WSF, 2021). The personalities of weightlifters was initially surveyed by Thune (1949) which included a broad inclusion of those who lifted weights, as opposed to the sport of weightlifting. The exploration of personality in strength sport ceased over following decades with only one notable paper comparing differences

in the personalities of bodybuilders and weightlifters (Darden, 1972). In this paper, weightlifters reported higher levels of surgency than bodybuilders, a trait related to positive affect. Further explorations of personality may shed light on whether certain strength sports may attract individuals with particular personality characteristics.

Personality has been suggested to consist of several dimensions which are consistently observed across cultures, races, and genders (Schmitt et al., 2007b; Weisberg et al., 2011). These dimensions represent the individual differences in motives, feelings, and behaviours. Early research predominantly categorised aspects of personality as trait differences (Carter & Shannon, 1940; Thune, 1949). The shift to a dimensional approach to personality was initially drawn from a factor analysis of 60 adjectives (Thurstone, 1934). Following further lexical analysis by Tupes and Christal (1992), this approach was accepted as a robust instrument deemed valid and reliable for measuring personality (Goldberg, 1993; Johnson, 2014; McCrae & John, 1992), and sparked a surge of personality research using the five-factor model popularised by McCrae and John (1992). The five-factor model includes dimensions representing: openness, conscientiousness, extraversion, agreeableness and neuroticism (Johnson, 2014). These dimensions are normally distributed across populations except for conscientiousness, which occasionally appears skewed in certain populations (i.e., unemployed population) (Uysal & Pohlmeier, 2011; Weisberg et al., 2011). Important distinctions within personality dimensions contribute to outcomes in a number of domains (Schmidt et al., 2018). For example, the openness dimension can be divided into two subdimensions: intellect and sensoaesthetic openness, in which intellect predicts academic success and sensoaesthetic openness predicts poor academic outcomes (DeYoung et al., 2007; Gatzka & Hell, 2018). For an overview of the dimensions, subdimensions, and their associated facets, please refer to Table 1.

Despite the importance of personality in predicting performance and development outcomes in other domains, research on the relationship between personality and strength sports is limited. Therefore, this review aims to unify available research on how the dimensions and facets of the five-factor model relate to athletes participating in different types of strength sports. Measuring differences in personality within strength sports athletes could provide insight into resistance training preferences and ultimately aid in improving resistance training adherence.

Table 1.

Five-Factor Model – Dimensions, Subdimensions and Facets

Dimensions	Openness		Conscientiousness		Extraversion	
Subdimensions	Openness	Intellect	Industriousness	Orderliness	Enthusiasm	Assertiveness
	Imagination		Self-efficacy		Friendliness	
	Artistic interest		Orderliness		Gregariousness	
Facets	Emotionality		Dutifulness		Assertiveness	
	Adventurousness		Achievement-striving		Activity Level	
	Intellect		Self-discipline		Excitement Seeking	
	Liberalism		Cautiousness		Cheerfulness	

Agreeableness		Neuroticism	
Compassion	Politeness	Volatility	Distress
Trust		Anxiety	
Morality		Anger	
Altruism		Depression	
Cooperation		Self-consciousness	
Modesty		Immoderation	
Sympathy		Vulnerability	

(DeYoung et al., 2007; Johnson, 2014)

2.2 Aesthetic-based Strength Sports

Aesthetic-based strength sports, such as bodybuilding, involve athletes being judged on specific criteria regarding their physique (Gentil, 2015; Rossow et al., 2013). Under the umbrella of bodybuilding, aesthetic-based strength sports have expanded to include a number of different subdisciplines (e.g., physique, classic physique, bikini, and fitness) (Liokaftos, 2019; Whitehead et al., 2020). Aesthetic-based athletes undertake resistance training focusing on hypertrophy, the building of cross-sectional area of the muscle, to enhance their muscularity (Alves et al., 2020). In addition to high volumes of resistance training, aesthetic-based athletes also partake in supporting behaviours such as cardiovascular training for fat loss, dieting, and supplementation (Gentil, 2015). The manipulation of these behaviours is determined by the phase of training: muscle gain 'bulking', fat loss 'cutting', or pre-competition 'prep' (Helms et al., 2014). This mixture of complex behaviours requires specific motives as they are both time consuming and physically demanding. Additionally, these motives appear to be the most distinct from other strength sports. The focus in personality

research related to bodybuilding has focused around normative and dysfunctional behaviours (Emini & Bond, 2014; Rubinstein, 2003; Santarnecchi & Dèttore, 2012; Steele et al., 2019). This research centres on traits such as narcissism and perfectionism to explain that the extreme behaviours (i.e., drug use and intensive dieting) are potentially harmful to aesthetic-based athletes (Steele et al., 2019). However, it must be noted that a portion of this research includes non-natural athletes, who partake in the use of performance enhancing drugs and it is possible that personality differences will occur between natural and non-natural athletes. One recent study has used a dimensional approach to the personality of bodybuilding revealing differences with both team and combat sport athletes (Witkowski & Piepiora, 2018). However, a facet level analysis has yet to be conducted. The following contains a tangential understanding of the personality dimensions, subdimensions and underpinning facets as it relates to aesthetic-based strength sports.

In modern bodybuilding, athletes seek to develop their physiques for aesthetic size and symmetry, but also perform a series of artistic movements (Rossow et al., 2013). Openness as a subdimension has been characterised as interest in beauty (Johnson, 1994). Aesthetic-based athletes may show an interest, or a tolerance, to artistic expression. In the creative domain, dancers and artists have been found to be high in openness and creativity (Fink & Woschnjak, 2011). Aesthetic-based athletes' focus on physical aesthetics which shows parallels with performing arts and aesthetic sports. For example, figure skating, ballet, and gymnastics require athletes to meet aesthetic and performance ideals (Francisco et al., 2012). Adjacently, the aesthetic norms of bodybuilding aligns with traditional phenotypes of gender appearance which is linked with conservative ideology (Aspridis et al., 2014; Fabris et al., 2018). This may mean that the facet liberalism is lower in aesthetic-based athletes, specifically in the bodybuilding discipline, though this posit is yet to be empirically verified.

Aesthetic-based athletes display characteristics of high orderliness, as their success requires adherence to regimented behaviours. This is particularly important as subtle changes in a routine can have drastic effects on athletes' appearance, especially in the weeks preceding a competition (Chappell & Simper, 2018). For example, aesthetic-based athletes will tightly control the food and liquid they consume in order to manipulate their body composition (Helms et al., 2014). The orderliness is deemed the inhibitory side of conscientiousness (DeYoung et al., 2007). Extreme orderliness behaviours are central to negative psychological phenomena explored in aesthetic-based athletes, such as body dysmorphia and perfectionism (Blouin & Goldfield, 1995). Dysfunctional orderliness increases the likelihood of muscle dysmorphia which has been proposed to be part of the

obsessive-compulsive spectrum and/or the eating disorder spectrum (Murray et al., 2010). Additionally, orderliness correlates with perfectionism (r=0.67), which has been proposed to contribute to body dysmorphia (DeYoung et al., 2007; Schieber et al., 2013). It is unclear whether these displays in orderliness can be attributed to socially prescribed perfectionism or self-orientated perfectionism (Dunkley et al., 2012). It is likely that aesthetic-based athletes experience both types of perfectionism depending on their level of success.

Achievement striving characteristics have been linked with self-orientated perfectionism (Dunkley et al., 2012). Achievement striving along with self-efficacy and self-discipline are the highest contributing facets to the subdimension industriousness (DeYoung et al., 2007). Industriousness has been observed to estimate exercise behaviour in university staff and students (Reed, 2014). Given aesthetic-based athletes' high adherence to exercise regimens, it is plausible that bodybuilders may exhibit this subdimension (Gentil, 2015).

Self-efficacy, or confidence, more broadly, is well explored in the sport literature (Moritz et al., 2000; Woodman & Hardy, 2003). However, this level of analysis has been conducted through self-determination theory, (Ryan & Deci, 2000) and Vealey's model of confidence (Vealey et al., 2018). In regard to self-discipline, bodybuilders tended to have more self-control than weightlifters, though it was not statistically significant (Darden, 1972). Self-control, an aspect of the 16 Personal Factor Model, is correlated with conscientiousness (r=0.66), though no facet level correlation has been conducted (Rossier et al., 2004). The available literature suggests that both facets of industriousness and orderliness contribute greatly to aesthetic-based athletes' personality.

Aesthetic-based athletes rank high in activity levels and assertiveness, facets of extraversion (Johnson, 2014; Tod et al., 2016). These facets have been reported to be moderately associated the conscientiousness dimension (r=0.53-0.55) (Kajonius & Johnson, 2019). An example of aesthetic-based athletes' activity is their propensity for high volumes of exercise. It is suggested that bodybuilders train four to seven times per week, with most muscles groups being trained at least twice per week (Hackett, 2022). This physical activity by aesthetic-based athletes has generated concerns over potential exercise addiction (Cook et al., 2020; Miller & Mesagno, 2014). Interestingly, this has been linked to both perfectionism and narcissism traits. Carroll (1989) found that bodybuilders tend to rank higher in narcissism than psychology students. However, the relationship between aesthetic-based athletes, extraversion, and narcissism is complex. At a dimensional level, it appears that aesthetic-based athletes tend towards vulnerable narcissism as they present with lower extraversion (Darden, 1972; Weiss & Miller, 2018). However, like perfectionism, aesthetic-based

athletes may shift from vulnerable narcissism towards grandiose narcissism with experience and/or performance enhancing drug interventions. However, no interventional research has verified this change, thus may be influenced by initial personality (Yates et al., 2003). Interestingly, a key component of grandiose narcissism is assertiveness (Hart et al., 2017). Assertiveness has been attributed to bodybuilding in both men (Zaręba & Potembska, 2016) and women (Roussel & Griffet, 2000), though the empirical evidence is limited.

Aesthetic-based strength sports are typically an individual pursuit, though there are interactions and relationships that occur. Similarly to extraversion, levels of agreeableness appears to be related to variation in human interaction (Cuperman & Ickes, 2009). The groups that physique athletes train within, when they train in groups, are self-selected, unlike most competitive team sports. Interestingly, empirical research reports that bodybuilders have significantly higher agreeableness than volleyball players and trended higher than footballers, and karate practitioners (Witkowski & Piepiora, 2018). Witkowski and Piepiora (2018) suggest that higher levels of agreeableness in bodybuilders, relative to other sports, may be due to nature of competition, as competition in aesthetic sports is less direct. Further research is needed to understand the nuanced facets of agreeableness and related traits in aesthetic-based athletes.

Several studies have explored neuroticism and its facets within aesthetic-based athletes (Hurst et al., 2000; Witkowski & Piepiora, 2018). Broadly, bodybuilders show higher rates of neuroticism than volleyball and karate athletes (Witkowski & Piepiora, 2018). In a study by Hurst et al. (2000) it was found that bodybuilders experienced social physique anxiety which decreases with experience. This may be connected to the correlation between socially prescribed perfectionism and neuroticism (r=0.55) (Dunkley et al., 2012). Additionally, strength training has been shown to ameliorate anxiety which may influence self-reported personality scores as it is also unclear whether this anxiety is state or innate (Gordon et al., 2018). Furthermore, Emini and Bond (2014) found that physique anxiety and mood control are two key motives for partaking in bodybuilding. High anxiety is a reoccurring theme in bodybuilding research; thus, it may be postulated that aesthetic-based athletes experience higher levels of this facet. Ultimately, personality research, using the five-factor model, at both the dimension and facet level is lacking on bodybuilders, thereby warranting research in this cohort.

2.3 Single Lift Strength Sports

Weightlifting and powerlifting are single lift strength sports which involve maximal efforts in selected movements. Weightlifting is an Olympic strength sport which involves two lifts, the snatch and the clean and jerk (IWF, 2022). Success in these two lifts require the athletes to bring a loaded barbell from the floor to an overhead position, with a maximal of three attempts for each (IWF, 2022; Stone et al., 2006). High amounts of power output are observed in weightlifting and provide predictive value for power-orientated performance (Garhammer, 1993). As such, weightlifting training is used by other sports to develop different aspects of the force-velocity profile (Suchomel et al., 2017). During training, weightlifters typically go through periods of higher volume followed by periods of high intensity leading into competition (Pistilli et al., 2004). This training involves specific weightlifting movement and derivatives, and supplementary strength movements including squats, and presses (Storey & Smith, 2012). The amount of exercise variation is relatively low compared to other strength sports due to the need for high specificity (Stone et al., 2006). The personality of weightlifters was first explored by Thune (1949) who suggested that weightlifters were introverted and lacked self-confidence. However, the definition of a weightlifter within this paper included those who "lift weights" which includes a broader range of individuals beyond the sport of weightlifting. Darden (1972) discovered a personality distinction between bodybuilders and weightlifters, showing higher surgency, a trait associated with extraversion, in weightlifters.

Powerlifting is a strength sport which require the athlete to complete three maximal effort lifts in the squat, bench press, and deadlift (IPF, 2023). Powerlifting is similar to weightlifting in that competition centres around single lifts with three attempts for each the squat, the bench and the deadlift (IPF, 2023). In recent years, powerlifting has become increasingly popular with thousands of participants competing in the United States alone (Ball & Weidman, 2018). Powerlifting encompasses two major styles: raw and equipped. Equipped powerlifters utilise suits and wraps made of thick, rigid materials, which enhance the amount of weight they can lift by providing support and compression (Bishop et al., 2018). Powerlifters focus on maximal strength training to increase force output with supplementary periods of hypertrophy focused training. There is little direct personality research regarding powerlifters and a dearth of analysis depth. For example, one Polish study recorded personality dimensions of youth powerlifters, though only descriptive statistics were reported (Ryguła et al., 2016). Other studies have explored psychological phenomena related to certain facets such as anxiety and self-control (Judge et al., 2016; Park, 2017). However, the focus in

science related to powerlifting has been focused on biomechanical and physiological processes and training responses.

The openness dimension is underrepresented in the literature concerning the personalities of athletes (Laborde et al., 2020) and unlike bodybuilding, there is no obvious subdimension or facet that aligns with the nature and behaviours of either weightlifters or powerlifters. Openness relates to novelty seeking behaviour, thus it may be expected that athletes' openness in strength sports is higher than other traditional sports (Gocłowska et al., 2019). However, all strength sports are regarded as minority sports; therefore, this difference in openness may not be noticeable between strength sports athletes. Further investigation is required to elucidate an understanding about the openness amongst both weightlifters and powerlifters.

