



The Prevalence and Risk Factors of Muscle Dysmorphia in Amateur Male Bodybuilders in the eThekweni Municipality

By

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This dissertation is submitted in partial compliance with the requirements for the
Master's Degree in Health Sciences: Chiropractic

Durban University of Technology

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18/07/2025

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Signature

DEDICATION

I dedicate this thesis to my grandfather and grandmother, Guru Govender and Valiema Govender.

ACKNOWLEDGEMENTS

I am grateful for the spiritual strength and direction that sustained me throughout my academic journey. I give thanks to my exceptional parents, who tirelessly motivated me to strive for excellence and made this educational pursuit possible. I also extend sincere appreciation to my supervisors, Prof. Pienaar, Dr. van Heerden, and Dr. Prince, for their invaluable mentorship, dedicated guidance, and countless hours invested in my research.

ABSTRACT

Background Muscle dysmorphia (MD), which falls within the spectrum of Body Dysmorphic Disorder, is an increasingly common psychological condition worldwide. Within the bodybuilding community, “bigorexia” manifests when bodybuilders perceive themselves as having much less muscle mass than they actually do, which resorts to the use of performance enhancing drugs (PEDs). Although PEDs are prescription-based, illegal use/excessive use can result in physiological and mental complications. Furthermore, the lack of research on MD in developing countries, such as South Africa, warrants investigations pertaining to the development of certain risk factors as well as the pathogenesis of the preoccupation of muscularity in MD. This will assist medical practitioners, such as chiropractors, in identifying and understanding MD risk factors and lead to improved patient management.

Methods: The research utilised a quantitative, descriptive, cross-sectional survey approach. The study targeted enrolling at least 196 amateur male bodybuilders from five chosen gymnasiums within the eThekweni Municipality area. Following the acquisition of informed consent, participants completed the modified Adonis Complex Questionnaire (ACQ). The collected questionnaire data were analysed using IBM SPSS version 25.

Results: The main findings of this study showed that most participants (65.8%) reported a minor concern of MD, 32.1% reported a moderate concern of MD and only 2% reported a serious concern for MD in the eThekweni Municipality. The prevalence of MD in amateur male bodybuilders showed a weak positive correlation with selected self-reported risk factors (low self-esteem, childhood victimisation, anxiety, perfectionism, eating disorders, PEDs and social media. The regression analysis revealed that unhealthy eating behaviours accounted for 19% of the variance, followed by anxiety, victimisation, and social media influence, which accounted for 10.4%, and self-esteem and perfectionism, which accounted for 3.9%. Only 2% of participants expressed having a serious concern of body image dissatisfaction, therefore, MD was

found to not have any influence on the quality of life of majority of the selected participants in this study. The quality of life of the 2% of participants with a serious concern of MD may have been influenced psychosocially and physically. The aim, objectives one, two, three as well as the alternate hypothesis, which states that MD is present in some amateur male bodybuilders in the eThekweni Municipality were achieved in this study.

Conclusions: The key findings showed that there was a 2% prevalence of MD amongst the participants in this study. There was a weak positive correlation of self-reported risk factors for developing MD which included low self-esteem, anxiety, depression, childhood victimisation, perfectionism, social media influence and an unhealthy relationship with food. In terms of quality of life, MD did not have a significant influence on the participant's perception of their quality of life. Chiropractors play an essential role in patient care due to injuries caused by over-exertion/over-training as a result of MD. Therefore, collaborative treatment plans with other healthcare professionals, such as psychologists, nutritionists and physicians is necessary to provide full comprehensive care for individuals with MD. By working together, healthcare professionals can create integrated treatment plans that consider all aspects of an individual's health. This holistic approach can improve overall treatment outcomes as it ensures that all contributing factors to MD can be addressed.

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LIST OF ABBREVIATIONS

APA: American Psychiatric Association

BDD: Body Dysmorphic Disorder

DSM-V: Diagnostic and Statistical Manual of Mental Disorders V

ED: Eating Disorder

MD: Muscle Dysmorphia

PEDs: Performance enhancing drugs

AAS: Anabolic-Androgenic Steroids

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LIST OF DEFINITIONS

Anabolic-androgenic steroids (AAS): Synthetic derivatives of testosterone, the male sex hormone, designed to promote muscle growth and enhance athletic performance (Greenway, 2018; Tovt *et al.*, 2021).

Body Dysmorphic Disorder (BDD): A psychological disorder marked by an intense fixation on perceived physical flaws, resulting in significant emotional distress and disruption of social and professional life.

Eating Disorder (ED): Mental health conditions defined by irregular or unhealthy eating patterns, often stemming from an excessive focus on food, body weight, or physical appearance (DSM-V-TR, 2022).

Muscle Dysmorphia (MD): A condition characterised by a compulsive focus on achieving greater muscularity, accompanied by a distorted perception of one's body image (Tovt *et al.*, 2021).

CHAPTER 1: INTRODUCTION

1.1 Background

Body Dysmorphic Disorder (BDD) is a mental health condition characterised by an obsessive focus on perceived bodily flaws, leading to substantial emotional distress and disruptions in social and professional life (American Psychiatric Association, 2013). Muscle Dysmorphia (MD), a subtype of BDD, is defined by an intense preoccupation with achieving greater muscularity, where individuals view their body as insufficiently muscular despite having a normal or highly developed physique (Tovt *et al.*, 2021). This disorder predominantly affects men, particularly those involved in bodybuilding, weightlifting, or fitness pursuits, and is linked to psychological distress, impaired daily functioning, and risky behaviours such as anabolic steroid use and excessive physical training, which can result in injuries. Within the bodybuilding community, MD is often termed "bigorexia" (Tovt *et al.*, 2021).

Muscle dysmorphia exhibits similarities with eating disorders like anorexia nervosa and bulimia nervosa but is unique due to its emphasis on muscularity. The exact origins of MD are not fully understood, but a blend of biological, psychological and societal factors plays a role. Psychological contributors, including low self-worth, perfectionist tendencies, and ineffective coping strategies, significantly drive its onset and continuation (Cerea *et al.*, 2018; Mitchell *et al.*, 2016). Sociocultural pressures, such as idealised muscular body standards promoted by society, amplify body image concerns, as highlighted in research by Hallsworth (2005) and Griffiths *et al.* (2015).

1.2 Prevalence of MD

Studies on MD prevalence have primarily targeted populations involved in muscle-centric activities like bodybuilding and weightlifting. Research indicates prevalence rates ranging from 3.4% to 62% among male bodybuilders and

weightlifters, with higher rates in competitive settings (Hitzeroth *et al.*, 2001; Longobardi *et al.*, 2017; Cerea *et al.*, 2018; Devrim *et al.*, 2018; Bashir, 2021). For instance, Olave *et al.* (2021) found that bodybuilders exhibited a higher prevalence of MD compared to runners or fitness athletes, emphasising the link between sports prioritising muscularity and MD development. Hitzeroth *et al.* (2001) reported that 53.6% of non-competitive male bodybuilders met the MD criteria, indicating its significance in this group. Similarly, Bashir (2021) found that 58.3% of Pakistani bodybuilders showed MD tendencies, suggesting the disorder's global relevance.

The increasing occurrence of MD may be linked to the growing appeal of bodybuilding and heightened self-awareness driven by online content, particularly through social media comparisons (Chatzopoulou, 2020). Devrim (2018) reported that 53.7% of bodybuilders displayed MD symptoms. Longobardi *et al.* (2017) identified MD prevalence among both amateur and competitive male bodybuilders, contributing to its recognition in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2022). In Western cultures, the idealised mesomorphic (muscular and athletic) or hyper-mesomorphic (highly muscular and defined) body type is frequently glorified, potentially exacerbating body image-related psychological issues (Chandler *et al.*, 2009; Chatzopoulou, 2020). Those engaging in weight training to modify their appearance face a higher risk of developing MD compared to individuals pursuing performance-oriented goals (Griffiths *et al.*, 2015; Tovt *et al.*, 2021).

Individuals with MD often devote excessive time to resistance training, follow rigid dietary plans, and avoid social settings where their physique might be visible, negatively affecting their social and health outcomes (Fitranti, 2022). These diets typically prioritise high protein consumption while restricting carbohydrates and fats, elevating the likelihood of supplement use (e.g., whey protein, creatine) by 2.56 times (Kreider *et al.*, 2017; Fitranti, 2022). Muscle dysmorphia frequently co-occurs with problematic eating behaviours such as restrictive eating, fasting, or purging, which may lead to health problems like high blood pressure, bradycardia, dehydration, and mental health issues, including depression and anxiety (Griffiths

et al., 2015; Fitranti, 2022; Martenstyn, 2022). A diagnosis of MD can contribute to the use of performance-enhancing drugs (PEDs), eating disorders, strained interpersonal relationships, and diminished daily functioning (Mitchell, 2017; Tovt *et al.*, 2021; Martenstyn, 2022).

Since its initial recognition in the late 1990s (Pope *et al.*, 1997), MD research has broadened to encompass diverse groups, including adolescents, women, and non-athletes (Cella, 2012; Hale *et al.*, 2013). Recent studies have investigated contributing factors such as social media, perfectionism, and co-occurring conditions like eating disorders and obsessive-compulsive disorder (Hallsworth *et al.*, 2005; Martenstyn *et al.*, 2021; Tovt *et al.*, 2021; MacPhail *et al.*, 2022). Additional research is essential to better understand MD's risk factors and mechanisms worldwide, as suggested by Sandgren *et al.* (2018) and Lavallee *et al.* (2023), to improve treatment approaches for healthcare professionals.

1.3 Study rationale and significance

Investigating MD prevalence and risk factors in amateur male bodybuilders is vital for developing targeted interventions, enabling early identification of at-risk individuals, and expanding knowledge on body image disorders. Existing MD research often relies on small-scale qualitative or cross-sectional studies, with 79–90% rated as low methodological quality by National Health and Medical Research Council guidelines (Cooper *et al.*, 2020). Limited research exists on MD risk factors in males, particularly in South Africa, where studies have focused more on eating disorders than muscularity concerns (Hitzeroth, 2001; Lavender, 2017; Gomes, 2019; Lavallee *et al.*, 2023).

Muscle dysmorphia is associated with harmful behaviours like excessive exercise, restrictive eating, and anabolic steroid misuse, which pose significant health risks (Tovt *et al.*, 2021). Chiropractors, as primary care providers, are well-positioned to address musculoskeletal issues linked to MD, such as injuries from overtraining or steroid use (Pope *et al.*, 2000; Tovt *et al.*, 2021). By integrating

screening tools for body image disorders, chiropractors can identify MD symptoms early and refer patients to mental health professionals. They can also promote balanced training and nutrition to prevent MD development. This study, using a quantitative cross-sectional survey of 196 amateur male bodybuilders in eThekweni, aims to provide insights to enhance chiropractic care and interdisciplinary treatment for MD.

1.4 Aim and objectives

1.4.1 Aim

This study seeks to investigate the prevalence and associated risk factors of Muscle Dysmorphia among amateur male bodybuilders in the eThekweni Municipality.