The distribution of conscientiousness facets within athletes, let alone strength athletes, has yet to be explored. Lighter weight categories of weightlifting and powerlifting may experience high orderliness, similar to aesthetic-based athletes, due to the necessity to remain within certain weight classes. The cluster of self-efficacy, self-discipline and achievement striving correspond with the level of mastery the athlete has achieved. The combination of these facets along with dutifulness contribute greatly to industriousness (Schmidt et al., 2018). Colloquially, industriousness has been called grit, and in recent years there has been independent research on grit, though criticism emerged with the lack of difference with conscientiousness (Ponnock et al., 2020; Schmidt et al., 2018). Grit and industriousness are likely associated with the success level of the athlete, which is unlikely to differ between weightlifters or powerlifters. Lastly, cautiousness, as a facet of conscientiousness, is an area of interest as varying technical requirements, loads, velocities, and perceived risks linked to the snatch and clean and jerk, in contrast to the squat, bench press, and deadlift, might appeal to individuals with distinct personalities. However, further investigation is essential to assess weightlifters and powerlifters and examine the underlying factors contributing to any personality differences if they are found.

Resistance training research, in the general population, has explored psychological factors that relate to neuroticism such as depression and anxiety (Gordon et al., 2018; Gordon et al., 2017). In powerlifting, trait anxiety has been found to negatively correlate with percentage best competition total (Jensen, 2010; Judge et al., 2016). However, it appears that both anxiety and depression have yet to be measured in powerlifters via a personality inventory. Anger has briefly been recorded, but only in relation to the use of PED, performance enhancing drugs (Sanjuan et al., 2015), and water cuts (Kwan & Helms, 2022), thus it is unclear as to whether powerlifters have

higher trait anger. Propensity for anger, in single lift sports and events, may also predict deliberate increases of physical arousal via behaviours such as slaps and yelling prior single lift attempts (e.g., deadlift etc.), though enthusiasm may also contribute to these behaviours. While psychological factors related to neuroticism, such as depression and anxiety, have been explored in strength sport research, the measurement of anxiety, depression, and anger via a personality inventory remains limited. Further investigation is needed to determine the levels of these facets in powerlifters and their potential influence on performance and behaviours.

2.4 Hybrid Strength Sports

CrossFit® and Strongman are examples of hybrid strength sports which require a broad range of strength related characteristics. CrossFit®, specifically, is one of the world's fastest growing high intensity training modalities, with over ten thousand affiliated gyms worldwide (Claudino et al., 2018). Athletes who compete in CrossFit® perform a variety of strength movements present in weightlifting, powerlifting and strongman, along with a multitude of other fitness skills which includes gymnastics (Claudino et al., 2018). CrossFit® requires a number of physiological adaptations, however preliminary research suggests that strength measures have the highest predictive value in CrossFit® performance (Butcher et al., 2015). Initial research into the personality of CrossFit® athletes has been inconclusive. Box et al. (2019) found no significant difference between the personalities of individuals who did CrossFit® over other modalities. Similarly, Fell (2017) found no difference between general gym goers and people who trained CrossFit®. However, neither of these studies explored the differences at a sub-dimensional or facet level.

Strongman is a sport where athletes compete in a series of strength orientated tasks to demonstrate their physical ability. Competitions often include events such as deadlifts, atlas stones, keg tosses, and farmer's carries (McGill et al., 2009). The physical demands for competition range from maximal strength, midrange power, and metabolic conditioning (Winwood et al., 2011). The versatility of a strongman/strongwoman athletes is more like CrossFit® than single lift strength sports like weightlifting and powerlifting. Though there is growing interest and participation in strongman, there is a dearth of research concerning personality and psychological factors. In saying this, strongman can be considered a high intensity sport, in which higher conscientiousness may be expected (Courneya & Hellsten, 1998). Evidence for the activities' intensity is supported by blood lactate recordings of over 10mmol (Keogh et al., 2010). Certainly, these scores may be high in all strength sports, but the following will explore subtle personality traits that hybrid strength athletes may possess.

Contrary to the previously explored strength sports, CrossFit® provides a more social environment in which athletes compete and train. Extraversion is suspected to be higher as CrossFit®-style training provides a higher level of novelty, supporting individuals who rank high in the excitement seeking facet. Additionally, adventurousness may trend higher in CrossFit® and strongman athletes. In most strength sports, the feats of strengths are standardised, but in hybrid strength sports different objects and styles of resistance are used to compete (IFFF, 2023; WSF, 2021). For example, strongman athletes may be expected to pull small aircraft a short distance whereas CrossFit® athletes may compete in novel combinations of exercises, such as yoke walks followed by handstand walking. The adventurous nature of these activities attracts individuals who may be motivated by risk taking and sensation seeking (Castanier et al., 2010). For these same reasons, hybrid strength athletes may also possess higher levels of excitement seeking than other strength athletes. The interaction between adventurousness and excitement seeking may also contribute to the correlation between openness and extraversion (Gocłowska et al., 2019).

Cautiousness is likely to be lower in hybrid sport athletes compared to other strength sports athletes. This is largely to do with the risk associated with high intensity activities involved within the sport. CrossFit® has a reputation of having high rates of injury, though these are not significantly higher than other strength sports (Keogh & Winwood, 2017). The perception of the sport influences individuals' likelihood of participating, thus individuals with lower cautiousness could be expected to pursue CrossFit®. Similarly, strongman athletes are willing to partake in strength task which are more risky than other strength sports. Paradoxically, higher conscientious people tend to enjoy high intensity activity more than lower conscientious (Courneya & Hellsten, 1998). This higher conscientiousness overall may be explained with higher levels of the subdimension, industriousness. It has been reported that CrossFit® athletes perceive the modality to require a high level of effort which is congruent with industriousness (Davies et al., 2016). Cautiousness may be the only aspect of conscientiousness that has an inverse relationship with high intensity activity, though this is yet to be explored. Adding to the complexity of conscientiousness in hybrid strength athletes is the inverse relationship to the use of PEDs (Garcia-Argibay, 2019). PED use in certain strength sports athletes may be partly explained by dutifulness as it has been reported that illicit drug users possess lower levels of this facet (Terracciano et al., 2008). Additionally, lower levels of cautiousness also had small but consistent influence on drug use (Terracciano et al., 2008). The intricate interactions between subdimensions and facets of conscientious and the propensity for drug use in strength sports is an area which needs further investigation.

A number of papers have explored the relationship between CrossFit® and psychological variables (Box et al., 2019; Dominski et al., 2021). CrossFit® athletes may experience physique anxiety similar to aesthetic-based athletes (Hurst et al., 2000). Interestingly, skill relates to increased body image satisfaction (Coyne & Woodruff, 2020). Changes in physique from strength related activities may contribute to decreases in anxiety from resistance exercise (Gordon et al., 2017). It could be inferred that individuals who pursue either aesthetic-based strength sports or CrossFit® may have higher initial trait anxiety which decreases as the athletes develop skills and experience physique changes. However, this has yet to be supported by empirical studies. Agreeableness has not been explored directly in either CrossFit® athletes or strongman athletes. However, both sports appear to have a comradery aspect. CrossFit®, in particular, has team events where individuals have to cooperate to achieve higher scores (IFFF, 2023). Working within teams requires elements of trust, though further exploration is required to understand these dynamics within strength sports (Costa et al., 2018).

2.5 Conclusion

Bodybuilding is the most studied strength sport in terms of temperament, with athletes possessing the potential to display high artistic interest, but bodybuilders may exhibit more neurotic tendencies due to physique anxiety and vulnerability. Weightlifters and powerlifters have often been categorised together within personality research, however, though no difference in personality have been reported further investigation is needed to establish whether there are differences at the facet level. Finally, hybrid strength sports athletes, particularly those in CrossFit®, may be theorised to display extraverted and adventurous tendencies due to the nature of the sport and the presence of group training.

Agreeableness is particularly interesting dimension which is yet to be explored in competitive strength sporting context. In particular, politeness, a subdimension of agreeableness, is negatively associated with competitiveness (Fong et al., 2021). It is unclear as to whether the trait of competitiveness correlates to performance in strength sports, but the link has been made in both academia (Baumann & Harvey, 2021) and team sport athletes (Passos et al., 2016). This suggests that agreeableness may decrease due to the level of competition despite which strength sport the athlete competes in, however current there is no literature to support this claim.

To summarise, there was a dearth of information regarding personality of strength sports athletes within the existing body of knowledge. Psychological phenomena provide some clues as to

the different temperament of these athletes, though this can be regarded as tangential evidence. This review illustrates the gaps and therefore potential for further research. Research into psychological aspects of strength sport will provide an understanding which supports the development and performance of these individuals. More specifically, the exploration of personality dimensions along with their facets will provide information about which temperament are drawn to which strength activities. Preliminary research has identified that personality influences the tendency of people to conduct certain physical activity. Thus, an extension of this research will guide recommendations to improve the adherence of resistance training in the general population.

Chapter 3

An Exploration of Personality Differences Between Strength Sports Athletes – Cross-Sectional Study

Prelude

Within the existing body of literature, there are significant gaps regarding the personality of strength sports athletes. Conducting research into the personality of strength sports is crucial, as it will provide valuable insights into the similarities and difference of these athletes. Specifically, exploring personality dimensions and their facets will shed light on what personality align with specific resistance training behaviours. Therefore, this chapter provides a starting point for this topic of research.

3.1 Introduction

In recent years, there has been a significant increase in the popularity of strength sports like bodybuilding, powerlifting, strongman/strongwoman, weightlifting, and more recently, CrossFit® (Kraemer et al., 2017; Steele et al., 2022). While these sports all prioritise strength development through resistance training, they differ in terms of the physiological demands and desired outcomes they emphasise (Hackett et al., 2020; Robinson et al., 2015; Storey & Smith, 2012). Research has highlighted the numerous physical and psychological benefits of resistance training, such as improvements in the musculoskeletal system, reduced risk of chronic diseases, and enhanced mental health (Ashton et al., 2020; Gordon et al., 2018; Grøntved et al., 2012; Schoenfeld et al., 2016). Examining the underlying psychological dimensions that contribute to sport selection can enhance our understanding of the unique personalities within each sport.

In the 20th century, personality researchers identified the presence of five distinct dimensions of personality, commonly known as the five-factor model (Goldberg, 1992; McCrae & Costa, 1987). The dimensions include openness, conscientiousness, extraversion, agreeableness and neuroticism (Goldberg, 1992). These personality dimensions are observed across cultures, races, and genders (Schmitt et al., 2007a; Weisberg et al., 2011). The dimensions represent the differences in motives, feelings, and behaviours between individuals. There is substantial evidence to support the existence of these five dimensions and the methodologies associated (Johnson, 2014; McCrae & Costa, 1987; McCrae et al., 2010). While personality dimensions provide merit for assessing broad aspects of personality, each dimension also contains six narrower facets which have high predictive

value on behaviour compared to the dimensions alone (Paunonen & Ashton, 2001). The exploration of personality dimensions and facets offers valuable insights that could potentially enhance adherence rates and foster better health outcomes.

Physical activity, with regards to frequency and intensity, was found to significantly correlate with personality dimensions, such as extraversion (r = 0.23), conscientiousness (r = 0.20) and neuroticism (r = -0.11) (Rhodes & Smith, 2006; Wilson & Dishman, 2015). Within the sports domain, personality dimensions have been noted to distinguish between certain sports, levels of participation (Piepiora et al., 2020; Piepiora et al., 2019), and the likelihood of success (Piepiora, 2021). While there are established observations with regards to physical activity and other sports, there is a dearth of information about whether strength sports athletes display unique personality characteristics. Bodybuilding is the most explored strength sport concerning temperament, with a focus on dysfunctional behaviour and negative affect (Emini & Bond, 2014; Steele et al., 2019). Bodybuilders have been shown to have higher neuroticism than other athletes (Witkowski & Piepiora, 2018). The research also implies that bodybuilders present with higher conscientiousness through higher reported perfectionism (Blouin & Goldfield, 1995). Weightlifters have also been included in personality research regarding individual sport athletes, with higher rates of openness, conscientiousness, and extraversion than team sport athletes (Darden, 1972; Ilyasi & Salehian, 2011). CrossFit®, as a modality of training, has recently shown no personality difference with other forms of training (Box et al., 2019), however, this research lacked facet-level analysis and did not target athletes specifically. Therefore, none of the personality research, thus far, has been comprehensive about the temperament of strength sports athletes, with a number of strength sports being absent from the literature altogether. Thus, examining strength sports athletes will provide valuable insights into the personality of athletes that are aligned with distinctive styles of resistance training.

Considering the numerous health benefits associated with resistance training, such as improvements in the musculoskeletal system, reduced risk of chronic diseases, and enhanced mental health, exploring the influence of underlying temperaments on longevity and adherence in resistance activities becomes crucial (Ashton et al., 2020; Gordon et al., 2018; Grøntved et al., 2012; Schoenfeld et al., 2016). Though there is substantial merit for using a dimension-level approach to measure personality in strength sports athletes, including facet-level information may help elucidate a more precise understanding of personalities across strength sports athletes. Thus, the aim of this study was to explore the personalities of strength sports athletes to understand whether the distinct resistance training behaviours and competitive demands unique to each sport are represented at a

dimensional or facet level. It was hypothesised that there would be dimensional differences between strength sports athletes, particularly with regards to higher levels of conscientiousness and neuroticism in bodybuilding athletes. Furthermore, we propose the hypothesis that there will be variations at the facet level that can provide insights beyond a dimensional level explanation.

3.2 Methods

3.2.1 Participants

A total of 219 strength sports athletes were initially recruited to take part in the survey. However, due to incomplete responses, the final dataset included responses from 187 strength sports athletes who completed the survey in its entirety (male 138, female 49). Among these athletes, there were 30 bodybuilders, 14 CrossFit® athletes, 86 powerlifters, 19 strongman/strongwoman competitors, and 31 weightlifters. To be included in the study, participants had to be actively participating in competitive events within their respective strength sport discipline within the past 12 months or expressed intentions to compete in the next 12 months. Additionally, all participants were required to be over 16 years of age. Prior to initiating the survey, all participants received clear information regarding the purpose, benefits, and risks associated with the research. Informed consent was obtained from each participant, indicating their willingness to participate, before proceeding to complete the survey. This study was approved by the Auckland University of Technology Ethics Committee, approval number 22/215.

3.2.2 Design

This study was designed to reach a convenient sample of athletes who currently engaged in a strength sport. An online questionnaire was used to allow digital administration of the survey. The survey was distributed via social media, using a snowball sampling approach to reach the specific sample of strength sports athletes (Atkinson & Flint, 2004). The online application Qualtric was used to provide an anonymous link to the survey and to collect responses (Qualtrics, Inc., Provo, Utah, USA). The link was sent with the acknowledgement that the survey was to explore the personalities of strength sports athetes and that the survey would take approximately 15 minutes to complete.