1.4.2 Objectives

1. To assess the prevalence of MD in amateur male bodybuilders.
2. To identify selected risk factors (low self-esteem, childhood victimisation, anxiety, eating disorders, performance-enhancing drugs, and social media) linked to MD in this population.
3. To evaluate the psychosocial and physical impacts of MD on the quality of life of amateur male bodybuilders.
4. To validate the Adonis Complex Questionnaire (ACQ) for use in the South African context through a pilot study and necessary modifications.

1.5 Hypothesis

Null: There is no prevalence of MD among amateur male bodybuilders in the eThekweni Municipality, and MD prevalence is not associated with selected risk factors contributing to its development.

Alternate: MD is present in some amateur male bodybuilders in the eThekwin Municipality, with prevalence linked to selected risk factors contributing to its development.

1.6 Potential Limitations of Study

The sample size cannot represent all amateur male bodybuilders in the eThekwin Municipality as this study is sampling amateur male bodybuilders from a limited number of gyms in a certain/specific demographic area that gave permission for the research to be conducted. The sample is restricted to amateur male bodybuilders from select gyms in the eThekwin Municipality, limiting its generalisability to the broader population. With approximately 80 bodybuilders per gym, the sample size may vary across locations. The requirement for English literacy may introduce cultural bias, as non-English speakers are excluded. Despite anonymity, participants may withhold honest responses due to fear of judgment or stigma surrounding body image issues. The use of multiple statistical tests without adjustment for Type 1 error inflation, could result in an increased risk of false positives. Psychological risk factors were assessed via participants' subjective self-reports rather than validated psychometric instruments, which may introduce bias and reduce objectivity. This was due to the scope of practice limitations.

1.7 Outline of Chapters

Chapter 1 introduces the research, providing a concise overview of MD, the study's aims, objectives, rationale, hypotheses, and potential limitations. Chapter 2 reviews existing literature on MD, identifying knowledge gaps, emphasising the need for further research, and exploring chiropractic care's role in MD management. Chapter 3 outlines the study's methodology, including sampling, questionnaire design, and data analysis methods. Chapter 4 presents the analysed data, offering clear insights into the study's findings. Chapter 5

discusses these findings, interpreting their implications and relating them to prior research. Chapter 6 summarises key results and offers suggestions for future research. The reference list includes all sources cited, and appendices contain permission letters, consent forms, and supplementary materials.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter synthesises existing research on Muscle Dysmorphia (MD) among male bodybuilders, exploring its prevalence, risk factors, and implications for healthcare, particularly chiropractic care. It examines psychological, sociocultural, and behavioural factors, including obsessive-compulsive tendencies, exercise dependence, and steroid use, to highlight their role in MD development. The review identifies gaps in current knowledge and underscores the importance of interdisciplinary interventions.

2.2 Classification of Body Dysmorphic Disorder and Muscle Dysmorphia

Muscle Dysmorphia (MD) and Body Dysmorphic Disorder (BDD) are closely related psychological disorders characterised by an excessive focus on one's physical appearance (Tovt *et al.*, 2021). Muscle dysmorphia is characterised by a specific fixation on achieving greater muscularity, where individuals view their physique as inadequately muscular despite a well-developed build, whereas BDD involves distress over perceived physical imperfections that are often minimal (American Psychiatric Association, 2013). Both conditions, listed below "Obsessive-Compulsive and Related Disorders" in the DSM-5, lead to significant emotional distress. Muscle dysmorphia is distinguished by its focus on muscularity, with compulsive behaviours such as excessive resistance training, in contrast to BDD's broader emphasis on various perceived flaws (Pope *et al.*, 1997).

Individuals with MD face health and social risks from comparing their physique to others, leading to extreme dieting, overtraining, and steroid misuse (Cella, 2012). These behaviours contribute to body image distortion, where individuals perceive themselves as smaller than they are, resulting in dissatisfaction and unhealthy practices (Griffiths *et al.*, 2015). Unlike general body image distortion, MD patients remain dissatisfied despite objective physical progress, as their goals shift to unattainable ideals (Martenstyn, 2022). Muscle dysmorphia typically emerges in late

adolescence (19–20 years), driven by social media exposure and societal pressures for an idealised physique (Chatzopoulou, 2020)

2.3 The Sport of Bodybuilding

Bodybuilding is a discipline centered on enhancing muscle size and clarity through strength exercises, dietary strategies, and supplements (d'Arripe-Longueville, 2019). Originating from ancient Greek and Egyptian traditions, it evolved through 19th-century European strongman performances. Modern competitions evaluate participants on muscle development, symmetry, and stage presentation in categories such as men's open bodybuilding, classic physique, and men's physique (Odrliin, 2023). Since the 1960s, bodybuilding has promoted a highly muscular, lean physique in Western culture, contributing to heightened appearance concerns and increased risk of MD (Chatzopoulou, 2020; Cerea *et al.*, 2018). According to Cakmak (2023), the fitness and bodybuilding industry significantly encourages individuals to prioritise their physical appearance, fostering a sense of self-worth tied to their physique. The pressure to achieve a muscular body is linked to appearance concerns and a strong drive for muscularity, which can contribute to MD development (Cerea *et al.*, 2018). While engaging in weightlifting and dietary practices to enhance one's physique is not inherently problematic or gender-specific, some individuals develop an unhealthy fixation on attaining an idealised body, which can dominate other life aspects, impairing well-being, work, academic, and social functioning, thus elevating MD risk (Griffiths *et al.*, 2015). The emphasis on muscularity and leanness in bodybuilding often leads athletes to adopt rigorous exercise and nutritional regimens, increasing the risk of appearance concerns and obsessive disorders like MD or eating disorders (Mitchell *et al.*, 2017).

2.3.1 Training

Bodybuilding training involves rigorous, high-volume resistance exercises targeting specific muscle groups to maximise hypertrophy and definition (McPhail, 2022). Programs focus on varied angles and muscle groups, with rest days for recovery, as outlined in Table 2.1.

Table 2.1: Common training techniques used by bodybuilders

Training method	Description	Exercise selection	Reference
Split training	Bodybuilders divide workout routines by muscle groups, training each on different days.	Chest & Triceps (Day 1), Back & Biceps (Day 2), Legs & Shoulders (Day 3)	McPhail (2022)
Compound movements	Workouts that engage several muscle groups at once, crucial for building strength and muscle mass.	Squats, Deadlifts, Bench Presses, Rows	Schoenfeld <i>et al.</i> , (2021)
Isolation movements	Exercises that focus on specific muscles for greater definition and symmetry.	Preacher Curls, Triceps Pushdowns, Quad Extensions, Hamstring Curls	Schoenfeld <i>et al.</i> , (2013)

Bodybuilders employ resistance training and weightlifting to promote muscle hypertrophy, resulting in larger and more defined muscle groups. They typically concentrate on specific muscle groups on designated days, allowing untrained muscles to rest, recover, and grow (McPhail, 2022). Nutrition plays a vital role in bodybuilding, with athletes adhering to rigorous dietary plans to enhance muscle development, recovery, and definition (McPhail, 2022).

2.3.2 Nutrition

Nutrition plans typically focus on optimising macronutrient intake, with an emphasis on high protein consumption to support muscle growth and repair. Nutritional strategies are outlined in Table 2.2.

Table 2.2: Nutritional strategies used by bodybuilders

Nutritional strategy	Description	Common sources	Reference
High protein intake	Essential for muscle growth and repair, bodybuilders consume high amounts of protein.	Lean proteins such as chicken, turkey, fish, eggs, dairy products, tofu, tempeh, and beans.	Phillips (2017)
Carbohydrate cycling	Cycling between high-carbohydrate and low-carbohydrate days to enhance energy, promote fat reduction, and maintain muscle mass.	High-carb days: whole grains, fruits, sweet potatoes. Low-carb days: leafy greens, lean proteins	Di Pasquale (1995)
Healthy fats	Crucial for hormone synthesis and general well-being, frequently incorporated into dietary regimens.	Avocados, nuts, seeds, olive oil	Di Pasquale (1995)

2.3.3 Dieting techniques

Bodybuilders employ specific dieting strategies, particularly pre-competition, to achieve low body fat and defined muscles, as summarised in Table 2.3 (McPhail, 2022).

Table 2.3: Terminology associated with dietary techniques used by bodybuilders

Approach	Description	Key focus	Reference
Bulking	A phase where bodybuilders consume a calorie surplus to maximise muscle growth.	High-protein and high-carbohydrate intake for muscle growth and recovery.	Di Pasquale (1995)
Cutting	A phase where bodybuilders consume a calorie deficit to reduce body fat while maintaining muscle mass.	Lower calorie intake with a focus on high-protein consumption.	Helms <i>et al.</i> (2014)
Intermittent fasting	Cycling between fasting and eating periods to promote fat loss while preserving muscle mass	Methods include the 16/8 approach (fasting for 16 hours and consuming meals within an 8-hour window) and the 5:2 strategy (eating regularly for five days and restricting intake for two days)	Tinsley and La Bounty (2015)

2.3.4 Supplementation

In addition to training and nutrition, bodybuilders use dietary supplements to support their training goals (McPhail, 2022), with the most common, protein, creatine and BCAA summarised in Table 2.4.

Table 2.4: Common supplements used by bodybuilders

Supplement	Description	Key benefits	Reference
Protein powders	Comprises whey, casein, and plant-based protein supplements, offering a practical protein source to support muscle development and recovery.	Supports muscle repair and growth, easy post-workout consumption.	McPhail (2022)
Creatine	A naturally occurring substance that boosts energy during intense physical activity.	Increases strength, muscle mass, and aids in recovery.	Kreider <i>et al.</i> (2017)
Branched-Chain Amino Acids (BCAAs)	Important amino acids that promote muscle protein synthesis and aid in recovery.	Reduces muscle soreness and promotes muscle recovery after workouts.	Shimomura <i>et al.</i> (2006)

2.3.5 Competitive and Amateur bodybuilding

The two aspects of the bodybuilding sport are competitive and non-competitive (amateur) bodybuilding. Competitive bodybuilding is a sport in which individuals compete on stage in front of judges and a crowd displaying their physiques (Steele, 2019). Male competitive categories typically feature multiple categories (Odrliin, 2023).

- Men's bodybuilding: This category focuses on muscularity, size, and overall physique.
- Classic physique: Similar to men's bodybuilding but with an emphasis on symmetry, aesthetics, and a smaller overall size.
- Men's physique: This category emphasises a lean and muscular physique with less emphasis on muscle size and more focus on overall aesthetics.

Competitive settings amplify pressure on appearance, elevating the risk of MD compared to non-competitive environments (Hallsworth, 2005; Mitchell *et al.*, 2017). In contrast, amateur bodybuilding fosters physical and mental health benefits through regular training and social interaction (Corina, 2018). The self-motivated nature of consistent weight training, free from competitive demands or standardised routines, encourages peer socialisation (Corina, 2018). This helps reduce work-related stress, enhances overall well-being, improves physical appearance, and supports health (Corina, 2018).

Pope *et al.* (1997) found that appearance intolerance, a feature of BDD, characterised by anxiety over perceived insufficient muscularity and avoidance of body exposure, is influenced by social media and peer pressure, heightening the risk of MD and eating disorders in both competitive and amateur bodybuilders (Pope *et al.*, 1997).

2.4 Origin of MD

The pursuit of muscularity, rooted in historical ideals of masculinity, has intensified with modern media, from muscular action figures to social media influencers (Pope *et*

al., 1997; Chatzopoulou, 2020). This societal pressure drives MD, particularly among competitive bodybuilders, who internalise exaggerated muscular ideals. Muscle dysmorphia is linked to comorbidities like obsessive-compulsive disorder (OCD) and eating disorders (ED), which exacerbate MD symptoms (DSM-V-TR, 2022).

2.4.1 Obsessive-Compulsive Disorder

Obsessive-Compulsive Disorder is defined by recurring, unwanted thoughts and repetitive actions that interfere with everyday functioning (DSM-V-TR, 2022). Muscle dysmorphia exhibits parallels with OCD, as both involve intense preoccupations with perceived imperfections and compulsive actions, such as excessive exercise, to alleviate distress (American Psychiatric Association, 2013). Bodybuilders with MD may dedicate hours to training or adhere to strict dietary regimes to address concerns about their physique (McPhail *et al.*, 2022). Griffiths *et al.* (2015) stated that bodybuilding reinforces these compulsive tendencies by providing a rewarding outlet for such behaviours, highlighting the overlap between MD and OCD (Chandler, 2009).

2.4.1.1 Implications for treatment of OCD and MD

The similarities of both disorders often overlap resulting in important implications for treatment. Martenstyn *et al.* (2021) suggested that individuals with MD may benefit from treatment approaches that address both MD and OCD symptoms. In their study, it was noted that interventions such as Cognitive-Behavioural Therapy (CBT), was effective in treating OCD and BDD, suggesting that a dual-targeted therapeutic approach could be highly effective. Similarly, McPhail *et al.* (2022) emphasised the importance of addressing both obsessive thoughts and compulsive behaviours in treatment interventions for MD. Their study highlighted the prevalence of obsessive thoughts regarding muscularity and compulsive behaviours such as excessive exercise and strict dietary practices among individuals with MD, indicating that effective treatment plans are necessary and must target both aspects to comprehensively address the condition.

2.4.2 Eating Disorders

Eating Disorders are mental health conditions marked by unhealthy eating patterns driven by an intense preoccupation with food, body weight, or shape (DSM-V-TR, 2022). The most prevalent forms include anorexia nervosa, characterised by self-induced starvation resulting in significantly low body weight and bulimia nervosa, characterised by repeated episodes of overeating followed by actions such as self-induced vomiting, laxative use, or fasting to avoid weight gain. (Brytek-Matera *et al.*, 2017). Both disorders feature distorted body image and problematic relationships with food. Muscle dysmorphia is frequently linked to disordered eating behaviours, such as extreme dieting, meal skipping, or excessive supplement use to modify body composition, and is associated with EDs like anorexia nervosa or bulimia nervosa, particularly among individuals engaged in activities emphasising muscularity and appearance, such as bodybuilding, fitness competitions, modelling, and acting.

Several studies have explored the connection between EDs and MD. Devrim *et al.* (2018) found a significant link between body image perception, EDs, and MD in a study of 120 competitive and amateur male bodybuilders. Their findings revealed that 67.5% of participants scored above the clinical threshold on the Eating Attitude Test (EAT-40), indicating a high prevalence of EDs, with 58.3% also exhibiting MD, underscoring a strong association between MD and eating pathology. Similarly, Gomes *et al.* (2019) reported that 39% of 308 males from muscularity-focused sports centres displayed disordered eating behaviours, highlighting the connection between body image concerns and eating issues. Fitranti *et al.* (2022) further noted that 80% of male bodybuilders and athletes in their study showed impaired eating behaviours, reinforcing the prevalence of these issues.

Both EDs and MD are influenced by an individual's perception of their body shape and size, shaped by societal ideals. Conformity to these ideals can foster a positive self-view if the individual aligns closely with the ideal, or a negative self-view if they deviate significantly (Mitchell *et al.*, 2017). For men, the societal ideal often emphasises lean muscularity with minimal body fat, driving those with MD to pursue highly muscular, low-fat physiques (Griffiths *et al.*, 2015). Eating disorders involve an obsession with body weight, leading to strict food intake control that can harm the body but temporarily boosts self-esteem through perceived control. In contrast, MD involves an obsession with muscularity, increasing control over exercise routines, which enhances self-

esteem through physical development. Thus, EDs and MD are linked through their impact on self-esteem, though they operate through different mechanisms.

Klimek *et al.* (2018) observed that men who strongly internalised ideals of thinness and muscularity showed a significant link to disordered eating and MD, with individuals displaying MD and adopting extreme dietary behaviours. Cella (2012) conducted a comparative study of 217 male athletes, including 119 competitive and 98 non-competitive bodybuilders, examining factors like diet, supplement use, exercise dependence, and body image concerns. The study reported that 3.4% of bodybuilders met MD criteria, with 35.3% showing eating disorder symptoms such as binge eating, excessive protein intake, and dietary restriction, indicating a high prevalence of disordered eating among those with MD.

The pursuit of muscularity often leads to significant dietary restrictions, similar to behaviours seen in EDs, such as reducing carbohydrate and overall caloric intake (Griffiths *et al.*, 2015). This restrictive approach can be detrimental, often involving excessive protein consumption (1–2 grams per 2.2 kg of body weight), moderate carbohydrates, low fat, and tightly controlled daily calories (Griffiths *et al.*, 2015; Mitchell, 2017). Individuals with MD may feel ashamed of their bodies, frequently checking their appearance in mirrors, avoiding public exposure (e.g., at beaches), and wearing loose clothing to hide their physique (Schneider, 2017; Tod, 2016). Anxiety and depression may emerge if they cannot adhere to strict diets or exercise routines, often prompting compensatory actions like additional workouts or further dietary restrictions (Griffiths *et al.*, 2015; Pope *et al.*, 1997).

Murray *et al.* (2012) tested the trans-diagnostic model of EDs in the context of MD, proposing that MD and EDs share common psychological drivers, including perfectionism, low self-esteem, emotional dysregulation, and social pressures, despite differing symptoms. Their study of 119 male bodybuilders found that 69% of MD symptoms were linked to these factors, confirming a significant positive correlation between ED and MD characteristics. This suggests that these shared psychological factors may predict the development of MD among male bodybuilders.

2.4.2.1 Implications for treatment of ED and MD

Treatment for MD, particularly when co-occurring with ED, requires a comprehensive, multidisciplinary approach that combines psychotherapy, nutritional interventions and when necessary, medication. Cognitive behavioural therapy is commonly used to address distorted body image and compulsive behaviours (Martenstyn *et al.*, 2021), nutritional therapy supports individuals in developing healthier eating habits, while medications like selective serotonin reuptake inhibitors (SSRIs) may be prescribed to address underlying mental health conditions, such as anxiety, depression, or obsessive-compulsive behaviours (Gossmann *et al.*, 2021). The management of ED focuses on restoring a healthy relationship with food and addressing restrictive/bingeing eating behaviours. A collaborative effort among psychologists, dietitians and other specialists is essential to ensure effective treatment. Martenstyn *et al.* (2021) emphasised the importance of addressing disordered eating behaviours in individuals with MD, calling for tailored interventions to effectively manage these related issues. Similarly, Longobardi *et al.* (2017) highlighted the necessity of interventions targeting both body image concerns and eating pathology in individuals with MD for promoting long-term recovery and well-being. Both studies highlight the critical need for comprehensive, individualised treatment approaches that address both disordered eating behaviours and body image concerns in individuals with MD and ED to ensure effective management and long-term recovery.

2.5 Prevalence of MD

Research indicates a rising prevalence of MD among male bodybuilders, encompassing both amateur and competitive spheres. Devrim *et al.* (2018) reported that among male amateur bodybuilders and athletes, the prevalence of MD was significantly higher compared with the general male population, with 53.7% of participants meeting diagnostic criteria for MD. Similarly, Hitzeroth *et al.* (2001) and Cella (2012), reported a high prevalence of MD symptoms among weightlifters and competitive bodybuilders compared to less competitive groups. A study done by Bashir (2021) demonstrated cultural differences in MD prevalence among amateur male bodybuilders in Pakistan. Similarly, a study by Longobardi *et al.* (2017) assessed male bodybuilders with a mean age of 30 years old, from Italy, and reported a

prevalence rate of 25%. Prevalence rates of MD vary depending on the population studied and the diagnostic criteria used. Among amateur male bodybuilders, prevalence rates range from 3.4% to 62%, with higher rates reported in competitive bodybuilders compared to recreational bodybuilders (Hitzeroth *et al.*, 2001; Longobardi *et al.*, 2017; Cerea *et al.*, 2018; Devrim *et al.*, 2018; Bashir, 2021). These results underscore the heightened risk of MD within the bodybuilding community, emphasising the necessity for targeted interventions and support strategies to address this concerning trend. Although MD was first introduced in scientific literature 30 years ago, its underlying causes remain poorly understood. This is partly due to the limited body of research on the disorder. Additionally, MD-related studies often face methodological challenges, particularly the tendency to conflate individuals with clinical MD and regular gym-goers who exhibit a strong desire for muscularity (MacPhail *et al.*, 2022).

2.6 Muscle dysmorphia in a South African context

Muscle dysmorphia is a globally recognised condition, though research within the South African context remains limited. While international studies done by Cerea *et al.* (2018), Devrim *et al.* (2018), and Bashir (2021) have explored the prevalence and associated risk factors of MD among male bodybuilders and fitness participants, much of this work focuses on competitive athletes. There is, however, a notable gap in research concerning amateur male bodybuilders, particularly in South Africa (Hitzeroth *et al.*, 2001).

A study by Dlagnikova and van Niekerk (2015), which assessed body image and psychological well-being among 395 South African university students, found a 5.1% prevalence rate of BDD in a category that included male bodybuilders. This current study aims to fill this gap by investigating 196 amateur male bodybuilders, applying stricter inclusion criteria designed specifically for this population, to offer a more precise understanding of MD prevalence. Currently, only three published studies have focused on MD in amateur South African bodybuilders, underscoring the urgent need for further research and locally relevant interventions.

2.7 Treatment of MD

Psychologists and other mental health professionals are increasingly aware of the prevalence of MD among male bodybuilders and fitness enthusiasts and are working to develop effective treatment strategies. Lavallee *et al.* (2023) outlined a methodological framework for developing interventions for individuals with MD symptoms.