3.2.3 Survey

The survey used in this study consisted of the International Personality Item Pool (IPIP) 120 questionnaire along with a section to collect demographic information: sex, strength sport, level of competition, and age. The IPIP 120 is a well-established inventory designed to assess five personality

dimensions: openness, conscientiousness, extraversion, agreeableness, and neuroticism (Kajonius & Johnson, 2019; McCrae & Costa Jr, 2004). The inventory comprises 120 items that capture different facets of these personality dimensions. The survey utilised a Likert scale response format for the IPIP 120 items, where participants rated each statement on a scale ranging from strongly disagree to strongly agree.

3.2.4 Statisical Analysis

Descriptive analysis was performed to summarise the characteristics of the study sample and the variables of interest. For continuous variables, personality dimensions and facets, means and standard deviations were calculated. Categorical variables, sex and strength sports, were summarised using frequencies and percentages. Descriptive statistics were generated using JASP version 0.16.3 (University of Amsterdam, Netherlands) with the alpha level set at $p<0.05$. Normality was assess using a Shapiro-Wilks on the residuals. Subsequently, Levene's test were conducted to ensure homogeneity of variance. Outliers were retained in the analysis to maintain data integrity and avoid potential biases. Age and level of competition, though initially included, were removed as covariates due to non-significance. Thus, one-way ANCOVAs (Analysis of Covariance) were employed to examine the differences between the personality dimensions and facets of strength sports athletes while controlling for sex. Due to a smaller sample size than initially anticipated, both level of competition and age were removed as covariates. This adjustment was necessary to minimise the risk of overfitting. When significant main effects were detected, post hoc analyses, a Bonferroni correction, were conducted to examine pairwise differences between the strength sport groups.

3.3 Results

219 strength sports athletes started the survey, with only 187 analysed for this study as 32 cases were excluded due to incomplete surveys. Of the 187 strength sports athletes, 138 were males (73.8%) and 49 were females (26.2%). Athletes self-selected their sport as bodybuilding (n = 31; 6.5% female), CrossFit® (n = 14; 57.1% female), powerlfiting (n = 86; 27.9% female), strongman/strongwoman (n = 22; 27.3% female), and weightlifting (n = 34; 20.6% female).

Independent samples t-tests showed that mean personality dimension and facet scores among female athletes were significantly higher than among male athletes for conscientiousness $t(187) = 2.036$, $p = 0.043$, agreeableness $t(187) = 3.214$, $p = 0.002$), anxiety $t(187) = 3.048$, $p = 0.003$, morality $t(187) = 2.086$, $p = 0.038$, emotionality $t(187) = 3.506$, $p < 0.001$, dutifulness $t(187) = 3.304$, $p < 0.001$, activity level $t(187) = 2.071$, $p = 0.040$, cooperation $t(187) = 4.265$, $p < 0.001$, and

achievement striving t(187) = 3.564, p < 0.001. Therefore, sex was confirmed as a covariate for further analysis.

3.3.1 Openness

While controlling for sex differences, an ANCOVA did not reveal any significant differences in the openness dimension regarding strength sports (F = 1.821, p = 0.171, ηp2 = 0.038). Similarly, one-way ANCOVAs for imagination (F = 0.188, p = 0.944, ηp2 = 0.004), intellect (F = 1.012, p = 0.403, ηp2 = 0.022), adventurousness (F = 0.331, p = 0.857, ηp2 = 0.007), and emotionality (F = 1.668, p = 0.159, ηp2 = 0.036) did not reveal significant differences amongst the groups. However, both artistic interest (F = 3.220, p = 0.014, ηp2 = 0.066) and liberalism (F = 2.420, p = 0.050, ηp2 = 0.051) revealed statistically significant difference between the groups. A post hoc analysis showed a large effect (d = 1.08) between bodybuilding and CrossFit® concerning artistic interest. Additionally, a medium effect (d = 0.78) was found between bodybuilding and weightlifting for liberalism. The means and standard deviations for each openness variable are displayed in Figure 1.

3.3.2 Conscientiousness

While controlling for sex differences, an ANCOVA did not reveal any significant differences in the conscientious dimension regarding strength sports (F = 2.223, p = 0.068, ηp2 = 0.047). Similarly, one-way ANCOVAs for self-efficacy (F = 1.42, p = 0.229, ηp2 = 0.03), dutifulness (F = 1.683, p = 0.156, ηp2 = 0.063), achievement-striving (F = 0.283, p = 0.889, ηp2 = 0.006), and self-discipline (F = 1.349, p = 0.253, ηp2 = 0.029) did not reveal significant differences amongst the groups. However, both orderliness (F = 3.063, p = 0.018, ηp2 = 0.063) and cautiousness (F = 2.589, p = 0.038, ηp2 = 0.054) revealed statistically significant difference between the groups. A post hoc analysis showed a medium effect between bodybuilding and powerlifting (*d* = 0.67) as well as bodybuilding and strongman/strongwoman (*d* = 0.79) concerning orderliness. Additionally, a large effect (*d* = 0.85) was identified between bodybuilding and strongman/strongwoman for cautiousness. The means and standard deviations for each conscientiousness variable are displayed in Figure 2.

3.3.3 Extraversion

While controlling for sex differences, an ANCOVA did not reveal any significant differences in the extraversion dimension regarding strength sports (F = 0.375, p = 0.826, ηp2 = 0.008). Similarly, one-way ANCOVAs for friendliness (F = 0.363, p = 0.828, ηp2 = 0.008), gregariousness (F = 0.196, p = 0.94, ηp2 = 0.004), assertiveness (F = 0.298, p = 0.879, ηp2 = 0.007), activity level (F = 0.535, p = 0.71,

ηp2 = 0.012), excitement seeking (F = 0.421, p = 0.794, np2 = 0.009), and cheerfulness (F = 0.426, p = 0.756, ηp2 = 0.01) did not reveal significant differences amongst the groups. The means and standard deviations for each extraversion variable are displayed in Figure 3.

3.3.4 Agreeableness

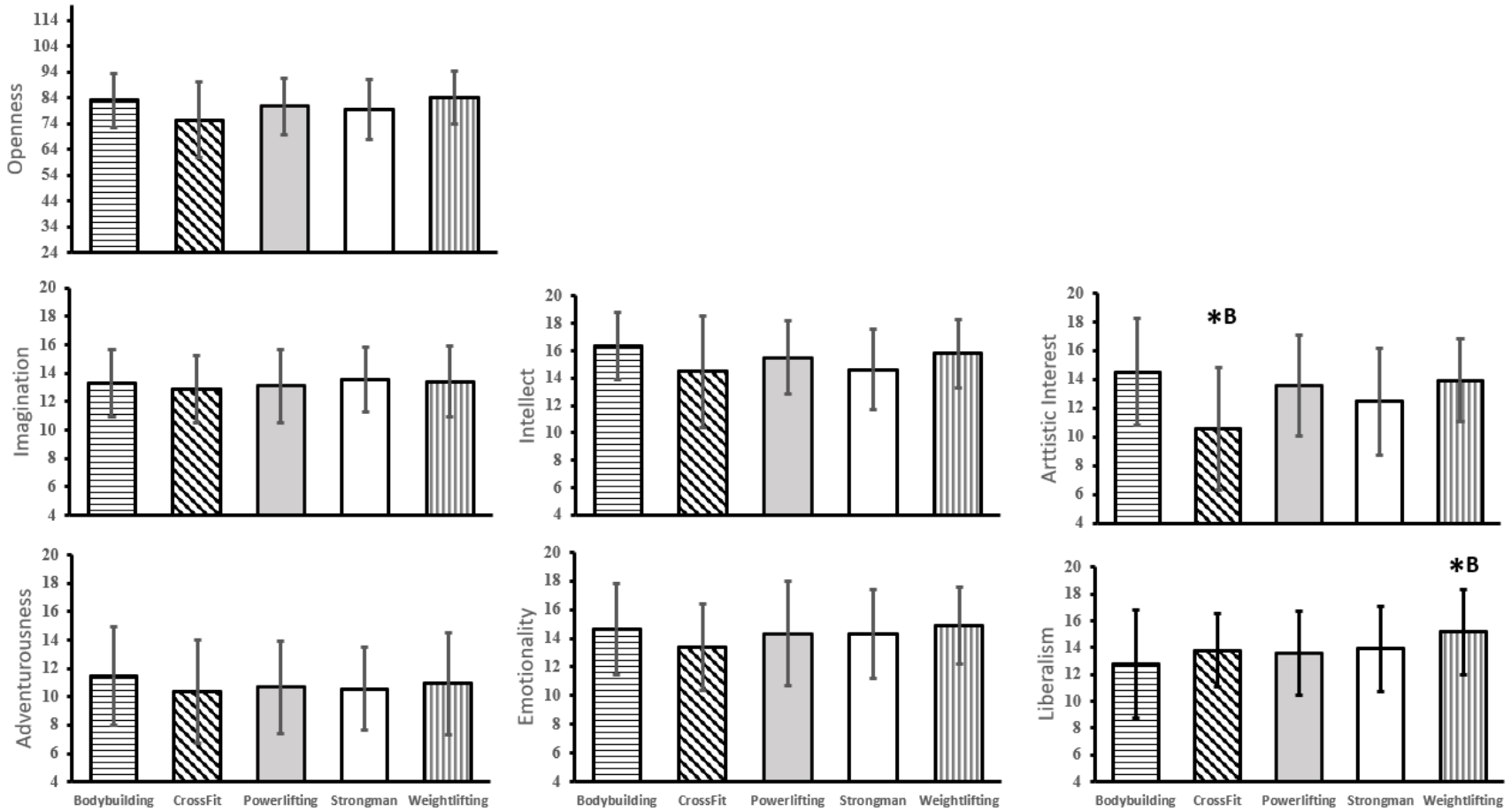
While controlling for sex differences, an ANCOVA did not reveal any significant differences in the agreeableness dimension regarding strength sports (F = 0.593, p = 0.668, ηp2 = 0.013). Similarly, one-way ANCOVAs for trust (F = 0.838, p = 0.503, ηp2 = 0.018), sympathy (F = 2.03, p = 0.092, ηp2 = 0.043), morality (F = 0.395, p = 0.812, ηp2 = 0.009), altruism (F = 1.952, p = 0.104, ηp2 = 0.041), modesty (F = 0.534, p = 0.711, np2 = 0.012), and cooperation (F = 0.53, p = 0.714, ηp2 = 0.012) did not reveal significant differences amongst the groups. The means and standard deviations for each agreeableness variable are displayed in Figure 4.

3.3.5 Neuroticism

While controlling for sex differences, an ANCOVA revealed a statistically significant difference in the neuroticism dimension regarding strength sports (F = 3.698, p = 0.006, ηp2 = 0.035). A post hoc analysis showed large effects between CrossFit® and powerlifting (Cohen's D = 0.87), CrossFit® and strongman/strongwoman (*d* = 1.16), and CrossFit® and weightlifting (*d* = 1.01). Similarly, one-way ANCOVAs for immoderation (F = 3.594, p = 0.008, np2 = 0.074) and vulnerability (F = 2.945, p = 0.022, ηp2 = 0.61) showed statistically significant differences amongst the groups. Post hoc analysis revealed higher levels of immoderation in strongman/strongwoman (*d* = 0.88) and weightlifting (*d* = 0.82) when compared to bodybuilding. Additionally, large effects were found in vulnerability between CrossFit® and strongman/strongwoman (*d* = 1.08) as well as CrossFit® and weightlifting (d = 0.95). Conversely, anxiety (F = 0.593, p = 0.165, ηp2 = 0.035), anger (F = 0.443, p = 0.778, ηp2 = 0.01), depression (F = 2.205, p = 0.07, ηp2 = 0.046), and self-consciousness (F = 1.037, p = 0.389, ηp2 = 0.022) did not reveal significant differences amongst the groups. The means and standard deviations for each neuroticism variable are displayed in Figure 5.

Figure 1.

Means and Standard Deviations of the Openness Dimension and Facets

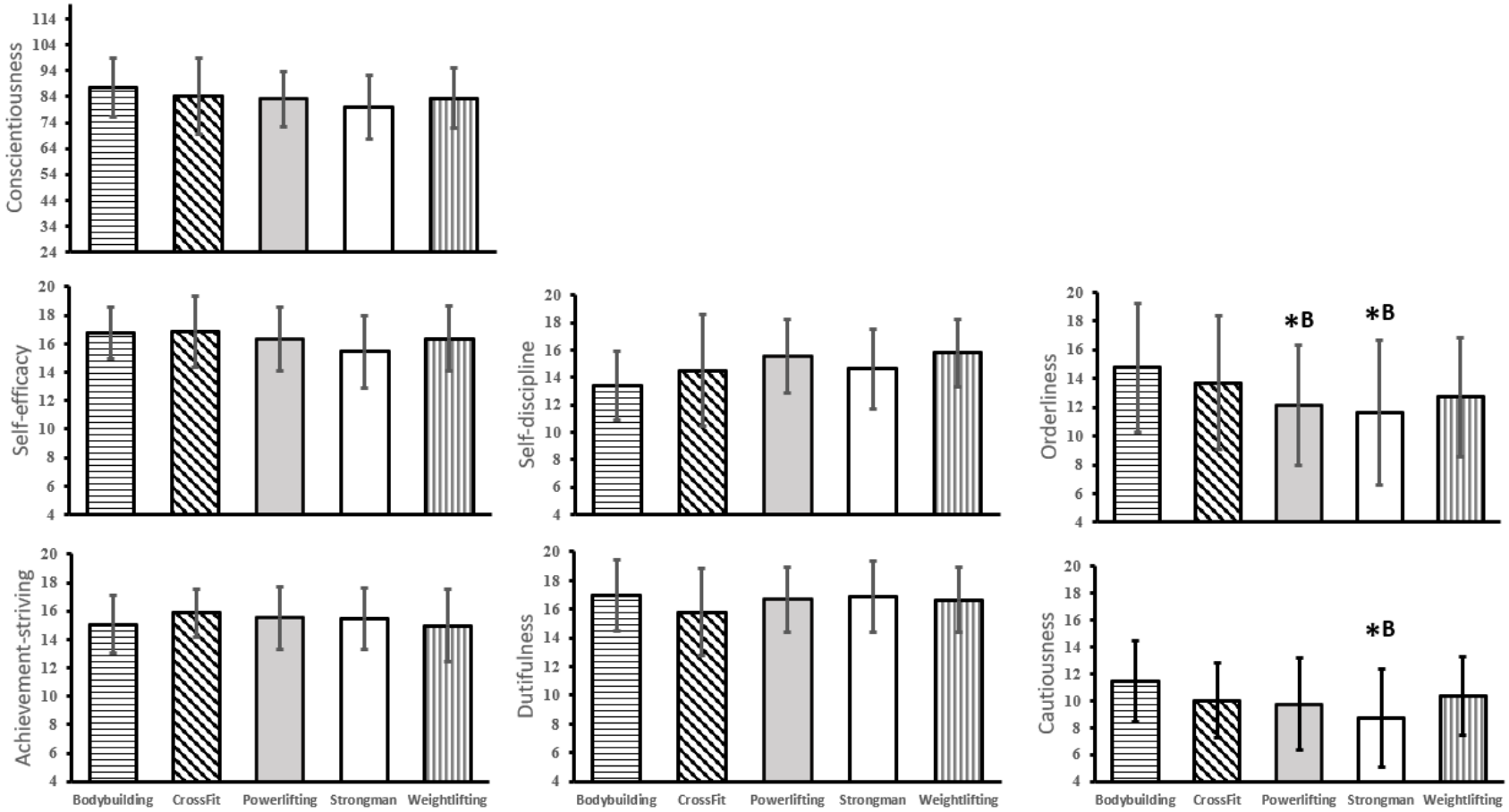


Note. Error bars represent the standard error around the means. Strongman represents both strongman and strongwoman athletes.

* indicate statistically significant differences at the $p < .05$ level, ^{B} = significantly different to bodybuilding

Figure 2.

Means and Standard Deviations of the Conscientiousness Dimension and Facets

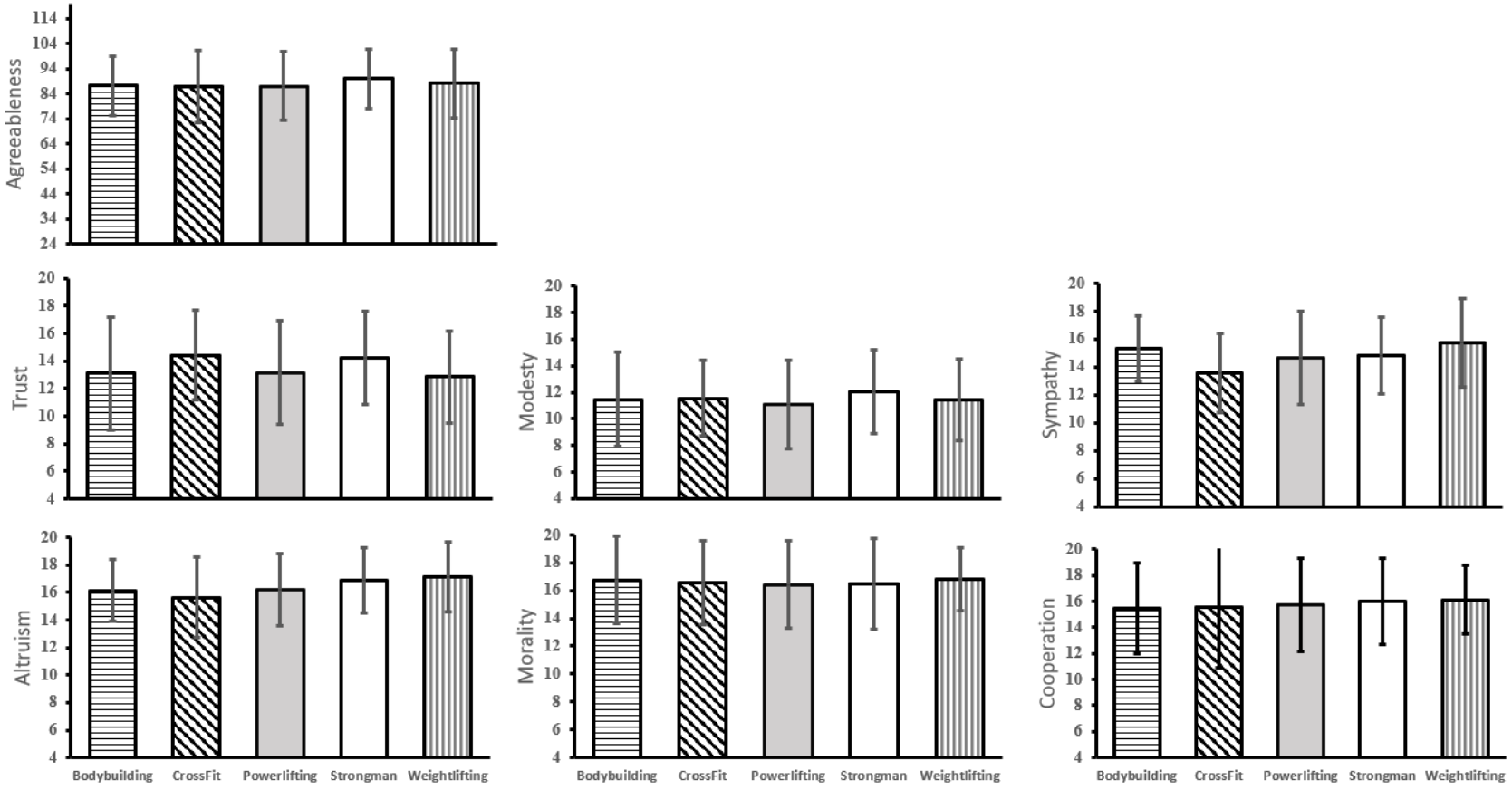


Note. Error bars represent the standard error around the means. Strongman represents both strongman and strongwoman athletes.

* indicate statistically significant differences at the $p < .05$ level, ^{B} = significantly different to bodybuilding

Figure 3.

Means and Standard Deviations of the Extraversion Dimension and Facets

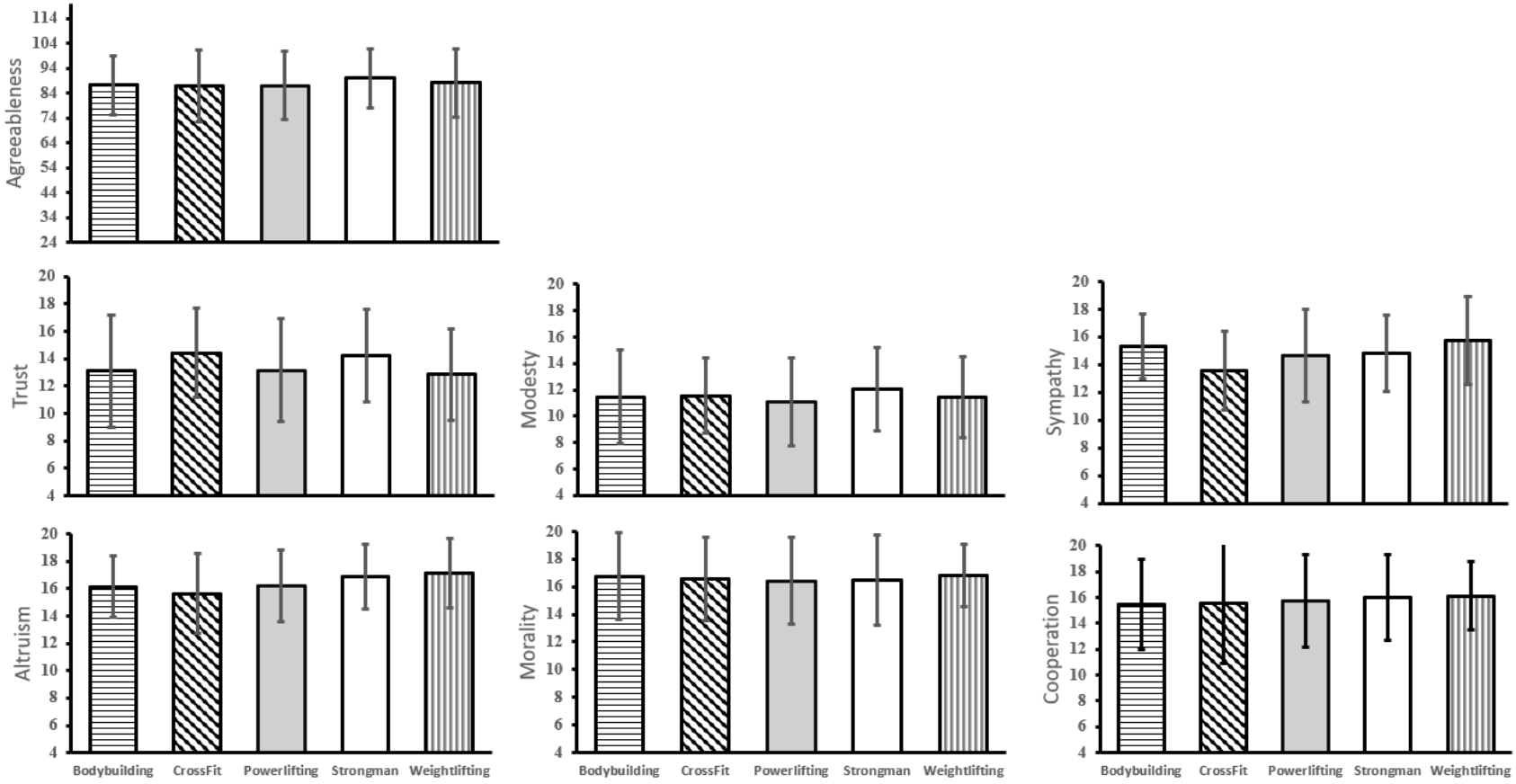


Note. Error bars represent the standard error around the means. Strongman represents both strongman and strongwoman athletes.

* indicate statistically significant differences at the $p < .05$ level

Figure 4.

Means and Standard Deviations of the Agreeableness Dimension and Facets

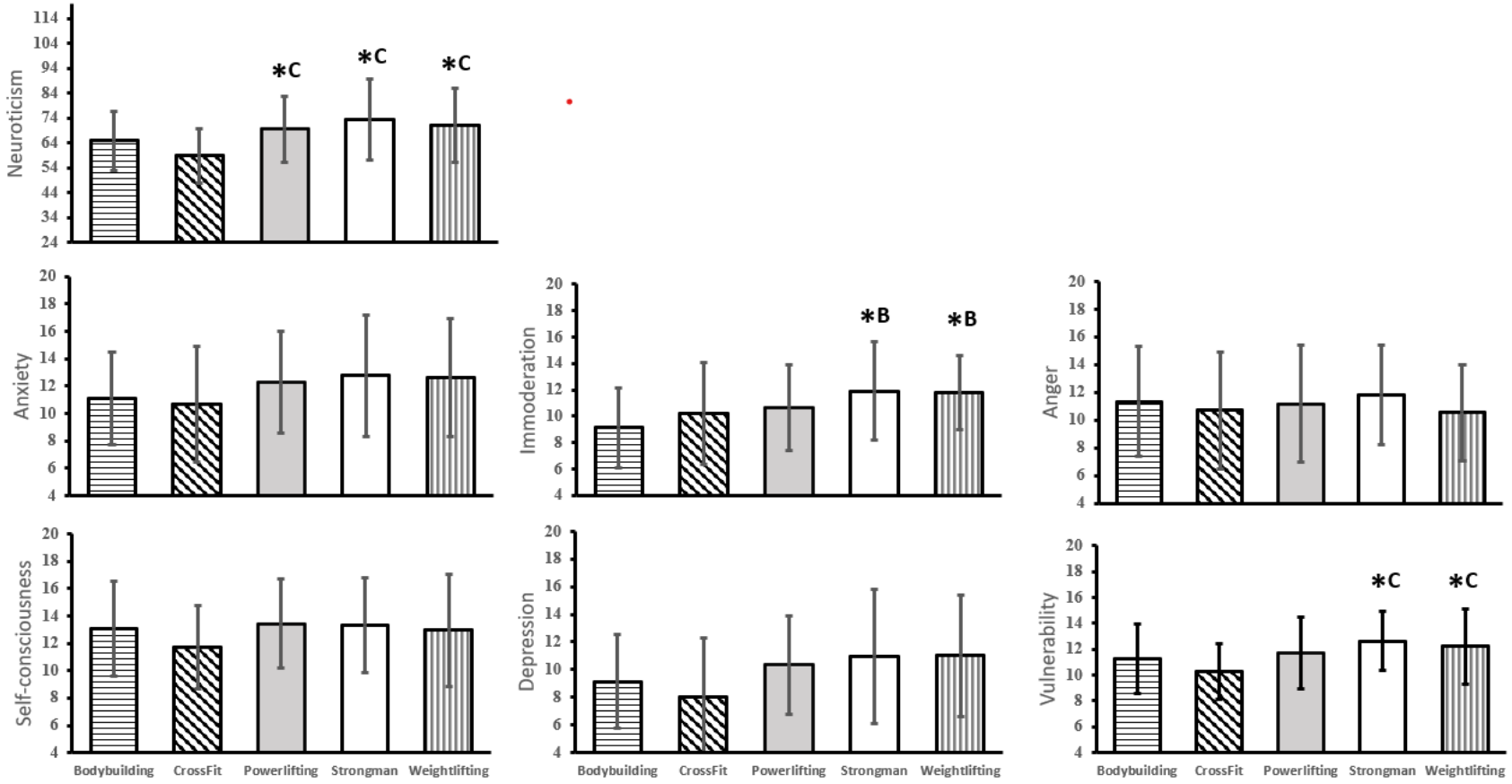


Note. Error bars represent the standard error around the means. Strongman represents both strongman and strongwoman athletes.

* indicate statistically significant differences at the $p < .05$ level

Figure 5.

Means and Standard Deviations of the Neuroticism Dimension and Facets



Note. Error bars represent the standard error around the means. Strongman represents both strongman and strongwoman athletes.

* indicate statistically significant differences at the $p < .05$ level, [B] = significantly different to bodybuilding, [C] = significantly different to CrossFit® athletes

3.4 Discussion

Although there is some research examining personality in sport (Allen & Laborde, 2014) there is little known about the temperaments and differences between strength sports athletes. In this study we aimed to explore personality dimensions and facets in five strength sport disciplines. The approach was similar to previous research, which explored the personality differences by using the five-factor model (Piepiora, 2021; Piepiora et al., 2020; Piepiora et al., 2019; Witkowski & Piepiora, 2018). However, in this study, additional facet analyses were conducted to gain insights which are missed at the dimensional level (Laborde et al., 2020). Additionally, these findings shed light on the personality similarities and differences between resistance training modalities as strength sports have distinct approaches depending on the physiological demands.

At the dimensional level, no differences were found between strength sports athletes with the exception of neuroticism. This difference was found in CrossFit® athletes who were lower in neuroticism than three other strength sports, which was not included in our hypothesis. Our study also appeared to conflict with previous research that suggested there was no personality difference between CrossFit® modalities and other training methodologies (Box et al., 2019) and that there are higher rates of neuroticism in bodybuilders than other sport athletes (Witkowski & Piepiora, 2018). Additionally, the finding that CrossFit® athletes are lower in neuroticism evokes particular intrigue as the majority of this group were female, which, on average, rank higher on neuroticism in the general population (Weisberg et al., 2011). This may only apply to this small sample, though may also suggest a unique psychological profile among female CrossFit® athletes that deviates from the general population. In addition to this unique finding regarding personality dimensions, this study provided insight into nuanced personality facets of these athletes. These findings were consistent with the prediction that further information would be found beyond dimensional analysis. These facet level differences were found within openess, conscietiousness, and neuroticism and concerned artistic interest, liberalism, orderliness, cautiousness, immoderation, and vulnerability.