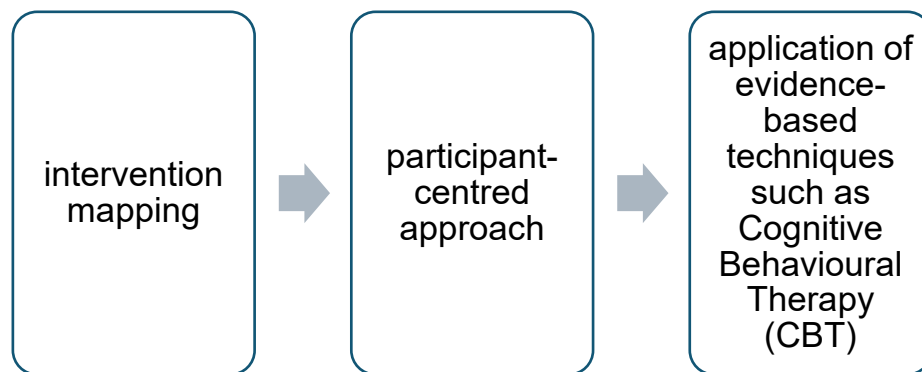


Figure 2.1: Methodological framework for developing interventions for individuals with MD symptoms.

These interventions are designed to tackle distorted perceptions of body image, compulsive exercise habits, and the psychological factors underlying the disorder. Leone *et al.* (2005) highlighted the importance of identifying and treating MD early, particularly among competitive bodybuilders, to mitigate serious mental and physical health risks. Their study found that early intervention led to noticeable improvements in participants. While these approaches can be beneficial for many affected individuals, their success may vary depending on cultural and regional contexts. In Western societies, where idealised body standards are often heavily promoted, individuals may feel heightened pressure to achieve a certain physique, which can contribute to the development of MD (Chatzopoulou, 2020). Conversely, living in smaller or less appearance-driven communities may result in different beauty standards and reduce the societal pressure to strive for extreme muscularity (Bashir, 2021).

2.8 Gender differences in MD

While MD is more frequently linked to men, research suggests that women can also experience symptoms associated with the condition. Several studies (Gruber *et al.*, 1999; Mitchison *et al.*, 2022) have explored MD prevalence and related disordered eating behaviours in both genders. Mitchison *et al.* (2022) reported that among Australians aged 11 to 19, the point prevalence of MD was 2.2% in males and 1.4% in females. Likewise, Gruber *et al.* (1999) investigated 38 female competitive bodybuilders and found that 32 of them experienced intense concerns about being both muscular and lean, to the extent that it negatively affected their social lives, work, or caused significant personal distress.

Robert *et al.* (2009) investigated the connection between MD and the pursuit of muscularity among male and female weightlifters, finding that 69% of men and 46% of women exhibited heightened levels of both MD symptoms and the desire for increased muscle mass. Similarly, Hale *et al.* (2013) studied MD and exercise dependence in 74 female weightlifters and found that 13.5% were at risk for MD, with the majority (9 out of 10) being competitive bodybuilders. Collectively, these findings indicate that although MD is more prevalent in men, it can also significantly affect women, particularly those engaged in bodybuilding.

2.9 Link between MD and Bodybuilding

Within bodybuilding circles, MD often nicknamed “bigorexia” is most common in men who feel dissatisfied with their muscular size, definition, or body-fat levels (Tovt *et al.* 2021). Daily life for those affected typically revolves around heavy resistance training and rigid, highly structured diets, a combination that can heighten anxiety about how others see their bodies, limit social activities, and encourage anabolic-steroid misuse (Pope *et al.* 1997).

Comparative research shows that competitive bodybuilders display more pronounced MD symptoms than recreational lifters, likely because they measure themselves

against elite stage standards rather than average gym physiques (Cella, 2012; d'Arripe-Longueville, 2019). This heightened appearance anxiety raises the odds of both MD and eating disorders (ED) among competitors.

Most intermediate-to-advanced bodybuilders competitive or not cycle through “bulking” (caloric surplus to gain muscle) and “cutting” (caloric deficit to shed fat) phases (Di Pasquale, 1995; d'Arripe-Longueville, 2019). Constantly toggling between size and leanness creates frequent opportunities for body dissatisfaction and can trigger binge-eating tendencies, further elevating ED and MD risk.

Numerous studies confirm that bodybuilders, overall, report higher MD prevalence and symptom severity than athletes in other sports (Amblard *et al.* 2021; Schafer *et al.* 2024). Schafer *et al.* (2024), for instance, found that those training in competitive environments show notably greater MD symptoms than those training recreationally. Collis *et al.* (2016) likewise observed that strict adherence to bodybuilding norms strongly correlates with MD severity.

Finally, simply being immersed in bodybuilding culture whether as an amateur or professional appears to heighten risk of MD. Individuals involved in the community tend to experience greater body dissatisfaction and disordered eating than those outside it (Babusa & Tury, 2012; d'Arripe-Longueville, 2019). Eichstadt *et al.* (2020) documented elevated ED rates among male athletes in muscle-centric sports like bodybuilding, while Schafer *et al.* (2024) reiterated that competitive settings intensify MD symptoms. Together, these findings underscore both the prevalence of MD and the powerful role of bodybuilding culture and environment in its development.

2.10 Anabolic Steroid Use

Competitive bodybuilding's expanding prize money and prestige have made anabolic-androgenic steroids (AAS) an appealing though risky shortcut for many athletes (Greenway, 2018). These synthetic testosterone derivatives, typically injected into large muscle groups, accelerate muscle growth and recovery but also heighten the likelihood of MD and carry serious health costs, including cardiovascular disease, cancers, testicular atrophy, and mood disorders (Tovt *et al.*, 2021).

AAS use is driven by several motives: boosting athletic performance, increasing muscle size and strength, raising self-esteem, and reducing body dissatisfaction or MD symptoms (Greenway, 2018). Men with low self-esteem often attempt to manage body anxiety through relentless training, physique checking, and strict dieting; when these practices no longer sustain their confidence, some turn to steroids (Cerea *et al.*, 2018; Mitchell, 2017).

Although steroid use is more common in competitive bodybuilders, prevalence among recreational lifters is only slightly lower. Kanayama *et al.* (2008) observed that many steroid users are not competitors at all but individuals pursuing muscularity for personal reasons. Recent data from Khalili (2023) put AAS use at 34.1 % in competitive and 27.5 % in non-competitive bodybuilders.

People displaying MD symptoms are significantly more inclined to participate in AAS use than those without such concerns (Kanayama *et al.* 2018; Khalili, 2023). This trend combined with mixed public perceptions of steroid dangers poses a growing public-health challenge. Side-effects range from hypertension, dyslipidaemia, and liver damage to libido changes, erectile dysfunction, acne, joint problems, and immune suppression (Kanayama *et al.* 2008).

Greenway (2018) and Khalili (2023) both documented a robust link between steroid use and MD severity, underscoring the vicious cycle whereby physique-focused rewards reinforce continued AAS consumption. As strict diets and intensive training yield visible muscular gains and, with them, a temporary boost in self-esteem some lifters become so invested in their appearance that they accept substantial medical risks to keep using steroids (Tovt *et al.*, 2021).

2.10.1 Complications associated with use of AAS

Extended misuse of AAS can result in severe physical and psychological consequences, significantly affecting overall health and well-being. Side effects of AAS misuse include infertility, hair loss, acne, voice deepening, cardiovascular disease, cancer, testicular atrophy, depression, aggression, anxiety, and sleep disturbances (Tovt *et al.*, 2021; Khalili, 2023).

Individuals with MD who use AAS face a significantly elevated risk of coronary heart disease, kidney damage, liver damage, and compromised immune function (Kanayama *et al.*, 2008; Tovt *et al.*, 2021). Additionally, sharing of needles among AAS users increases the risk of contracting diseases such as Hepatitis and HIV (Tovt *et al.*, 2021). Typically, AAS are used in cycles lasting six to twelve weeks, followed by an equivalent period without use before resuming (Tovt *et al.*, 2021). The side effects of AAS range from mild to severe and may include aggression, paranoia, anxiety, depression, reduced sexual libido, erectile dysfunction (particularly at the cycle's end), and severe acne (Tovt *et al.*, 2021).

2.10.2 Treatment interventions for AAS use and MD

Addressing the relationship between AAS use and MD is essential for developing effective intervention and treatment strategies. Christine (2025) emphasised the importance of interventions addressing both AAS use and symptoms of MD. The study suggests that early detection and education on use as well as non-judgmental medical care are key to addressing steroid abuse while maintaining ethical guidelines. McPhail *et al.* (2022) proposed interventions focused on addressing underlying psychological factors associated with AAS use, such as body image dissatisfaction and self-esteem issues. These studies highlight the integrated approach needed to address the complex relationship between AAS use and psychological health in individuals, particularly in contexts where body image and muscularity are emphasised.

2.11 Risk Factors

Although there is no known cause of MD, some potential risk factors have been identified.

Internal risk factors

- Defined as characteristics at a psychological level that may expose individuals to negative outcomes such as anxiety, perfectionism, impulsivity and coping mechanisms (CDC, 2021).

External risk factors

- Defined as characteristics at a community or cultural level which can influence an individual's cultural norm (social attitude; beliefs) and social connections (social isolation) (CDC, 2021).

Figure 2.2: Internal vs External risk factors

Risk factors associated with MD:

- Exercise dependence
- Childhood victimisation and body image dissatisfaction
- Psychological factors
- External risk factors
- Social media and unrealistic body standards
- Sociocultural influences
- Influence of peer groups

2.11.1 Exercise Dependence

Individuals who exhibit compulsive exercise behaviours are at a heightened risk for developing MD (Amblard *et al.*, 2021; Cerea *et al.*, 2018). Exercise addiction (EA) represents a type of behavioural addiction, characterised by an inability to control compulsive exercise habits (Olave *et al.*, 2021). Initially driven by positive reinforcement such as weight loss or muscle gain, EA can shift to negative reinforcement as the individual becomes increasingly focused on maintaining an ideal physique, often neglecting social connections and overall health in the process (Tovt *et al.*, 2021). This shift underscores how the initial rewards of exercise can turn into

detrimental outcomes, such as MD symptoms, when the behaviour persists despite adverse physical and psychological consequences (Griffiths *et al.*, 2015).

The compulsive nature of exercise and dietary control in bodybuilding may also be linked to earlier experiences of childhood victimisation or bullying. Research has shown that individuals who have been socially excluded or bullied due to their appearance or weight are more likely to develop body image concerns that persist into adulthood (David *et al.*, 2011). This pattern suggests that for some, bodybuilding becomes more than just a sport, but as a coping mechanism to counteract past experiences of exclusion and gain social validation (Chandler *et al.*, 2009).

As individuals intensify their commitment to regular exercise and bodybuilding, they may experience withdrawal symptoms, including anxiety, depression and irritability when unable to train (Griffiths *et al.*, 2015). This is especially true for bodybuilders who adhere to strict training and diet regimes, even at the cost of their mental and physical well-being. The emphasis on body image, strict eating schedules and rigid training routines suggests that incorporating periodic breaks or deload weeks (period of time in which weight training intensity and frequency is reduced in order to fully recover) could help reduce distorted body image perceptions and prevent conditions like EA MD (Griffiths *et al.*, 2015).

Further reinforcing this link, Olave *et al.* (2021) found that MD was strongly associated with EA, which, in turn, fuels muscle dissatisfaction. Given that some individuals initially take up bodybuilding as a way to escape past victimisation, this cycle of compulsive training and dependency on external validation may worsen MD and EA symptoms. Addressing these compulsive behaviours and promoting structured rest periods is crucial in preventing and managing MD and EA, particularly among those with a history of childhood victimisation.