Bodybuilding is the only strength sport assessed which aesthetic standard is the basis of competition, with athletes' physiques being judged on symmetry, muscularity, definition, and overall impression (IFBB, 2021). The higher artistic interest of bodybuilders aligns with findings from other aesthetic based athletes such as dancers and gymnasts who have high openness (Fink & Woschnjak,

2011). Constrasting within the openness dimension, was the result of lower liberalism in these bodybuilding athletes. However, this is consistent with the idea that bodybuilders have more traditional views of phenotical physiques (Aspridis et al., 2014; Fabris et al., 2018). Bodybuilders difference in liberalism was only statistically significantly with weightlifters (d = 0.76), though trended lower than all strength sports athletes. Low trending liberalism may explain why bodybuilders failed to exhibit higher openess. Higher artistic interest appears to balance the openness scores of bodybuilders to provide the illusion that openness is statistically equivalent amongst strength sports athletes. However, this facet level analysis clearly supports the importance of going beyond the dimensions of personality.

While no significant differences were identified between the conscientiousness of strength sports athletes, significant differences were observed in facet levels. It is important to note that conscientiousness did trend moderately higher in bodybuilders than strongman/strongwoman. It appears that conscientiousness runs along similar lines to openess with facet level differences buffering the total dimensional score in bodybuilding athletes. With regard to the facets, orderliness was found to be moderately higher in bodybuilders than both powerlifters and strongman/strongwoman. Orderliness has been mapped with autonomy as athletes seek to control their environment (Laborde et al., 2020). Bodybuilding appears to be more independent than other strength sports, with paths to success being more self-determined (Suffolk, 2015). Thus, individuals who seek to control their environment, such as tidying up, may be best suited to bodybuilding. Additionally, bodybuilders were found to be lower, to a large degree, in immoderation than both strongman/strongwoman and weightlifters. These facets, taken together, are consistent with the strict dietary practices needed, particularly those required to reach the extreme leanness for competitive physique sports (Helms et al., 2019).

Cautiousness is an inhibitory facet of personality which was observed to be lower in strongman/strongwoman than bodybuilders, to a large effect, and trended lower than all other strength sport athetes. This appears to match the behaviours of strongman/strongwoman athletes who willingly attempt varied strength tasks which are percieved to have high risk of injury (Winwood et al., 2014). For example, the keg toss involves throwing a heavy keg backward over the individuals head which may result in the keg falling on the athlete. CrossFit® athletes also attempt a variety of strength tasks with percieved risk, however, this risk involves practiced movements (i.e. deadlifts, clean and jerk) under fatigue which have clearer contingencies, for instance, guiding the bar forward after missing a jerk. In

contrast, hypertrophy training for bodybuilders, though challenging, has the lowest rates of injury in strength sports (Keogh & Winwood, 2017). Bodybuilders often use controlled tempo techniques and utilise machines which dictate the movement path of the load (Li et al., 2023). Thus, being cautious is beneficial to bodybuilders and other aesthetic-based athletes as injuries can influence the physiques aesthetic and interupt progress. Whereas, taking higher risks in other strength sports may lead to preferentially higher rewards.

Within this sample, no significant difference was found between the groups for levels of agreeableness. The indirect nature of competition may explain the high agreeableness across all strength sports athletes. According to Witkowski and Piepiora (2018), agreeableness tends to be higher in sports where competition is indirect, which is characterised by lack of direct contact with a competitor. All strength sports measured in this study compete indirectly in most events, even though some events compete head to head (e.g. atlas stones, rope climbs etc.). Competiveness is typically correlated with lower agreeableness (Fong et al., 2021), however, indirect competition provides a nuanced situation for athletes with higher agreeableness to compete. Nevertheless, emotional stability may be a more important determiner of sport selection and performance as it is regarded as a socially desirable trait (DeYoung et al., 2007).

Neuroticism, also known as emotional stability, was the only personality dimension found be significantly different between strength sports athletes within this study. Specfically, CrossFit® athletes were shown to have much lower neuroticism compared to powerlifters, strongman/strongwoman, and weightlifters. Our findings are consistent with the personality research as higher physical activity is correlated with lower neuroticism (Rhodes & Smith, 2006; Wilson & Dishman, 2015). CrossFit® requires athletes to develop both strength and cardiorespiratory endurance concurrently (Claudino et al., 2018). Training these components has been found to ameliorate both depression (Gordon et al., 2018; Kandola et al., 2019), and anxiety (Gordon et al., 2017). Therefore, the broader training approach of CrossFit® athletes may provide physical and psychological preparation for a variety of stresses. Supporting this further is the lower vulnerability observed in CrossFit® athletes relative to other strength sports athletes. Vulnerability is inversely correlated to resilience and is often conceptualised on a continuum (Haddadi & Besharat, 2010). Futher research exploring the changes of neuroticism and vulnerability in strength

sports athletes over time may reveal whether these personality differences are influenced by training behaviours.

The findings of this study indicate that strength sports athletes display somewhat unique personality characteristics, based on sport demands and training processes. However, this study only investigated strength sports athletes, thus generalising these finding to other populations, such as other sports and none competitive individuals, is limited. Unfortunately, the respondent rate is smaller than suggested for cross-sectional research and along with only one time point of personality being reported, limits the statistical power of this study. Additionally, as this research is cross-sectional in nature the causal effects of training modalities and environments cannot be established. Further studies with multiple time points of data collection will enable greater understanding around the development and change of personality in response to different training modalities over time, which would build on the research by Piepiora (2021).

Conclusion

This is first study, to our knowledge, which comprehensively explores the personality of strength sports athletes. As aknowledged by Laborde et al. (2020), most sport and exercise research focuses on narrow psychological phenomena as it it deemed to be more predictive. Thus, adopting this approach has shed light on the specific similarities and differences between strength sports athletes and provides insight into which temperaments engage in similar, but slightly different behaviours. Key differences were found particularly between bodybuilders and other strength athletes within the openess, conscientiousness, and neuroticism dimensions. Individuals with higher orderliness and cautiousness may suited to aesthetic-based strength training such as bodybuilding. Whereas, individuals who report lower neuroticsm may prefer CrossFit® as a resistance training modality. However, further research is needed to confirm these differences in strength sports athletes and how resistance training relates to changes to personality over time.

Chapter 4

Summary, Practical Recommendations, Limitations, and Future Research

4.1 Summary

The aim of this dissertation was to establish and develop an understanding of the personality of strength sports athletes. Before now, there has been a dearth of personality research regarding strength sports athletes, with only a few studies concerning the topic in the last half century (Bäckmand et al., 2001; Darden, 1972; Witkowski & Piepiora, 2018). Some recent research has eluded to the personality profile of certain strength sports athletes, specifically bodybuilders (Piepiora, 2021) and weightlifters (Ilyasi & Salehian, 2011), however this research did not compare the differences between strength sport disciplines directly. Additionally, most personality research, especially regarding sport, has adopted a dimensional approach, thus the understanding within personality facets is poorly understood. Adjacently, a large body of research has explored the relationship between physical activity and personality, including a couple of notable meta-analyses (Rhodes & Smith, 2006; Wilson & Dishman, 2015). This research has established difference between those who are active and those who are sedentary. Recent research has explored the difference between individuals who use different exercise modalities (Box et al., 2019). However, this research has limited scope concerning resistance training. Thus, the focus of strength athletes in this dissertation enabled a unique perspective on the personality of individuals who consistently participate in various methods of resistance training.

4.1.1 Narrative Review

Previous psychology research has adopted a narrow facet approach to strength sports, thus the literature has large gaps in facet representations of personality. Therefore, a narrative review (chapter 2) was conducted as part of this dissertation to discern the current knowledge regarding personality in strength sports athletes. A limited number of studies compared strength sports athletes personality, thus this review relied on adjacent research to infer the scope of personality in strength athletes. While many posits were inferred, abbutting research indicates that personality dimensions and facets likely differ amongst strength sports athletes. However, a comprehisive exploration of the narrower facets would be needed to shed light on the personality similarities and differences in strength sports athletes that were missing within the literature.

4.1.2 Cross-Sectional Descriptive Survey

Adjacent psychology research suggested that there are important differences in the personality of strength sports athletes. However, no previous research had explored these differences at the facet level. Therefore, the purpose of this study was to determine the similarities and differences between the personalities of 187 strength sports athletes by using the IPIP-120 inventory. The primary findings were as follows:

1. Bodybuilders ranked higher on artistic interest, particularly in regards to CrossFit® athletes.
2. The liberalism of bodybuilders was significantly lower than weightlifters, and trends lower than the other strength sports athletes.
3. Orderliness and cautiousness ranked higher in bodybuilders than other strength sports athletes, despite no significant difference in overall conscientiousness.
4. The neuroticism was lower in CrossFit® athletes despite the majority of this group being female.
5. CrossFit® athletes ranked lower on vulnerability, particularly with regards to strongman/strongwoman athletes and weightlifters.
6. Immoderation was lower in bodybuilders, particularly with regards to strongman/strongwoman athletes and weightlifters.
7. Strength sports athletes ranked similarly in both extraversion and agreeableness.

This study provided the first comprehensive exploration of personality in strength sports athletes. The findings both supported and conflicted with inferences from the literature.

4.2 Practical Recommendations

It has been posited that training a sport discipline shapes the personality of the athlete (Piepiora, 2021). This was somewhat supported by the findings of this research. These findings have implications for current and prospective strength sport coaches and athletes. The following are preliminary insights which may guide the participation in strength sports based of initial personality or desire to change.

1. Bodybuilding, or aesthetic-based strength sports, provide a resistance training framework which suits individuals with artistic interest and/or are injury avoident. Thus, adoption of bodybuilding as a sport may be suitable for people who match these personality characteristics.

2. CrossFit® has an inherient aerobic component which may either select and/or provide a resistance training framework for lower neuroticism and vulnerability, particularly for female participants. Thus, individuals seeking to reduce neuroticism and vulnerability may benefit from adopting CrossFit® as a sport.
3. Strongman/strongwoman athletes present with lower orderliness, and cautiousness, along with higher immoderation. Thus, individuals who prefer less structure, and do not have an aesthetic focus, may be suited to a strongman/strongwoman resistance training framework for adherence.

4.3 Limitations

There are a number of limitations which need to be consider when intepreting the results found in this dissertation.

1. The narrative review presented is limited by subjectivity, a lack of reproducibility, inadequate assessment of study quality, limited statistical analysis, and a lack of search transparency.
2. The design of the study was cross-sectional, thus causal influences cannot be established between personality and strength sports athletes. Additionally, only one time point was recorded, due to time constraints, which reduces the robustness of the findings.
3. The participants in this study comprised of strength sports athletes, therefore generalising the findings to other populations is limited (i.e. general populations, others strengths sports). Furthermore, incompleteness of response data reduced the statistical power of the findings.

4.4 Further Research

This dissertation aimed to explore the personality of strength sports athletes in an effort to understand the similarities and differences of athletes who focus on resistance training as a predominant modality. Considering the findings and limitations of this dissertation, the following are suggestion for further research.

1. Given the inherient bias of the narrative review, a mapping review of sport and exercise psychology, as it relates to the personality of strength sports athletes, will broaden the understanding of the current literature whilst reducing subjectivity, and providing reproducibility.

2. As similarities and differences in personality have been found in this study (chapter 3), further studies should include larger sample sizes, with multiple time points, to confirm these differences with a stronger statistical power and show whether the personality of these athletes change over time.
3. Lastly, further research into the change of personality among athletes in strength sports, along with the training methods they employ, could provide valuable insights into the magnitude of their influence.

4.5 Conclusion

This dissertation provides academic insight into the personality similarities and differences of strength sports athletes. The data in this study showed the value of analysing beyond personality dimensions in sport as nuanced personality characteristics were found at the facet level in these athletes. While further research is needed to understand the relationship and development of personality in regards to resistance training behaviour, environment, and culture, this dissertation established a starting point for exploration of personality in strength sports athletes.

References

Allen, M. S., & Laborde, S. (2014). The Role of Personality in Sport and Physical Activity. *Current Directions in Psychological Science*, *23*(6), 460-465. https://doi.org/10.1177/0963721414550705

Alves, R. C., Prestes, J., Enes, A., de Moraes, W. M., Trindade, T. B., de Salles, B. F., Aragon, A. A., & Souza-Junior, T. P. (2020). Training programs designed for muscle hypertrophy in bodybuilders: a narrative review. *Sports*, *8*(11), 149.

Ashton, R. E., Tew, G. A., Aning, J. J., Gilbert, S. E., Lewis, L., & Saxton, J. M. (2020). Effects of short-term, medium-term and long-term resistance exercise training on cardiometabolic health outcomes in adults: systematic review with meta-analysis. *Br J Sports Med*, *54*(6), 341-348. https://doi.org/10.1136/bjsports-2017-098970

Aspridis, A., O'Halloran, P., & Liamputtong, P. (2014). Female bodybuilding: Perceived social and psychological effects of participating in the figure class. *Women in Sport and Physical Activity Journal*, *22*(1), 24-29.

Atkinson, R., & Flint, J. (2004). Snowball sampling.

Bäckmand, H., Kaprio, J., Kujala, U., & Sarna, S. (2001). Personality and mood of former elite male athletes-a descriptive study. *International journal of sports medicine*, *22*(03), 215-221.

Ball, R., & Weidman, D. (2018). Analysis of USA powerlifting federation data from January 1, 2012–June 11, 2016. *The Journal of Strength & Conditioning Research*, *32*(7), 1843-1851.

Baumann, C., & Harvey, M. (2021). What is unique about high performing students? Exploring personality, motivation and competitiveness. *Assessment & Evaluation in Higher Education*, *46*(8), 1314-1326. https://doi.org/10.1080/02602938.2020.1870930

Bishop, P. A., Williams, T. D., Heldman, A. N., & Vanderburgh, P. M. (2018). System for Evaluating Powerlifting and Other Multievent Performances. *The Journal of Strength & Conditioning Research*, *32*(1), 201-204. https://doi.org/10.1519/jsc.0000000000001808

Blouin, A. G., & Goldfield, G. S. (1995). Body image and steroid use in male bodybuilders. *International Journal of Eating Disorders*, *18*(2), 159-165.