2.11.2 Childhood victimisation and body image dissatisfaction

Childhood victimisation encompasses experiences of physical, emotional or sexual abuse such as assault, verbal harassment, humiliation and inappropriate touching occurring during early formative years (David *et al.* 2011). Evidence from David *et al.*

(2011) points to a link between such adverse experiences and the emergence of MD later in life.

Antonacci (2023) further argues that early victimisation can shape body-image beliefs, self-esteem and coping mechanisms, thereby predisposing individuals to MD. Supporting this view, Ganson *et al.* (2024) examined 912 Canadians aged 16–30 and found that those reporting five or more adverse childhood experiences (ACEs) were markedly more likely to display MD symptoms: 16.1 % of this high-ACE group met clinical-risk criteria versus 10.6 % among peers with no ACEs.

Body-image worries often trace back to puberty, where weight- or shape-related bullying can leave lasting psychological imprints (Antonacci, 2023). The specific nature of that bullying influences later reactions to typical physique-alteration cycles namely “bulking” (caloric surplus) and “cutting” (caloric deficit). Ridgeway (2023) found that individuals bullied for being naturally lean felt heightened distress when losing muscle during a cut but were relatively unfazed by gains during a bulk. Conversely, those teased for having a bulkier build reported intense anxiety about fat gain during bulking phases yet showed minimal concern over muscle or weight loss while cutting. These patterns illustrate how early body-related ridicule can shape lifelong attitudes and behaviours toward physique changes

2.12 Psychological factors

Researchers have linked a range of psychological traits such as perfectionism, low self-esteem, narcissistic tendencies, a strong need for external approval, mood disorders, anxiety, and an intense drive to succeed to a higher likelihood of developing MD (Cerea *et al.*, 2018).

In a longitudinal study of male bodybuilders, Mitchell *et al.* (2016) and Cerea *et al.* (2018) found that perfectionistic attitudes often went hand-in-hand with obsessive concerns about muscular size and shape. Participants also showed low self-esteem, which was tied to a greater risk of MD symptoms, and many reported social anxiety and depressive moods that strongly correlated with those symptoms.

Hallsworth *et al.* (2005) looked at recreational bodybuilders and discovered that men who felt more dissatisfied with their bodies tended to objectify themselves focusing heavily on how they looked rather than how they felt. Heightened appearance anxiety mediated this link, worsening mental-health outcomes. Taken together, these findings highlight how factors such as perfectionism, self-esteem problems, and social anxiety can play a key role in both the onset and severity of MD among male bodybuilders.

2.12.1 Perfectionism

Perfectionism is a psychological trait associated with MD (Cerea, 2018). Individuals with MD often have unrealistically high standards for their physical appearance, striving for an idealised and often unattainable level of muscularity (Tovt *et al.*, 2021).

Perfectionism is a complex characteristic comprising of self-directed perfectionism, externally directed perfectionism, and socially imposed perfectionism, each contributing distinctly to the emergence and continuation of MD (Cerea *et al.*, 2018). Perfectionism influences MD development both directly and indirectly; direct influences arise from the pursuit of an idealised muscular physique (socially imposed perfectionism), while indirect influences may stem from body image dissatisfaction (self-directed perfectionism) (Cerea *et al.*, 2018).

This drive for perfection can lead to obsessive behaviours related to diet, exercise and body image, contributing to the development and maintenance of MD (Tovt *et al.*, 2021). This involves an excessive focus on self-image and an inflated sense of self-worth, driving individuals to seek validation and admiration to an extreme degree (narcissism).

2.12.2 Narcissism and need for validation

Narcissism is a trait defined by grandiosity, a sense of entitlement, and a persistent need for admiration and validation from others (Boulter, 2022). Those with MD frequently display narcissistic characteristics, such as a strong desire for recognition, dominance, and affirmation of their physical appearance (Boulter, 2022). People with MD often crave external validation of their physique, which drives obsessive thoughts

and behaviours related to diet, exercise, and body image (Chandler *et al.*, 2009; Cerea *et al.*, 2018). This pursuit of validation fuels their efforts to achieve an idealised body to earn admiration and approval (Chandler *et al.*, 2009). Research shows that individuals with MD exhibit higher levels of narcissism than those without the disorder. (Rodrigue *et al.*, 2018).

Boulter (2022) highlights research showing a connection between narcissism and MD, identifying two key dimensions: (a) grandiose and (b) vulnerable. Grandiose narcissism is defined by an exaggerated sense of self-importance and confident behaviour, whereas vulnerable narcissism is characterised by low self-esteem and feelings of insufficiency (Boulter, 2022). Grandiose narcissism manifests in an exaggerated self-perception (e.g., “I am the most muscular person”), whereas individuals with MD typically exhibit a diminished self-image (e.g., “Everyone else is more muscular than I am”) (Boulter, 2022). This lowered self-image is often linked to low self-esteem and the influence of vulnerable narcissism in those with MD (Boulter, 2022).

2.12.3 Self-esteem

Self-esteem is the way an individual perceives or values themselves (Cerea *et al.*, 2018). An individual’s self-esteem can be high (positive view on oneself) or low (negative view on oneself). Low self-esteem is another common psychological factor amongst individuals with MD (Cerea *et al.*, 2018). Feelings of inadequacy and inferiority are often linked to dissatisfaction with one's physical appearance, leading individuals to believe that they are not muscular enough or that their bodies are not sufficiently developed (Cerea *et al.*, 2018).

Cerea *et al.* (2018) stated that individuals with decreased self-esteem participate in anaerobic exercise to mitigate feelings of inadequacy, with their dedication to the activity strengthened by muscular gains, therefore, will enhance their self-worth. Low self-esteem may lead to avoidance of social environments where the body is exposed, and this avoidance is briefly relieved by a decrease in social anxiety, perpetuating the behaviour. According to Cerea *et al.* (2018), low self-esteem may serve as a motivational factor for MD symptoms through negative reinforcement. The apprehension of being negatively judged by others about one’s physique generates

an aversive emotional state. (Chandler *et al.*, 2009). Given that the societal ideal for the male body is a mesomorph, naturally athletic, and muscular build, building muscle through weightlifting is a socially acceptable way to enhance self-esteem among peers (Chandler *et al.*, 2009). Consequently, weightlifting elevates self-esteem and reinforces behaviours associated with MD (Rodrigue *et al.*, 2018). Rodrigue *et al.* (2018) found that men who participate in weight training tend to have more positive body image perceptions and higher self-esteem.

2.12.4 Mood Disorders and Anxiety

Research suggests that individuals with MD experience greater levels of depression and anxiety compared to those without the disorder (Tovt *et al.*, 2021). Mitchell *et al.* (2016) conducted a systematic and meta-analysis review to assess the relationship between MD and psychological distress, emphasising depression and anxiety. The results revealed a positive association between MD symptoms and elevated scores for depression and anxiety. These psychological challenges can heighten feelings of inadequacy and low self-worth, thereby contributing to the development and persistence of MD.

2.12.5 Drive for achievement

The drive for achievement is frequently observed as a personality trait among individuals with MD, particularly among competitive male bodybuilders (Cerea *et al.*, 2018). These individuals frequently exhibit a strong motivation to attain specific fitness objectives, such as gaining muscle mass or lowering body fat levels (Tovt *et al.*, 2021). Studies show that individuals with MD exhibit a greater drive for achievement compared to non-dysmorphic individuals (Cella, 2012; Mitchell *et al.*, 2017; Cerea *et al.*, 2018). This drive for achievement can be motivated internally by the individual or externally by societal pressures and expectations.

2.13 External risk factors of MD

2.13.1 Social media and unrealistic body standards

Sociocultural ideals portrayed on social media impact a wide audience, but individuals who rely on social media for their careers, such as influencers, face a heightened risk of developing MD due to the pressure to maintain a specific online appearance (Schneider, 2017; MacPhail *et al.*, 2022). Platforms like Instagram and TikTok significantly influence body image perceptions and behaviours among amateur male bodybuilders (Vuong *et al.*, 2021). The widespread exposure to images of idealised, hyper-muscular male physiques can foster body dissatisfaction and contribute to the onset of MD (Vuong *et al.*, 2021).

Constant exposure to images of hypertrophic and perfectly proportioned bodies can create a distorted perception of one's own physique, leading to a cycle of obsessive self-monitoring and validation-seeking behaviour (Chatzopoulou, 2020). The prevalence of digitally altered and heavily filtered images on social media further perpetuates unrealistic body standards. Individuals may feel pressure to achieve unattainable levels of muscularity to match the idealised images they see online (Chatzopoulou, 2020).

The use of photo editing applications and filters enables individuals to alter their appearance, creating a skewed perception of reality. Amateur male bodybuilders may feel pressured to edit their images to display a more muscular and visually appealing physique, which can intensify feelings of inadequacy and dissatisfaction (Chatzopoulou, 2020; Vuong *et al.*, 2021). Social media has become a primary platform for direct social comparison (Chatzopoulou, 2020). Societal influences, from media advertising to celebrated sports figures, often define the "ideal" physique (Vuong *et al.*, 2021). Chatzopoulou (2020) notes that many individuals report their social media feeds being dominated by "fitspiration" or "Instabod" content, featuring professional bodybuilders or fitness influencers with unrealistic physiques that distort perceptions of what is naturally achievable.

The increased prominence of individuals on social media has amplified focus on physical appearance and overall physique (Vuong *et al.*, 2021). Exposure to social media images can negatively impact body satisfaction for both men and women (Vuong *et al.*, 2021). Idealised body standards differ by gender, with men experiencing

higher body dissatisfaction often focusing on muscularity, while women with similar concerns tend to prioritise thinness (Chatzopoulou, 2020). These gender-specific societal ideals elevate the risk of developing MD.

The role of social media in fostering and sustaining MD is well-established. Vuong *et al.* (2021) conducted a study with 1,153 adolescents (55.4% male) and found that media depictions of idealised muscular bodies significantly contribute to body image distortion and the pursuit of muscularity. Similarly, Fitranti (2022) studied 100 male bodybuilders aged 17–45 and identified social influence as the most significant factor in MD development. These findings underscore the significant link between media exposure to muscular male imagery and the development of MD symptoms.

2.13.2 Sociocultural influences

Studies indicate that individuals dissatisfied with their bodies and strongly influenced by sociocultural ideals of muscularity, particularly in Western nations, are more prone to developing MD (Chatzopoulou, 2020; Vuong *et al.*, 2021). Social pressures are closely linked to ED behaviours associated with mesomorph body ideals, dissatisfaction with muscularity, and concerns about body fat (Vuong *et al.*, 2021). These pressures can result in appearance-related anxiety, depression, and social withdrawal when physique goals are unmet or unsustainable (Chatzopoulou, 2020). Blashill (2020) highlights that adherence to traditional masculinity is a significant sociocultural factor among men with MD, showing a strong positive correlation between conformity to masculine norms and muscle dissatisfaction (Blashill, 2020). Men who prioritise appearance and adhere to traditional masculine ideals may emphasise muscularity over other aspects of their appearance as an outward expression of masculinity (Blashill, 2020).

2.13.3 Influence of peer groups

Peer groups can exert a considerable impact on the development of MD. Within male peer groups, there is frequently a significant emphasis on achieving an idealised physique that aligns with societal standards of muscularity (Vuong *et al.*, 2021). Research suggests that individuals who are heavily influenced by their peers are more

prone to body dissatisfaction (Vuong *et al.*, 2021). The drive for muscularity, propelled by societal expectations and media depictions of the ideal male physique, significantly contributes to the onset of MD symptoms (Vuong *et al.*, 2021).

2.14 Multidisciplinary Management Approaches for MD

Due to the complex psychological and behavioural patterns associated with MD, management strategies should address both the underlying cognitive disturbances and the physical consequences of excessive training (Martenstyn *et al.*, 2021). These strategies include:

Psychotherapy: Cognitive Behavioral Therapy (CBT) assists individuals in recognising and altering distorted perceptions of their body image, fostering healthier approaches to exercise and nutrition, and decreasing compulsive behaviours (Martenstyn *et al.*, 2021).

Pharmacological Interventions: Medications such as selective serotonin reuptake inhibitors (SSRIs) or anti-anxiety drugs may be used to address underlying depression, anxiety, or obsessive-compulsive tendencies associated with MD (Cerea *et al.*, 2018). However, pharmacotherapy alone is not a sustainable solution and is most effective when integrated with psychotherapy and holistic treatments, such as chiropractic care.

2.15 Role of Chiropractic care in MD management

Chiropractic treatment centers on identifying, managing, and preventing mechanical issues in the musculoskeletal system, with a special focus on spinal health. Although not a primary treatment for MD, chiropractic care can serve a supportive role by addressing musculoskeletal issues and enhancing overall physical health in affected individuals. It targets common weightlifting-related problems linked to MD, such as pain, injuries, discomfort, and misalignments caused by overtraining and inadequate recovery periods (Tovt *et al.*, 2021). Gevers-Montoro *et al.* (2021) emphasised the advantages of chiropractic interventions in alleviating musculoskeletal pain and improving physical well-being in individuals experiencing discomfort.

Bodybuilders often seek chiropractic treatment for physical conditions affecting joints subjected to repetitive stress and improper technique, particularly the shoulder, knee, and lumbar spine (Barreto *et al.*, 2024). These conditions include tendonitis, ligament injuries, sacroiliac syndrome, impingement syndrome, rotator cuff issues, muscle strains or tears, and spinal disc injuries. Given the higher prevalence of MD in this group, bodybuilders may also exhibit related risk factors.

Recognising the prevalence and risk factors of MD is essential for healthcare professionals to provide effective and comprehensive care. A holistic approach prioritises both the physical and psychological dimensions of a patient's health, highlighting the importance of identifying MD to facilitate referrals to appropriate therapies or mental health support. By combining physical and psychological interventions, healthcare providers can better promote overall well-being in bodybuilders.

2.15.1 Chiropractic interventions

Amateur bodybuilders may seek chiropractic care to manage the symptoms such as tendonitis, stress fractures, chronic joint inflammation that may be associated with intense weight training. During these consults, it is imperative for the chiropractor to check for signs of psychological distress e.g. anxiety, depression in order to refer the patient for psychological help if needed. Through this mechanism, chiropractors are involved in the management of MD. The interventions that chiropractors may make use of, as described by Gevers-Montoro *et al.* (2021), to manage patients with MD include:

- **Manual therapy:** Chiropractors may employ hands-on techniques, such as spinal adjustments and joint mobilisation, to correct fixations and enhance joint function and health.
- **Soft tissue therapy:** Massage and myofascial release can be used to alleviate muscle tension and discomfort linked to MD.
- **Exercise prescription:** Chiropractors may recommend tailored exercises to improve strength, flexibility, and posture, supporting individuals with MD in pursuing their fitness goals safely and sustainably.

2.15.2 Implications for Chiropractic practice

Whilst chiropractic treatment can play a supportive role in MD management, it is essential for chiropractors to work collaboratively with other healthcare professionals and also refer patients who show signs and symptoms of MD to psychologists, nutritionists and physicians to provide comprehensive care for these individuals. By working together, healthcare professionals can create integrated treatment plans that consider all aspects of an individual's health (Martenstyn *et al.*, 2021). This holistic approach can improve overall treatment outcomes, as it ensures that all contributing factors to MD are addressed.

2.16 Conclusion

This literature review offers a thorough examination of the prevalence and risk factors of MD among amateur male bodybuilders, exploring the psychological, sociocultural, and biological factors that contribute to its development and persistence. The review underscores the notable prevalence of MD in this population, with studies reporting rates ranging from 3.4% to 62%, with higher rates observed among competitive bodybuilders compared to recreational ones. Key risk factors identified include sociocultural influences, such as media depictions of idealised muscularity, societal expectations, peer influences, and cultural standards of masculinity. Psychological factors, including body image dissatisfaction, perfectionism, low self-esteem, narcissism, need for validation, mood disorders, anxiety, drive for achievement, obsessive-compulsive tendencies, and eating disorders, were highlighted as significant contributors to MD. Additionally, personality traits such as exercise dependence, anabolic-androgenic steroid use, and experiences of childhood victimisation were found to play a role in MD development. The influence of bodybuilding culture, training practices, nutrition, and various dieting approaches on MD was also examined. Furthermore, the potential supportive role of chiropractic care in managing MD was considered. Addressing these factors through targeted mental health interventions, chiropractic care, and a multidisciplinary approach that promotes healthier body image ideals within bodybuilding communities is critical to reducing MD's prevalence and impact.

In conclusion, multiple interconnected factors contribute to the prevalence and risk of MD among amateur male bodybuilders. Research on this topic within the South African context is limited, with most studies focusing on competitive rather than amateur bodybuilders. This research aims to address this gap by offering meaningful insights into the experiences of amateur male bodybuilders in the eThekweni region.

CHAPTER 3: METHODOLOGY

3.1 Study Design

A quantitative descriptive cross-sectional questionnaire was utilised to obtain data from participants at a specific point in time (Setia, 2016). The current study's research design was appropriate as it did not involve tracking or studying participants over an extended period. It enabled the collection of data from a large sample, facilitating quantitative analysis and providing insights into participants' attitudes, behaviours, or preferences at a specific moment (Setia, 2016).

3.2 Target population

Amateur male bodybuilders in the eThekweni Municipality, Durban, South Africa.

3.3 Study location

This study was conducted in gymnasiums across the eThekweni Municipality, (Umhlanga Ridge, Berea, La Lucia, Musgrave, and Overport) after receiving the appropriate and relevant permission from the Gymnasium manager (Appendix B). Hard copies of the questionnaire were handed out at these specific gymnasiums (Appendix A).

3.4 Sampling

3.4.1 Sampling strategy

The study employed a non-probability sampling strategy, which involved a non-random selection of participants based on specific criteria to ensure relevant data collection. Both convenience and purposive sampling were used. Convenience sampling facilitated access to amateur male bodybuilders in gyms, while purposive sampling ensured that only participants meeting the inclusion criteria were selected. The inclusion criteria (see Section 3.7) were essential for obtaining unbiased, reliable and accurate results on MD among amateur male bodybuilders in the eThekweni Municipality (Riccobono, 2020).

3.4.2 Sample size

Permission was granted by five gymnasiums in the eThekweni Municipality (Appendix B) to conduct the study. There were approximately 80 amateur male bodybuilders at each gym.

A p value of 0.53 was assumed (based on the number of amateur male bodybuilders estimated at each of the five gymnasiums with the probability of having MD), the margin of error was 0.05, an alpha value of 0.05 and population of 400 (5 x 80) participants were used. The Cochrane's formula found the minimum required sample size to be 196 participants (Hendry, 2024). This equates to 40 participants from each of the five gymnasiums to achieve the goals of the current study.

3.5 Measuring tool

The study questionnaire was adapted from a pre-validated questionnaire called the Adonis complex questionnaire (ACQ) (Riccobono, 2020). The ACQ has been found to be a reliable ($\alpha = 0.812$) and valid (CFI = 0.95, RMSEA = 0.058, SRMR = 0.064) measure of MD (Riccobono, 2022). Permission was granted by the authors for use (Appendix C).

The Adonis Complex Questionnaire (ACQ) evaluates an individual's level of preoccupation with their physical appearance and the extent to which this concern may adversely affect their life, potentially leading to pathological behaviours over time. It comprises of 13 self-report items scored on a 4-point Likert scale, ranging from 0 ("rarely or not at all") to 3 ("frequently") (Riccobono, 2020). The ACQ's total score ranges from 0 to 39, with higher scores reflecting greater levels of MD. Participants select one of three response options that best reflects their experiences. These responses, arranged from minor to severe (normal to pathological), capture concerns about physical appearance and its impact on psychosocial, sexual, nutritional, and athletic aspects of life (Riccobono, 2020). Scores ranging from zero to nine suggest little to no concern regarding body image, 10-19 suggest mild to moderate concern, 20-29 denote serious concern, and 30-39 indicate severe body image dissatisfaction and MD prevalence (Leone *et al.*, 2005).

Data were analysed using the sphericity test and the Kaiser-Meyer-Olkin measure (Hendry, 2024). To establish the number of factors positively associated with each questionnaire item, the Kaiser-Guttman criterion was applied, supplemented by the Cattell Scree Test (Hendry, 2024). The reliability of the questionnaire and the homogeneity of its factors were assessed by computing Cronbach's α coefficient for each factor and the average interitem correlations. Confirmatory factor analysis (CFA) using maximum-likelihood estimation, with covariance matrices analysed via AMOS 24.0, was conducted to evaluate various factorial models (Riccobono, 2020).

The internal consistency reliability of the Adonis Complex Questionnaire (ACQ) and its subscales was evaluated using Cronbach's alpha, with results indicating strong reliability for the overall scale and both subscales, as presented in Table 3.5 (Riccobono, 2020).

Table 3.5: Internal consistency reliability (Cronbach's α) of the ACQ

	No. of items	Mean	SD	Cronbach's α
ACQ	13	4.84	4.5	0.812
Psychosocial	6	2.22	2.47	0.781
Control	7	2.61	3	0.772

3.6 Data collection procedure

The data collection process was carried out in two distinct phases, as detailed below.

3.6.1 Phase 1: Focus group

A focus group was conducted to evaluate the suitability of the questionnaire for the target audience (George, 2021). This involved an informal discussion among selected members to refine the questionnaire or interview questions (George, 2021). The focus group aimed to test the face and content validity of the measurement tool. Face validity was determined by the group's agreement that the questionnaire effectively measured its intended purpose, while content validity ensured the questions were relevant to the study (Bhandari, 2022).

The method of the focus group aims to obtain data from a predetermined group of individuals rather than from a randomised sample of a larger population. The focus group consisted of 5–7 participants, *viz.*, the current researcher, two supervisors, a Masters student who has completed the research questionnaire and one amateur male bodybuilder.