Box, A. G., Feito, Y., Brown, C., & Petruzzello, S. J. (2019). Individual differences influence exercise behavior: how personality, motivation, and behavioral regulation vary among exercise mode preferences. *Heliyon*, *5*(4), e01459. https://doi.org/10.1016/j.heliyon.2019.e01459

Butcher, S. J., Neyedly, T. J., Horvey, K. J., & Benko, C. R. (2015). Do physiological measures predict selected CrossFit® benchmark performance? *Open access journal of sports medicine*, *6*, 241.

Carroll, L. (1989). A comparative study of narcissism, gender, and sex-role orientation among bodybuilders, athletes, and psychology students. *Psychological Reports*, *64*(3), 999-1006.

Carter, G. C., & Shannon, J. R. (1940). Adjustment and Personality Traits of Athletes and Non-Athletes. *The School Review*, *48*(2), 127-130. https://doi.org/10.1086/440482

Castanier, C., Le Scanff, C., & Woodman, T. (2010). Beyond sensation seeking: Affect regulation as a framework for predicting risk-taking behaviors in high-risk sport. *Journal of Sport and Exercise Psychology*, *32*(5), 731-738.

Chappell, A. J., & Simper, T. N. (2018). Nutritional peak week and competition day strategies of competitive natural bodybuilders. *Sports*, *6*(4), 126.

Claudino, J. G., Gabbett, T. J., Bourgeois, F., Souza, H. d. S., Miranda, R. C., Mezêncio, B., Soncin, R., Cardoso Filho, C. A., Bottaro, M., Hernandez, A. J., Amadio, A. C., & Serrão, J. C. (2018). CrossFit Overview: Systematic Review and Meta-analysis. *Sports Medicine - Open*, *4*(1), 11. https://doi.org/10.1186/s40798-018-0124-5

Cook, R. H., Griffiths, M. D., & Pontes, H. M. (2020). Personality Factors in Exercise Addiction: A Pilot Study Exploring the Role of Narcissism, Extraversion, and Agreeableness. *International Journal of Mental Health and Addiction*, *18*(1), 89-102. https://doi.org/10.1007/s11469-018-9939-z

Costa, A. C., Fulmer, C. A., & Anderson, N. R. (2018). Trust in work teams: An integrative review, multilevel model, and future directions. *Journal of Organizational Behavior*, *39*(2), 169-184. https://doi.org/https://doi.org/10.1002/job.2213

Courneya, K. S., & Hellsten, L.-A. M. (1998). Personality correlates of exercise behavior, motives, barriers and preferences: An application of the five-factor model. *Personality and individual differences*, *24*(5), 625-633. https://doi.org/https://doi.org/10.1016/S0191-8869(97)00231-6

Coyne, P., & Woodruff, S. J. (2020). Examining the influence of CrossFit participation on body image, self-esteem, and eating behaviours among women. *Journal of Physical Education and Sport*, *20*(3), 1314-1325.

Cuperman, R., & Ickes, W. (2009). Big Five predictors of behavior and perceptions in initial dyadic interactions: Personality similarity helps extraverts and introverts, but hurts "disagreeables". *Journal of personality and social psychology*, *97*(4), 667.

Darden, E. (1972). Sixteen Personality Factor Profiles of Competitive Bodybuilders and Weightlifters. *Research Quarterly. American Association for Health, Physical Education and Recreation*, *43*(2), 142-147. https://doi.org/10.1080/10671188.1972.10615125

Davies, M. J., Coleman, L., & Babkes Stellino, M. (2016). The relationship between basic psychological need satisfaction, behavioral regulation, and participation in CrossFit. *Journal of Sport Behavior*, *39*(3), 239.

DeYoung, C. G., Quilty, L. C., & Peterson, J. B. (2007). Between facets and domains: 10 aspects of the Big Five. *J Pers Soc Psychol*, *93*(5), 880-896. https://doi.org/10.1037/0022-3514.93.5.880

Dominski, F. H., Serafim, T. T., Siqueira, T. C., & Andrade, A. (2021). Psychological variables of CrossFit participants: a systematic review. *Sport Sciences for Health*, *17*(1), 21-41. https://doi.org/10.1007/s11332-020-00685-9

Dowd, R., & Innes, J. M. (1981). Sport and Personality: Effects of Type of Sport and Level of Competition. *Perceptual and Motor Skills*, *53*(1), 79-89. https://doi.org/10.2466/pms.1981.53.1.79

Dunkley, D. M., Blankstein, K. R., & Berg, J. L. (2012). Perfectionism dimensions and the five–factor model of personality. *European Journal of Personality*, *26*(3), 233-244.

El-Kotob, R., Ponzano, M., Chaput, J.-P., Janssen, I., Kho, M. E., Poitras, V. J., Ross, R., Ross-White, A., Saunders, T. J., & Giangregorio, L. M. (2020). Resistance training and health in adults: an overview of systematic reviews. *Applied Physiology, Nutrition, and Metabolism*, *45*(10), S165-S179.

Emini, N. N., & Bond, M. J. (2014). Motivational and psychological correlates of bodybuilding dependence. *Journal of behavioral addictions*, *3*(3), 182-188.

Fabris, M. A., Longobardi, C., Prino, L. E., & Settanni, M. (2018). Attachment style and risk of muscle dysmorphia in a sample of male bodybuilders. *Psychology of Men & Masculinity*, *19*(2), 273.

Fell, J. (2017). Psychological Outcomes Associated with CrossFit. *Journal of Evolution and Health: A joint publication of the Ancestral Health Society and the Society for Evolutionary Medicine and Health*, *2*(2).

Fink, A., & Woschnjak, S. (2011). Creativity and personality in professional dancers. *Personality and individual differences*, *51*(6), 754-758. https://doi.org/https://doi.org/10.1016/j.paid.2011.06.024

Fong, M., Zhao, K., & Smillie, L. D. (2021). Personality and competitiveness: Extraversion, agreeableness, and their aspects, predict self-reported competitiveness and competitive bidding in experimental auctions. *Personality and individual differences*, *169*, 109907. https://doi.org/https://doi.org/10.1016/j.paid.2020.109907

Francisco, R., Alarcão, M., & Narciso, I. (2012). Aesthetic Sports as High-Risk Contexts for Eating Disorders — Young Elite Dancers and Gymnasts Perspectives. *The Spanish journal of psychology*, *15*(1), 265-274. https://doi.org/10.5209/rev_SJOP.2012.v15.n1.37333

Garcia-Argibay, M. (2019). The relationship between the big five personality traits, impulsivity, and anabolic steroid use. *Substance Use & Misuse*, *54*(2), 236-246.

Garhammer, I. (1993). A Review of power output studies of olympic and powerlifting: methodology, performance. *J. Strength Cond. Res*, *7*, 76-89.

Gatzka, T., & Hell, B. (2018). Openness and postsecondary academic performance: A meta-analysis of facet-, aspect-, and dimension-level correlations. *Journal of Educational Psychology*, *110*(3), 355.

Gentil, P. (2015). A nutrition and conditioning intervention for natural bodybuilding contest preparation: observations and suggestions. *Journal of the International Society of Sports Nutrition*, *12*(1), 50. https://doi.org/10.1186/s12970-015-0111-x

Gerlach, G., Herpertz, S., & Loeber, S. (2015). Personality traits and obesity: a systematic review. *Obesity reviews*, *16*(1), 32-63.

Gocłowska, M. A., Ritter, S. M., Elliot, A. J., & Baas, M. (2019). Novelty seeking is linked to openness and extraversion, and can lead to greater creative performance. *Journal of personality*, *87*(2), 252-266. https://doi.org/https://doi.org/10.1111/jopy.12387

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological assessment*, *4*(1), 26.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American psychologist*, *48*(1), 26.

Gordon, B. R., McDowell, C. P., Hallgren, M., Meyer, J. D., Lyons, M., & Herring, M. P. (2018). Association of Efficacy of Resistance Exercise Training With Depressive Symptoms: Meta-analysis and Meta-regression Analysis of Randomized Clinical Trials. *JAMA Psychiatry*, *75*(6), 566-576. https://doi.org/10.1001/jamapsychiatry.2018.0572

Gordon, B. R., McDowell, C. P., Lyons, M., & Herring, M. P. (2017). The effects of resistance exercise training on anxiety: a meta-analysis and meta-regression analysis of randomized controlled trials. *Sports Medicine*, *47*(12), 2521-2532.

Grøntved, A., Rimm, E. B., Willett, W. C., Andersen, L. B., & Hu, F. B. (2012). A prospective study of weight training and risk of type 2 diabetes mellitus in men. *Arch Intern Med*, *172*(17), 1306-1312. https://doi.org/10.1001/archinternmed.2012.3138

Hackett, D. A. (2022). Training, Supplementation, and Pharmacological Practices of Competitive Male Bodybuilders Across Training Phases. *The Journal of Strength & Conditioning Research*, *36*(4), 963-970. https://doi.org/10.1519/jsc.0000000000003989

Hackett, D. A., Wilson, G. C., Mitchell, L., Haghighi, M. M., Clarke, J. L., Mavros, Y., O'Connor, H., Hagstrom, A. D., Slater, G. J., Keogh, J., & McLellan, C. (2020). Effect of Training Phase on Physical and Physiological Parameters of Male Powerlifters. *Sports (Basel)*, *8*(8). https://doi.org/10.3390/sports8080106

Haddadi, P., & Besharat, M. A. (2010). Resilience, vulnerability and mental health. *Procedia-Social and Behavioral Sciences*, *5*, 639-642.

Hart, W., Adams, J., Burton, K. A., & Tortoriello, G. K. (2017). Narcissism and self-presentation: Profiling grandiose and vulnerable Narcissists' self-presentation tactic use. *Personality and individual differences*, *104*, 48-57.

Helms, E. R., Aragon, A. A., & Fitschen, P. J. (2014). Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation. *Journal of the International Society of Sports Nutrition*, *11*(1), 20. https://doi.org/10.1186/1550-2783-11-20

Helms, E. R., Prnjak, K., & Linardon, J. (2019). Towards a Sustainable Nutrition Paradigm in Physique Sport: A Narrative Review. *Sports*, *7*(7), 172. https://www.mdpi.com/2075-4663/7/7/172

Huang, I. C., Lee, J. L., Ketheeswaran, P., Jones, C. M., Revicki, D. A., & Wu, A. W. (2017). Does personality affect health-related quality of life? A systematic review. *PLOS ONE*, *12*(3), e0173806. https://doi.org/10.1371/journal.pone.0173806

Hurst, R., Hale, B., Smith, D., & Collins, D. (2000). Exercise dependence, social physique anxiety, and social support in experienced and inexperienced bodybuilders and weightlifters. *British journal of sports medicine*, *34*(6), 431-435. https://doi.org/10.1136/bjsm.34.6.431

IFBB. (2021). *IFBB Rules of Bodybuilding and Fitness*. Retrieved 24/2/2023 from https://ifbb.com/wp-content/uploads/2023/01/01-IFBB-General-Rules-2021-edition-F-1.pdf

IFFF. (2023). *International Functional Fitness Federation Competition Rulebook and Standards*. https://functionalfitness.sport/wp-content/uploads/2023/01/2023_iF3_Competition_Rulebook.pdf

Ilyasi, G., & Salehian, M. H. (2011). Comparison of personality traits between individual and team athletes. *Middle-East Journal of Scientific Research*, *9*(4), 527-530.

IPF. (2023). *Technical Rules book of the International Powerlifting Federation*. Retrieved 24/2/2023 from https://www.powerlifting.sport/fileadmin/ipf/data/rules/technical-rules/english/IPF_Technical_Rules_Book_2023__1_.pdf

IWF. (2022). *IWF TECHNICAL AND COMPETITION RULES & REGULATIONS*. Retrieved 24/2/2023 from https://iwf.sport/wp-content/uploads/downloads/2022/11/IWF-TCRR-2022.pdf

Jensen, A. M. (2010). A mind-body approach for precompetitive anxiety in power-lifters: 2 case studies. *Journal of Chiropractic Medicine*, *9*(4), 184-192. https://doi.org/https://doi.org/10.1016/j.jcm.2010.08.003

Johnson, J. A. (1994). Clarification of factor five with the help of the AB5C model. *European Journal of Personality*, *8*(4), 311-334.

Johnson, J. A. (2014). Measuring thirty facets of the Five Factor Model with a 120-item public domain inventory: Development of the IPIP-NEO-120. *Journal of Research in Personality*, *51*, 78-89.

Judge, L. W., Urbina, L. J., Hoover, D. L., Craig, B. W., Judge, L. M., Leitzelar, B. M., Pearson, D. R., Holtzclaw, K. A., & Bellar, D. M. (2016). The impact of competitive trait anxiety on collegiate powerlifting performance. *Journal of Strength and Conditioning Research*, *30*(9), 2399-2405.

Kajonius, P. J., & Johnson, J. A. (2019). Assessing the structure of the Five Factor Model of Personality (IPIP-NEO-120) in the public domain. *Europe's Journal of Psychology*, *15*(2), 260.

Kandola, A., Ashdown-Franks, G., Stubbs, B., Osborn, D. P. J., & Hayes, J. F. (2019). The association between cardiorespiratory fitness and the incidence of common mental health disorders: A systematic review and meta-analysis. *Journal of Affective Disorders*, *257*, 748-757. https://doi.org/https://doi.org/10.1016/j.jad.2019.07.088

Keogh, J. W., Payne, A. L., Anderson, B. B., & Atkins, P. J. (2010). A brief description of the biomechanics and physiology of a strongman event: the tire flip. *J Strength Cond Res*, *24*(5), 1223-1228. https://doi.org/10.1519/JSC.0b013e3181cc61cd

Keogh, J. W. L., & Winwood, P. W. (2017). The Epidemiology of Injuries Across the Weight-Training Sports. *Sports Medicine*, *47*(3), 479-501. https://doi.org/10.1007/s40279-016-0575-0

Kraemer, W. J., Ratamess, N. A., Flanagan, S. D., Shurley, J. P., Todd, J. S., & Todd, T. C. (2017). Understanding the Science of Resistance Training: An Evolutionary Perspective. *Sports Med*, *47*(12), 2415-2435. https://doi.org/10.1007/s40279-017-0779-y

Kwan, K., & Helms, E. (2022). Prevalence, Magnitude, and Methods of Weight Cutting Used by World Class Powerlifters. *Journal of Strength and Conditioning Research*, *36*(4), 998-1002.

Laborde, S., Allen, M. S., Katschak, K., Mattonet, K., & Lachner, N. (2020). Trait personality in sport and exercise psychology: A mapping review and research agenda. *International Journal of Sport and Exercise Psychology*, *18*(6), 701-716. https://doi.org/10.1080/1612197X.2019.1570536

Li, J., Davies, T. B., & Hackett, D. A. (2023). Self-Reported Training and Supplementation Practices Between Performance-Enhancing Drug-User Bodybuilders Compared with Natural Bodybuilders. *J Strength Cond Res*, *37*(5), 1079-1088. https://doi.org/10.1519/jsc.0000000000004356

Liokaftos, D. (2019). Natural bodybuilding: An account of its emergence and development as competition sport. *International Review for the Sociology of Sport*, *54*(6), 753-770.

Luchetti, M., Barkley, J. M., Stephan, Y., Terracciano, A., & Sutin, A. R. (2014). Five-factor model personality traits and inflammatory markers: New data and a meta-analysis. *Psychoneuroendocrinology*, *50*, 181-193. https://doi.org/https://doi.org/10.1016/j.psyneuen.2014.08.014

Malinauskas, R., Dumciene, A., Mamkus, G., & Venckunas, T. (2014). Personality Traits and Exercise Capacity in Male Athletes and Non-Athletes. *Perceptual and Motor Skills*, *118*(1), 145-161. https://doi.org/10.2466/29.25.PMS.118k13w1

McCrae, R. R., & Costa Jr, P. T. (2004). A contemplated revision of the NEO Five-Factor Inventory. *Personality and individual differences*, *36*(3), 587-596.

McCrae, R. R., & Costa, P. T., Jr. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of personality and social psychology*, *52*(1), 81-90. https://doi.org/10.1037//0022-3514.52.1.81

McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *J Pers*, *60*(2), 175-215. https://doi.org/10.1111/j.1467-6494.1992.tb00970.x

McCrae, R. R., Kurtz, J. E., Yamagata, S., & Terracciano, A. (2010). Internal Consistency, Retest Reliability, and Their Implications for Personality Scale Validity. *Personality and Social Psychology Review*, *15*(1), 28-50. https://doi.org/10.1177/1088868310366253

McGill, S. M., McDermott, A., & Fenwick, C. M. (2009). Comparison of Different Strongman Events: Trunk Muscle Activation and Lumbar Spine Motion, Load, and Stiffness. *The Journal of Strength & Conditioning Research*, *23*(4), 1148-1161. https://doi.org/10.1519/JSC.0b013e318198f8f7

Miller, K. J., & Mesagno, C. (2014). Personality traits and exercise dependence: Exploring the role of narcissism and perfectionism. *International Journal of Sport and Exercise Psychology*, *12*(4), 368-381. https://doi.org/10.1080/1612197X.2014.932821

Morgan, W. P., & Johnson, R. W. (1978). Personality characteristics of successful and unsuccessful oarsmen. *International journal of sport psychology*.

Moritz, S. E., Feltz, D. L., Fahrbach, K. R., & Mack, D. E. (2000). The Relation of Self-Efficacy Measures to Sport Performance: A Meta-Analytic Review. *Research Quarterly for Exercise and Sport*, *71*(3), 280-294. https://doi.org/10.1080/02701367.2000.10608908

Murray, S. B., Rieger, E., Touyz, S. W., & De la Garza García, L., Yolanda. (2010). Muscle dysmorphia and the DSM-V conundrum: Where does it belong? A review paper. *International Journal of Eating Disorders*, *43*(6), 483-491.

Park, R. L. (2017). The Mentality of Strength: A Study on the Effects of Grit, Self-Control, and Conscientiousness on Rate of Progress in Powerlifting.

Passos, P., Araújo, D., & Davids, K. (2016). Competitiveness and the Process of Co-adaptation in Team Sport Performance [Perspective]. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.01562

Paulhus, D. L., & Williams, K. M. (2002). The dark triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of research in personality*, *36*(6), 556-563.

Paunonen, S. V., & Ashton, M. C. (2001). Big five factors and facets and the prediction of behavior. *J Pers Soc Psychol*, *81*(3), 524-539.

Piepiora, P. (2021). Personality profile of individual sports champions. *Brain and Behavior*, *11*(6), e02145.

Piepiora, P., Maśliński, J., Gumienna, R., & Cynarski, W. (2020). Sport technique as a determinant of athletes' personality. *Quality in Sport*, *6*(1), 33-43.

Piepiora, P., Migasiewicz, J., & Napieraj, D. (2019). Personality profile of athletes practising endurance disciplines. *Journal of Education, Health and Sport*, *9*(4), 394-402.

Pistilli, E. E., Kaminsky, D. E., Totten, L., & Miller, D. (2004). An 8-Week Periodized Mesocycle Leading to a National Level Weightlifting Competition. *Strength & Conditioning Journal*, *26*(5), 62-68. https://journals.lww.com/nsca-scj/Fulltext/2004/10000/An_8_Week_Periodized_Mesocycle_Leading_to_a.14.aspx

Ponnock, A., Muenks, K., Morell, M., Seung Yang, J., Gladstone, J. R., & Wigfield, A. (2020). Grit and conscientiousness: Another jangle fallacy. *Journal of research in personality*, *89*, 104021. https://doi.org/https://doi.org/10.1016/j.jrp.2020.104021

Reed, J. (2014). A Survey of Grit and Exercise Behavior. *Journal of Sport Behavior*, *37*(4).

Rhodes, R. E., & Smith, N. E. (2006). Personality correlates of physical activity: a review and meta-analysis. *Br J Sports Med*, *40*(12), 958-965. https://doi.org/10.1136/bjsm.2006.028860

Robinson, S. L., Lambeth-Mansell, A., Gillibrand, G., Smith-Ryan, A., & Bannock, L. (2015). A nutrition and conditioning intervention for natural bodybuilding contest preparation: case study. *Journal of the International Society of Sports Nutrition*, *12*(1), 20. https://doi.org/10.1186/s12970-015-0083-x

Rossier, J., Stadelhofen, F., & Berthoud, S. (2004). The hierarchical structures of the NEO PI-R and the 16 PF 5. *Hogrefe & Huber Publishers European Journal of Psychological Assessment*, *20*, 27-38. https://doi.org/10.1027/1015-5759.20.1.27

Rossow, L. M., Fukuda, D. H., Fahs, C. A., Loenneke, J. P., & Stout, J. R. (2013). Natural bodybuilding competition preparation and recovery: a 12-month case study. *International Journal of Sports Physiology & Performance*, *8*(5).

Roussel, P., & Griffet, J. (2000). The path chosen by female bodybuilders: A tentative interpretation. *Sociology of sport journal*, *17*(2), 130-150.

Rubinstein, G. (2003). Macho man: Narcissism, homophobia, agency, communion, and authoritarianism--a comparative study among Israeli bodybuilders and a control group. *Psychology of Men & Masculinity*, *4*(2), 100.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions. *Contemporary Educational Psychology*, *25*(1), 54-67. https://doi.org/https://doi.org/10.1006/ceps.1999.1020

Ryguła, I., Płóciennik, Ł., & Lipińska, P. (2016). Diagnostic sources of information on sports result determinants in young powerlifting athletes. *Human Movement*, *17*(3), 168-175.

Sanjuan, P. M., Pearson, M. R., & Langenbucher, J. L. (2015). Conditional effects of appearance and performance enhancing drugs (APEDs) use on mood in powerlifters and bodybuilders. *Alcoholism treatment quarterly*, *33*(4), 444-457.

Santarnecchi, E., & Dèttore, D. (2012). Muscle dysmorphia in different degrees of bodybuilding activities: Validation of the Italian version of Muscle Dysmorphia Disorder Inventory and Bodybuilder Image Grid. *Body Image*, *9*(3), 396-403.

Schieber, K., Kollei, I., de Zwaan, M., Müller, A., & Martin, A. (2013). Personality traits as vulnerability factors in body dysmorphic disorder. *Psychiatry research*, *210*(1), 242-246.

Schmidt, F. T. C., Nagy, G., Fleckenstein, J., Möller, J., & Retelsdorf, J. (2018). Same Same, but Different? Relations between Facets of Conscientiousness and Grit. *European Journal of Personality*, *32*(6), 705-720. https://doi.org/10.1002/per.2171

Schmitt, D. P., Allik, J., McCrae, R. R., & Benet-Martínez, V. (2007a). The Geographic Distribution of Big Five Personality Traits: Patterns and Profiles of Human Self-Description Across 56 Nations. *Journal of Cross-Cultural Psychology*, *38*(2), 173-212. https://doi.org/10.1177/0022022106297299

Schmitt, D. P., Allik, J., McCrae, R. R., & Benet-Martínez, V. (2007b). The Geographic Distribution of Big Five Personality Traits:Patterns and Profiles of Human Self-Description Across 56 Nations. *Journal of Cross-Cultural Psychology*, *38*(2), 173-212. https://doi.org/10.1177/0022022106297299

Schoenfeld, B. J., Ogborn, D., & Krieger, J. W. (2016). Effects of Resistance Training Frequency on Measures of Muscle Hypertrophy: A Systematic Review and Meta-Analysis. *Sports Med*, *46*(11), 1689-1697. https://doi.org/10.1007/s40279-016-0543-8

Schurr, K., Ashley, M., & Joy, K. (1977). A multivariate analysis of male athlete personality characteristics: Sport type and success.

Steca, P., Baretta, D., Greco, A., D'Addario, M., & Monzani, D. (2018). Associations between personality, sports participation and athletic success. A comparison of Big Five in sporting and non-sporting adults. *Personality and individual differences*, *121*, 176-183. https://doi.org/https://doi.org/10.1016/j.paid.2017.09.040

Steele, I. H., Pope, H. G. J., & Kanayama, G. (2019). Competitive Bodybuilding: Fitness, Pathology, or Both? *Harvard Review of Psychiatry*, *27*(4), 233-240. https://doi.org/10.1097/hrp.0000000000000211

Steele, J., Keogh, J., & Loenneke, J. P. (2022). Editorial: Understanding & Improving Performance in Strength Sports [Editorial]. *Frontiers in Sports and Active Living*, *4*. https://doi.org/10.3389/fspor.2022.807941

Stone, M. H., Pierce, K. C., Sands, W. A., & Stone, M. E. (2006). Weightlifting: A brief overview. *Strength and Conditioning Journal*, *28*(1), 50.

Storey, A., & Smith, H. K. (2012). Unique Aspects of Competitive Weightlifting. *Sports Medicine*, *42*(9), 769-790. https://doi.org/10.1007/BF03262294

Suchomel, T. J., Comfort, P., & Lake, J. P. (2017). Enhancing the Force-Velocity Profile of Athletes Using Weightlifting Derivatives. *Strength & Conditioning Journal*, *39*(1), 10-20. https://doi.org/10.1519/ssc.0000000000000275

Suffolk, M. T. (2015). Professional female bodybuilding: Self-determination theory approach. *Journal of International Women's Studies*, *16*(3), 71-85.

Terracciano, A., Löckenhoff, C. E., Crum, R. M., Bienvenu, O. J., & Costa, P. T. (2008). Five-Factor Model personality profiles of drug users. *BMC Psychiatry*, *8*(1), 22. https://doi.org/10.1186/1471-244X-8-22

Thune, J. B. (1949). Personality of weightlifters. *Research Quarterly of the American Association for Health, Physical Education, & Recreation*, *20*, 296-306.

Thurstone, L. L. (1934). The vectors of mind. *Psychological review*, *41*(1), 1.

Tod, D., Edwards, C., & Cranswick, I. (2016). Muscle dysmorphia: current insights. *Psychology research and behavior management*, *9*, 179.

Tupes, E. C., & Christal, R. E. (1992). Recurrent Personality Factors Based on Trait Ratings. *Journal of personality*, *60*(2), 225-251. https://doi.org/https://doi.org/10.1111/j.1467-6494.1992.tb00973.x

Uysal, D., & Pohlmeier, W. (2011). Unemployment duration and personality. *Journal of Economic Psychology - J ECON PSYCH*, *32*, 980-992. https://doi.org/10.1016/j.joep.2011.03.008

Vealey, R. S., Chase, M. A., Block, C., & Cooley, R. (2018). Confidence. In *Sport, Exercise and Performance Psychology* (pp. 302-324). Routledge.

Weisberg, Y., DeYoung, C., & Hirsh, J. (2011). Gender Differences in Personality across the Ten Aspects of the Big Five [Original Research]. *Frontiers in Psychology*, *2*. https://doi.org/10.3389/fpsyg.2011.00178

Weiss, B., & Miller, J. D. (2018). Distinguishing Between Grandiose Narcissism, Vulnerable Narcissism, and Narcissistic Personality Disorder. In A. D. Hermann, A. B. Brunell, & J. D. Foster (Eds.), *Handbook of Trait Narcissism: Key Advances, Research Methods, and Controversies* (pp. 3-13). Springer International Publishing. https://doi.org/10.1007/978-3-319-92171-6_1

Whitehead, J., Slater, G., Wright, H., Martin, L., O'Connor, H., & Mitchell, L. (2020). Disordered eating behaviours in female physique athletes. *European Journal of Sport Science*, *20*(9), 1206-1214.

Wilson, K. E., & Dishman, R. K. (2015). Personality and physical activity: A systematic review and meta-analysis. *Personality and individual differences*, *72*, 230-242. https://doi.org/https://doi.org/10.1016/j.paid.2014.08.023

Winwood, P. W., Hume, P. A., Cronin, J. B., & Keogh, J. W. L. (2014). Retrospective Injury Epidemiology of Strongman Athletes. *The Journal of Strength & Conditioning Research*, *28*(1), 28-42. https://doi.org/10.1519/JSC.0b013e3182986c0c

Winwood, P. W., Keogh, J. W., & Harris, N. K. (2011). The Strength and Conditioning Practices of Strongman Competitors. *The Journal of Strength & Conditioning Research*, *25*(11), 3118-3128. https://doi.org/10.1519/JSC.0b013e318212daea

Witkowski, K., & Piepiora, P. (2018). Personality traits of competitive athletes according to type of pressure exerted on opponents. *South African Journal for Research in Sport, Physical Education and Recreation*, *40*(1), 97-109.

Woodman, T., & Hardy, L. (2003). The relative impact of cognitive anxiety and self-confidence upon sport performance: A meta-analysis. *Journal of Sports Sciences*, *21*(6), 443-457.

WSF. (2021). *World Strongman Technical Rules*. https://worldstrongman.org/technical-rules/

Yates, W. R., Holman, T. L., & Demers, L. (2003). Measures of aggression and mood changes in male weightlifters with and without androgenic anabolic steroid use. *J Forensic Sci*, *48*(3).

Zaręba, Z., & Potembska, E. (2016). Use of psychoactive substances, body image and characteristics of personality traits in bodybuilders. *Current Problems of Psychiatry*, *17*(1).