The focus group discussion was not analysed. However, each question was read out by the current researcher and the participants had an opportunity to provide insights into the question and comment on its appropriateness to meet the research objectives. The focus group discussion was approximately two hours.

Revisions to the pre-focus questionnaire were made following feedback received during a Microsoft Teams meeting.

1. Extra columns removed throughout the document.
2. Question 5 of Section A should be removed.
3. Question 1 and 7 from Section B should be removed.
4. Question 5 of Section B should be altered to using boxes to tick.
5. A reference for validity of the questionnaire should be added next to the ACQ heading of Section B.
6. Question 4 of Section B and question 5 of Section C should not be underlined.
7. Neutral column for Section C should be removed.
8. Section D should have 4 (1 to 10) columns for each area of quality of life.
9. Question 8 and 9 of Section D should be removed.

These suggestions were corrected accordingly.

Inclusion criteria for focus group:

1. Participants who agreed to and signed the informed consent form.

2. The current researcher, two supervisors, one collaborator and a Masters student who has completed the research questionnaire
3. One amateur male bodybuilder who met the main study inclusion criteria.

Exclusion criteria for focus group:

1. Participants who did not agree to and did not sign the informed consent form.
2. Participant was a competitive male bodybuilder.
3. Participants other than the current researcher, supervisors, collaborator and Masters student who filled out the research questionnaire

3.6.2 Phase 2: Pilot study

A pilot study is a preliminary investigation conducted to evaluate the feasibility of methods intended for a larger-scale study (Lowe, 2019).

The purpose of the pilot study was to ensure that the measurement tool is adaptable to the target population. Pilot studies on MD were performed internationally, but there are no published reports of a similar type of study performed on South African amateur bodybuilders.

The adapted ACQ was given to a South African demographic in the main study, therefore, completion of the pilot study was an indication of how successful the main study will be. This was done by determining a selected sample size, establishing an inclusion and exclusion criteria, having the participants complete the measurement tool (adapted ACQ) and reviewing/analysing the data obtained. The pilot study consisted of 20 participants which represented 10% of sample size.

Suggestions and concerns following the pilot study:

1. Fix grammatical and technical issues throughout the questionnaire.
2. In Section B, Q1, change the word order of the question to make it sound consistent.
3. Section B, Q5, change the mesomorphic option to thin.

4. Section D, put “On a scale of 1–10 (where 1 is very poor and 10 is excellent) please rate: “at the top” and then put the simplified headings below:
 - a. Your current physical health.
 - b. Quality of your current relationships.
 - c. Your current feelings of positive emotions.
 - d. Your current feelings of having purpose and meaning in life.

These suggestions were corrected accordingly.

Inclusion criteria for pilot study:

Amateur male bodybuilders must meet the following criteria:

1. Participants must be a biological male to ensure homogeneity.
2. Participants must be a non-competitive or amateur bodybuilder.
3. Participants must be between the ages of 18 to 50 years old.
4. Participants must spend a minimum of three hours divided into three sessions of training per week, consisting of weightlifting.
5. Participants must have been training for a minimum of 2–3 years using a bodybuilding style training.
6. Participants must prioritise having a physique that consists of medium to high muscle mass and relatively low body fat percentage (Mesomorph physique).
7. Participants must be able to read and understand the English language.
8. Participants must have read and signed the informed consent form.

Exclusion criteria:

1. Participants who are not a biological male to ensure homogeneity.

2. Participants who are professional or competitive bodybuilders.
3. Participants who are younger than 18 and older than 50 years of age.
4. Participants who do not spend a minimum of three hours divided into three sessions of training per week, consisting of weightlifting.
5. Participants who have not been training for a minimum of 2–3 years using a bodybuilding style training.
6. Participants who do not prioritise having a physique that consists of medium to high muscle mass and relatively low body fat percentage (Mesomorph physique).
7. Participants who took part in the focus group discussion.
8. Participants who have not read and signed the informed consent form.

3.7 Main study

Inclusion criteria:

Amateur male bodybuilders must meet the following criteria:

1. Participants must be a biological male to ensure homogeneity.
2. Participants must be a non-competitive or amateur bodybuilder.
3. Participants must be between the ages of 18 to 50 years old.
4. Participants must spend a minimum of three hours divided into three sessions of training per week, consisting of weightlifting.
5. Participants must have been training for a minimum of 2–3 years using a bodybuilding style training.
6. Participants must prioritise having a physique that consists of medium to high muscle mass and relatively low body fat percentage (Mesomorph physique).
7. Participants must be able to read and understand the English language.
8. Participants must have read and signed the informed consent form.

Exclusion criteria:

1. Participants who are not a biological male to ensure homogeneity.
2. Participants who are professional or competitive bodybuilders.
3. Participants who are younger than 18 and older than 50 years of age.
4. Participants who do not spend a minimum of three hours divided into three sessions of training per week, consisting of weightlifting.
5. Participants who have not been training for a minimum of 2–3 years using a bodybuilding style training.
6. Participants who do not prioritise having a physique that consists of medium to high muscle mass and relatively low body fat percentage (Mesomorph physique).
7. Participants who took part in the focus group discussion.
8. Participants who have not read and signed the informed consent form.

3.7.1 Main study procedure

Once ethical clearance was granted by the Durban University of Technology (DUT) Institutional Research Committee (IREC), ethics number (IREC 121/23), advertisements were placed in gymnasiums to inform potential participants about the study (Appendix E). During visits to each gymnasium five times a week, the researcher informed potential participants about the study and provided a letter of information to those who expressed interest and met the inclusion criteria.

Once participant eligibility was determined, the participant was given the informed consent (Appendix D) document to complete and sign (for confidentiality purposes). The current researcher was available to assist participants in filling in the informed consent forms, if any queries were raised. The participants were then asked to complete the adapted ACQ. Questionnaires were distributed and collected in hard copy format at local gyms, with no online submission option available. Names and personal details were kept anonymous. Upon completion of the questionnaire, it was

handed back to the current researcher with the informed consent forms and placed in a sealed box. Once all 40 questionnaires from each of the five gymnasiums were completed, they were collected by the current researcher and sent for data analysis to a biostatistician. The questionnaires will be kept for a period of five years, thereafter, they will be discarded.

3.8 Data analyses

The data was analysed using the Statistical Package for the Social Sciences (SPSS; version 25, IBM Inc., Chicago, IL, USA). Descriptive statistics, presented through tables and charts, were employed to visually depict the data. To identify significant patterns, inferential statistical methods were utilised, including Pearson's correlation, t-tests, analysis of variance (ANOVA), and Chi-square tests. When the assumptions for these tests were not satisfied, non-parametric alternatives or exact tests were applied as appropriate. Factor analysis was applied to determine the results gathered from the adapted ACQ (Hendry, 2023). All differences were considered significant at $p < 0.05$.

To analyse the data structure, a construct was measured using multiple items (questions in the ACQ), which were then simplified into a smaller set of latent variables (Factors).

Factor analysis using promax rotation (an oblique rotation method) was conducted on the 13 questions. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.74, indicating that the data was adequate for factor analysis. Additionally, a significant Bartlett's test ($\text{Chi-square}_{(66)} = 381.46$, $p < 0.001$) further confirmed the reliability of the data. Question 12, which pertained to the use of anabolic steroids, was excluded from the final analysis as it did not show strong a correlation with any factor.

Two factors emerged from the ACQ: Psycho-social effects of physical appearance (PS) = 18.83% and Control about physical appearance (CON) = 9.14%.

The consistency of grouping items into a single latent variable was evaluated using Cronbach's alpha, with a threshold of 0.7 or above deemed satisfactory. Items exhibiting weak correlations with others or reducing overall reliability were removed.

Factor extraction was deemed effective if the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy surpassed 0.6 and Bartlett's test of sphericity yielded a significant result, confirming the data's suitability for factor analysis.

3.9 Ethical Considerations

Complete ethical approval was granted by the Independent Research Ethics Committee (IREC) at Durban University of Technology on October 25, 2023 (Ethics Clearance Number: IREC 121/23). A submission was made to the Institutional Research Committee (IREC) before data collection.

- Ethical considerations included autonomy, beneficence, non-maleficence, and justice.
- There were no risks or discomfort for participants, as the study used a questionnaire as its measurement tool.
- No harm was inflicted on participants (non-maleficence).
- Participation contributed to a better understanding of MD in men, benefiting both healthcare practitioners and bodybuilders by highlighting risk factors and prevention strategies (beneficence).
- Participants had the right to choose whether to take part in the study without facing any repercussions.
- Participation was voluntary, and individuals could withdraw at any time without providing a reason or facing consequences (autonomy).
- All participants were treated fairly and without discrimination. Their information remained confidential, and surveys were submitted online (justice).
- The study's results were used exclusively for research purposes, with access restricted to individuals directly involved in the project.
- A mental health assistance line was provided for any participant who required support.
- The data collection process did not involve access to confidential personal data without prior participant consent.

- Data was collected and disseminated while ensuring confidentiality of both the data and participant identities.
- All data was securely stored in a password-protected file for five years before being permanently deleted. Hard copies were shredded after the retention period.
- Recruitment involved a direct personal approach from the researcher to potential participants. No personal, professional, or familial relationships existed between the researcher and the participants (e.g., employees, students, or family members).

CHAPTER 4: RESULTS

4.1 Introduction

This chapter presents results of the statistical analysis completed on the data obtained from the research study, focusing on the relationship between the prevalence of MD and various psychological and social factors. In addition, the aim is to uncover significant predictors and provide a better understanding of the factors contributing to this condition. Furthermore, the chapter presents a comprehensive examination of the data collected through questionnaires, employing statistical techniques such as factor analysis, regression analysis and correlation assessments.

Within the eThekweni region, 40 questionnaires were distributed to each of the five selected gymnasiums. Of the 200 questionnaires distributed, 196 were returned and completed correctly. Four questionnaires were discarded as these questionnaires were incomplete. A sample size of 196 was adequate to carry out the data analysis for this study (Hendry, 2024).

4.2 Demographic Information

4.2.1 Age

The average age of participants was 27 years and 8 months, with the youngest being 18 years old and the oldest 50 years old. The median age was 26 years and 5 months.

4.2.2 Race

Figure 1 represents the race distribution amongst the participants in this study. The Indian race represented the highest percentage (42%), followed by White (27%) and African (23%) participants. The Asian community was the least represented (1%) (Figure 4.1).

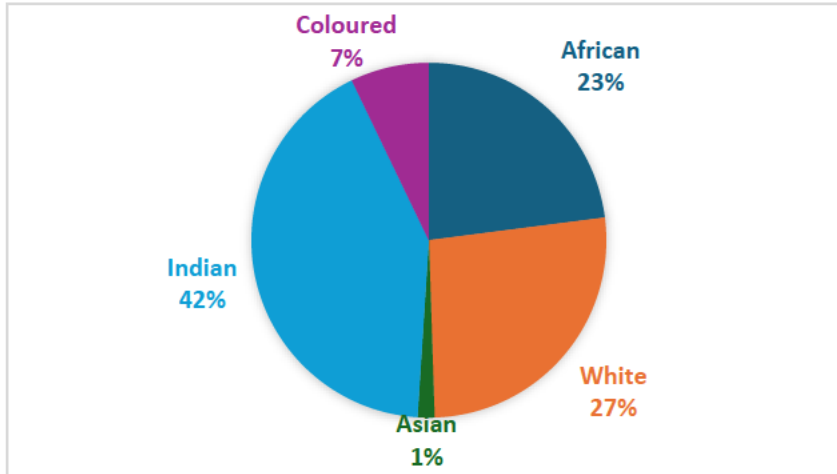


Figure 4.1: Values represent the total race distribution percentage observed in 196 participants.