Appendices

5.1 Ethics Approval

Auckland University of Technology Ethics Committee (AUTEC)

Auckland University of Technology
D-88, Private Bag 92006, Auckland 1142, NZ
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

21 September 2022

Aaron Uthoff
Faculty of Health and Environmental Sciences
Dear Aaron

Ethics Application: **22/215 Brawn and Brains: An exploration of personality dimensions in strength sports athletes**

Thank you for submitting your responses to AUTEC's conditions. Your application is approved subject to:

1. Provision of a pdf of the finalised survey showing the formatting that the participants will see and including the Information Sheet as the first block of the survey and the ability to access their survey results at the end of the survey.

Please provide us with a response to the points raised in these conditions, indicating either how you have satisfied these points or proposing an alternative approach. AUTEC also requires copies of any altered documents, such as Information Sheets, surveys etc. You are not required to resubmit the application form again. Any changes to responses in the form required by the committee in their conditions may be included in a supporting memorandum.

Please note that the Committee is always willing to discuss with applicants the points that have been made. There may be information that has not been made available to the Committee, or aspects of the research may not have been fully understood.

Once your response is received and confirmed as satisfying the Committee's points, you will be notified of the full approval of your ethics application. Full approval is not effective until all the conditions have been met. Data collection may not commence until full approval has been confirmed. If these conditions are not met within six months, your application may be closed and a new application will be required if you wish to continue with this research.

To enable us to provide you with efficient service, we ask that you use the application number and study title in all correspondence with us. If you have any enquiries about this application, or anything else, please do contact us at ethics@aut.ac.nz.

We look forward to hearing from you,

(This is a computer-generated letter for which no signature is required)

The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Cc: black.johncarsten@gmail.com; eric.helms@aut.ac.nz; tom.stewart@aut.ac.nz

5.2 Information Sheet

Participant Information Sheet

Date Information Sheet Produced

12th of August, 2022

Project Title

Brawn and Brains: An exploration of personality dimensions in strength sports athletes

An Invitation

My name is John Black, I am a MSEH candidate conducting research through the Sports Performance Research Institute New Zealand at AUT Millennium. I would like to invite you to participate in this survey on the personality dimensions of strength sports athletes. What is the purpose of this research? The purpose of this research is to determine the difference between the personalities of strength sports athletes. Specifically, the distribution of the Big 5 personality dimensions: openness, conscientiousness, extraversion, agreeableness, and neuroticism. The findings of this research are intended to be used for academic publications and presentations.

How was I identified and why am I being invited to participate in this research?

If you are reading this sheet, you clicked on a survey link from a social media advertisement. As a reminder, participants must be competing or intending to compete in a strength sport. These sports include bodybuilding, powerlifting, weightlifting, strongman/strongwoman, and CrossFit. For the purpose of this study, the athlete must have competed, or intend to compete within a 12-month period.

How do I agree to participate in this research?

Your participation in this research is voluntary (it is your choice) and whether or not you choose to participate will neither advantage nor disadvantage you. By submitting the questionnaire, you are giving consent to participate. Because the survey is anonymous, once you have completed the survey, you will not be able to retract your data.

What will happen in this research?

This questionnaire is completed online. It consists of up to 125 questions (120 regarding personality) and should take approximately 10-15 minutes to complete.

What are the discomforts and risks?

You are not likely to experience any discomfort or risk by completing the questionnaire.

What are the benefits?

By participating in this study, you will contribute to an understanding of personality difference between strength sports athletes. This research is intended to be a steppingstone for further research related to

resistance training adherence and longevity. If you wish, you will also get access to the results of your submission, which may be of personal interest and curiosity.

This research will also form part of my MSEH studies and will assist me in obtaining that qualification.

How will my privacy be protected?

The questionnaire is entirely anonymous, and you will not be identifiable.

What are the costs of participating in this research?

Participation in this research will take approximately 10-15 minutes of your time.

What opportunity do I have to consider this invitation?

The survey will be ongoing until 30th of October 2022, you will have until then to participate.

Will I receive feedback on the results of this research?

Yes, the last page of the survey will include a URL link, which will give you access to your results.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Dr Aaron Uthoff, aaron.uthoff@aut.ac.nz, or telephone 021 090 57414.

Concerns regarding the conduct of the research should be notified to the Executive Secretary of AUTEC, ethics@aut.ac.nz, (+649) 921 9999 ext 6038.

Whom do I contact for further information about this research? Please keep this Information Sheet for your future reference. You are also able to contact the research team as follows:

Researcher Contact Details:

John Black - email: cmv1087@autuni.ac.nz, or mobile: +61 449 929 597 **Project Supervisor Contact Details**:

Dr Aaron Uthoff - email: aaron.uthoff@aut.ac.nz, or mobile: +64 210 905 7414.

Approved by the Auckland University of Technology Ethics Committee on type the date final ethics approval was granted, AUTEC Reference number type the reference number.

5.3 Consent and Cross-Sectional Survey

Brawn and Brains: An exploration of personality dimensions in strength sports athletes

Start of Block: Information Sheet

Consent

○ I have read and understood the information given in the Information Sheet. (1)

Instructions

In this survey there are 5 general questions followed by 120 scale questions to measure dimensions of your personality. Please answer the questions as honestly as possible, in the way that you are, not how you would like to be perceived. Please don't spend too much time thinking about the questions, it is best to go with your first thought. You may notice that some of the questions are quite similar, this is intentional to measure different aspects of personality. The survey will likely take 10-15 minutes to complete.

Thank you very much for agreeing to participate in this research study.

End of Block: Information Sheet

Start of Block: Demographic

Q1 Sex

○ Male (1)

○ Female (2)

○ Non-binary / third gender (3)

○ Prefer not to say (4)

Q2 Age

- ○ 16-18 (1)
- ○ 19-23 (2)
- ○ 24-29 (3)
- ○ 30-34 (4)
- ○ 35-39 (5)
- ○ 40-44 (6)
- ○ 45-49 (7)
- ○ 50-54 (8)
- ○ 55-59 (9)
- ○ 60-64 (10)
- ○ 65+ (11)

Q3 What strength sport do you, or plan to, compete in? (Pick the most current sport)

- ○ Bodybuilding (1)
- ○ Powerlifting (2)
- ○ Weightllifting (3)
- ○ Strongman/Strongwoman (4)
- ○ CrossFIt (5)

Q4 What level have you competed at in your chosen sport?

- ○ Local (1)
- ○ Regional (2)
- ○ National (3)
- ○ International (4)

Q5 Number of Competitions

- ○ Planning to compete for the first time (in the next 12 months) (1)
- ○ 1 (2)
- ○ 2-5 (3)
- ○ 6-10 (4)
- ○ 11+ (5)

End of Block: Demographics

Start of Block: Personality Questionnaire (IPIP-NEO-120)

Block 1 Personality - Choose the most accurate statement

	Very Accurate (1)	Moderately Accurate (2)	Neither Accurate, Nor Inaccurate (3)	Moderately Inaccurate (4)	Very Inaccurate (5)
Worry about things. (1)	○	○	○	○	○
Make friends easily. (2)	○	○	○	○	○
Have a vivid imagination. (3)	○	○	○	○	○
Trust others. (4)	○	○	○	○	○
Complete tasks successfully. (5)	○	○	○	○	○
Get angry easily. (6)	○	○	○	○	○
Love large parties. (7)	○	○	○	○	○
Believe in the importance of art. (8)	○	○	○	○	○
Use others for my own ends. (9)	○	○	○	○	○
Like to tidy up. (10)	○	○	○	○	○
Often feel blue. (11)	○	○	○	○	○
Take charge. (12)	○	○	○	○	○
Experience my emotions intensely. (13)	○	○	○	○	○

Am concerned about others. (14)	○	○	○	○	○
Keep my promises. (15)	○	○	○	○	○
Find it difficult to approach others. (16)	○	○	○	○	○
Am always busy. (17)	○	○	○	○	○
Prefer variety to routine. (18)	○	○	○	○	○
Love a good fight. (19)	○	○	○	○	○
Do more than what's expected of me. (20)	○	○	○	○	○

Block 2 Personality - Choose the most accurate statement

	Very Accurate (1)	Moderately Accurate (2)	Neither Accurate, Nor Inaccurate (3)	Moderately Inaccurate (4)	Very Inaccurate (5)
Go on binges. (1)	○	○	○	○	○
Love excitement. (2)	○	○	○	○	○
Love to read challenging material. (3)	○	○	○	○	○
Believe that I am better than others. (4)	○	○	○	○	○
Am always prepared. (5)	○	○	○	○	○
Panic easily. (6)	○	○	○	○	○
Radiate joy. (7)	○	○	○	○	○
Tend to vote for liberal political candidates. (8)	○	○	○	○	○
Sympathise with the homeless. (9)	○	○	○	○	○
Jump into things without thinking. (10)	○	○	○	○	○
Fear fro the worst (11)	○	○	○	○	○
Feel comfortable around people. (12)	○	○	○	○	○

Enjoy wild flights of fantasy. (13)	○	○	○	○	○
Believe that others have good intentions. (14)	○	○	○	○	○
Excel in what I do. (15)	○	○	○	○	○
Get irritated easily. (16)	○	○	○	○	○
Talk to a lot of different people at parties. (17)	○	○	○	○	○
See beauty in things that others might not notice. (18)	○	○	○	○	○
Cheat to get ahead. (19)	○	○	○	○	○
Often forget to put things back to their proper place. (20)	○	○	○	○	○

Block 3 Personality - Choose the most accurate statement

	Very Accurate (1)	Moderately Accurate (2)	Neither Accurate, Nor Inaccurate (3)	Moderately Inaccurate (4)	Very Inaccurate (5)
Dislike myself. (1)	○	○	○	○	○
Try to lead others. (2)	○	○	○	○	○
Feel others' emotions. (3)	○	○	○	○	○
Love to help others. (4)	○	○	○	○	○
Tell the truth. (5)	○	○	○	○	○
Am afraid to draw attention to myself. (6)	○	○	○	○	○
Am always on the go. (7)	○	○	○	○	○
Prefer to stick with things I know. (8)	○	○	○	○	○
Yell at people. (9)	○	○	○	○	○
Work hard. (10)	○	○	○	○	○
Rarely overindulge. (11)	○	○	○	○	○
Seek adventure. (12)	○	○	○	○	○
Avoid philosophical discussions. (13)	○	○	○	○	○

Think highly of myself. (14)	○	○	○	○	○
Carry out my plans. (15)	○	○	○	○	○
Become overwhelmed by events. (16)	○	○	○	○	○
Have a lot of fun. (17)	○	○	○	○	○
Believe that there is no absolute right and wrong. (18)	○	○	○	○	○
Feel sympathy for those who are worse off than myself. (19)	○	○	○	○	○
Make rash decisions. (20)	○	○	○	○	○

Block 4 Personality - Choose the most accurate statement

	Very Accurate (1)	Moderately Accurate (2)	Neither Accurate, Nor Inaccurate (3)	Moderately Inaccurate (4)	Very Inaccurate (5)
Am afraid of many things (1)	○	○	○	○	○
Avoid contact with others. (2)	○	○	○	○	○
Love to daydream. (3)	○	○	○	○	○
Trust what people say. (4)	○	○	○	○	○
Handle tasks smoothly. (5)	○	○	○	○	○
Lose my temper. (6)	○	○	○	○	○
Prefer to be alone. (7)	○	○	○	○	○
Do not like poetry. (8)	○	○	○	○	○
Take advantage of others. (9)	○	○	○	○	○
Leave a mess in my room. (10)	○	○	○	○	○
Am often down in the dumps. (11)	○	○	○	○	○
Take control of things. (12)	○	○	○	○	○
Rarely notice my emotional reactions. (13)	○	○	○	○	○

Am indifferent to the feelings of others. (14)	○	○	○	○	○
Break rules. (15)	○	○	○	○	○
Only feel comfortabe with friends. (16)	○	○	○	○	○
Do a lot in my spare time. (17)	○	○	○	○	○
Dislike changes. (18)	○	○	○	○	○
Insult people. (19)	○	○	○	○	○
Put little time and effort into my work. (20)	○	○	○	○	○

Block 5 Personality - Choose the most accurate statement

	Very Accurate (1)	Moderately Accurate (2)	Neither Accurate, Nor Inaccurate (3)	Moderately Inaccurate (4)	Very Inaccurate (5)
Easily resist temptations. (21)	○	○	○	○	○
Enjoy being reckless. (22)	○	○	○	○	○
Have difficulty understanding abstract ideas. (23)	○	○	○	○	○
Have a high opinion of myself. (24)	○	○	○	○	○
Waste my time. (25)	○	○	○	○	○
Feel thaat I'm unable to deal with things. (26)	○	○	○	○	○
Love life. (27)	○	○	○	○	○
Tend to vote for conservative political candidates. (28)	○	○	○	○	○
Am not interested in other people's problems. (29)	○	○	○	○	○
Rush intor things. (30)	○	○	○	○	○
Get stressed out easily. (31)	○	○	○	○	○

Keep others at a distance. (32)	○	○	○	○	○
Like to get lost in thought. (33)	○	○	○	○	○
Distrust people. (34)	○	○	○	○	○
Know how to get things done. (35)	○	○	○	○	○
Am not easily annoyed. (36)	○	○	○	○	○
Avoid crowds. (37)	○	○	○	○	○
Do not enjoy going to art museums. (38)	○	○	○	○	○
Obstruct others' plans. (39)	○	○	○	○	○
Leave my belongings around. (40)	○	○	○	○	○

Block 6 Personality - Choose the most accurate statement

	Very Accurate (1)	Moderately Accurate (2)	Neither Accurate, Nor Inaccurate (3)	Moderately Inaccurate (4)	Very Inaccurate (5)
Feel comfortable with myself. (41)	○	○	○	○	○
Wait for others to lead the way. (42)	○	○	○	○	○
Don't understand people who get emotional. (43)	○	○	○	○	○
Take no time for others. (44)	○	○	○	○	○
Break my promises. (45)	○	○	○	○	○
Am not bothered by difficult social situations. (46)	○	○	○	○	○
Like to take it easy. (47)	○	○	○	○	○
Am attached to conventional ways. (48)	○	○	○	○	○
Get back at others. (49)	○	○	○	○	○
Do just enough work to get by. (50)	○	○	○	○	○
Am able to control my cravings. (51)	○	○	○	○	○

Act wild and crazy. (52)	○	○	○	○	○
Am not interested in theoretical discussions. (53)	○	○	○	○	○
Boast about my virtues. (54)	○	○	○	○	○
Have difficulty starting tasks. (55)	○	○	○	○	○
Remain calm under pressure. (56)	○	○	○	○	○
Look at the bright side of life. (57)	○	○	○	○	○
Believe that we should be tough on crime. (58)	○	○	○	○	○
Try not to think about the needy. (59)	○	○	○	○	○
Act without thinking. (60)	○	○	○	○	○

End of Block: Personality Questionnaire (IPIP-NEO-120)