4.2.3 Occupation

Participants were divided into four occupational groups (Hendry, 2024). These groups were chosen to avoid redundancy in data presentation due to the similar occupations of the study participants. The academic group included any occupation requiring three years of university study. The public sector group encompassed government-affiliated occupations, such as police officers and administrators. Skilled labour workers were defined as those in manual labour occupations, including construction, plumbing or electrical work. The sport occupation group consisted of individuals involved in occupations such as coaching or professional athletics.

The occupation distribution indicated that the highest representation was academic (42%), followed by public sector (38%), skilled labour worker (11%) and sport having the lowest representation of 9%.

4.2.4 Marital Status

A majority of the participants in this study were single (74%), 23% of participants were married and the lowest number of participants was divorced (3%; Figure 4.2).

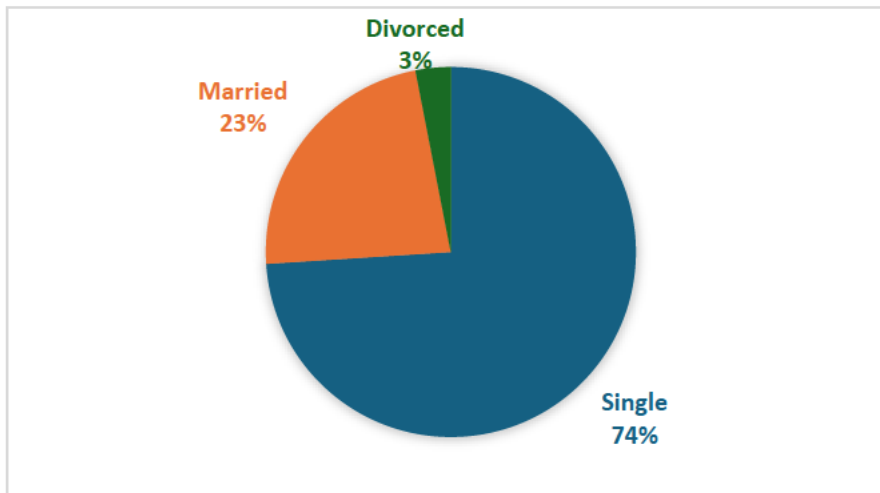


Figure 4.2: Values represent the total marital status percentage observed in 196 participants.

4.3 Training History

Descriptive analysis was used for all the training history data.

4.3.1 Number of days training per week

Weight training frequency ranged from two to seven days per week, with a median of five and a standard deviation of 1.05 (Figure 3). While 40% of participants trained five days a week, the distribution included individuals who trained six (12.8%) or seven (3.6%) days a week. Only 0.5% of participants trained two days or less per week (Figure 4.3).

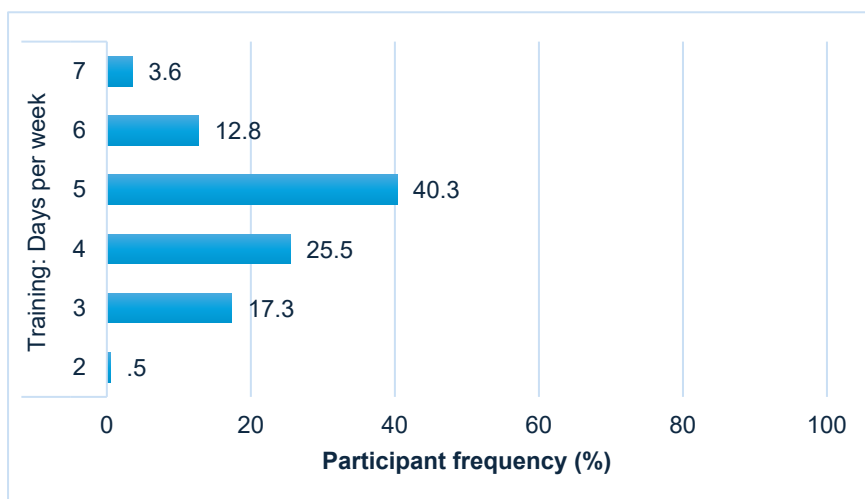


Figure 4.3: Values represent the total training frequency days per week percentage observed in 196 participants.

4.3.2 Number of hours training per day

The majority of participants (55.1%) reported training durations of less than two hours per day. This was followed by 41.3% of participants who trained for two to four hours per day, and 3.1% trained for four to six hours per day (Table 4.6).

Table 4.6: Frequency of training duration (hours) amongst participants in five gymnasiums within the eThekweni region. Values represent the total frequency of training duration (hours) percentage observed in 196 participants.

On average, how many hours do you train per day?	Frequency	Response (%)
<2 hours	108	55.1
2 – 4 hours	81	41.3
4 – 6 hours	7	3.6
Total response	196	100

4.3.3 Years of bodybuilding style training

A majority of participants (57.7%) reported having “at least four years of training” experience. There were 29.6% of participants who reported having between “four and

ten years” of training, while 12.8% had “more than ten years” of experience in bodybuilding style training (Table 4.7).

Table 4.7: Values represent the total historical frequency of body building style (years) percentages observed in 196 participants.

How many years have you been doing bodybuilding style training?	Frequency	Response (%)
2 years	59	30.1
2 – 4 years	54	27.6
4 – 6 years	35	17.9
6 – 10 years	23	11.7
>10 years	25	12.8
Total response	196	100.0

4.3.4 Types of training techniques

The most prevalent training technique was a combination of hypertrophy, strength, and endurance training (39.8%). This was followed by a combination of hypertrophy and strength training (35.2%). Hypertrophy-only training constituted 13.8% of regimens, while strength-only training was the least common at 11.2% (Table 4.8).

Table 4.8: Frequency of training techniques amongst participants in five gymnasiums within the eThekweni region. Values represent the total frequency of training techniques percentages observed in 196 participants.

	Response Frequency (%)			
	Hypertrophy	Strength	Combination of hypertrophy and strength	Combination of hypertrophy, strength and endurance
What type of training techniques do you use to increase muscle size?	13.8%	11.2%	35.2%	39.8%

4.3.5 Words that describe the perfect physique

Participants were asked to select which word described the perfect physique. The most frequently selected word was "muscular" (85.2%). The terms "strong" (69.4%), "lean" (66.8%), and "athletic" (59.7%) were also commonly chosen. "Sculpted" was the least frequently selected descriptor (18.9%; Figure 4.4).

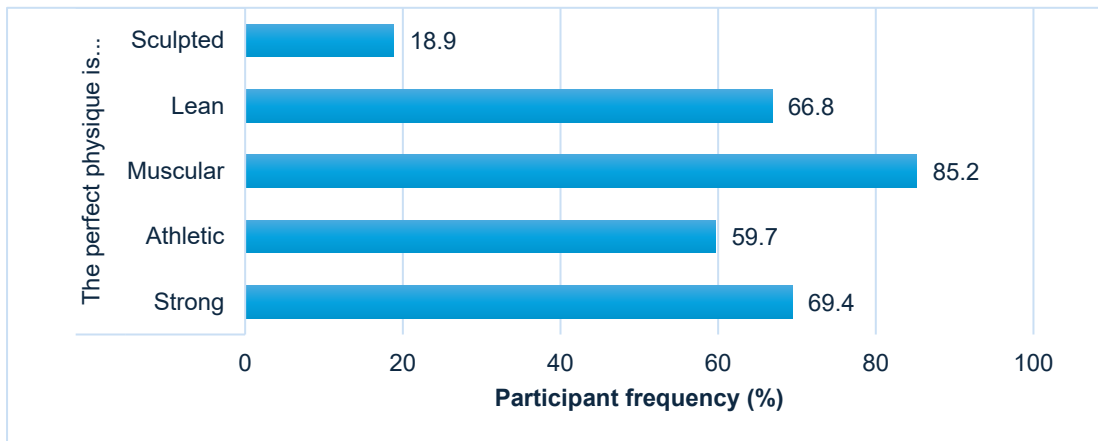


Figure 4.4: Values represent the total word choices associated with a perfect physique percentages observed in 196 participants.

4.4 Prevalence of Muscle Dysmorphia

The Adonis Complex Questionnaire is a self-report tool used to assess the extent of an individual's preoccupation with muscularity and their perceived need to achieve an idealised, muscular physique. It is often utilised in studies examining body image disorders, particularly MD prevalence amongst men (Riccobono, 2020).

In order to obtain an overall score for the development of MD symptomology, the scoring of all 13 items can be aggregated (Riccobono, 2020). Scoring of zero to nine is scored as a minor concern, 10–19 as a mild to moderate concern, 20–29 as a serious concern and 30–39 as severe forms of body image dissatisfaction and MD prevalence (Leone *et al.*, 2005). Table 9 represents the percentage of participants within each category. The majority of participants (65.8%) demonstrated a minor concern for MD prevalence. Only 2% of participants were categorised as having a serious concern for MD prevalence. The mean score for MD prevalence was 8.14, indicating a low level of concern amongst participants. Scores ranged from a minimum of 0 to a maximum of 29, with a standard deviation of 4.74.

Table 4.9: Muscle dysmorphia scoring using the Adonis Complex Questionnaire amongst participants in five gymnasiums within the eThekweni region. Values represent the total score percentages of the ACQ observed in 196 participants.

Scoring categories of MD	Frequency	Response (%)
Minor	129	65.8
Mild-moderate	63	32.1
Serious	4	2.0
Total	196	100.0

4.4.1 Objective analysis

Objective 1: To determine the prevalence of MD in amateur male bodybuilders.

4.4.2 Factor analysis of ACQ

Factor analysis using ProMax rotation (an oblique rotation method) was conducted on the 13 questions. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was 0.74, indicating that the data was suitable for factor analysis. Additionally, a significant Bartlett's test ($\text{Chi-square}_{(66)} = 381.46, p < 0.001$) further confirmed the reliability of the data. Question 12, which pertained to the use of anabolic steroids, was excluded from the final analysis as it did not show a strong correlation with any factor.

Two factors emerged from the ACQ: Psycho-social effects of physical appearance (PS) = 18.83% and Control about physical appearance (CON) = 9.14%. These two factors accounted for 28% of the variance in the data. The first factor, the Psycho-social effects of physical appearance, is associated with the social aspects of an individual's physical appearance, such as wearing baggy or oversized clothes to conceal one's physique in social settings. The second factor, Control about physical appearance, is linked to an individual's personal worries about their appearance, such as avoiding mirrors or refraining from taking photographs to evade self-assessment of their physique (Riccobono, 2020; Hendry, 2024).

Table 10 displays the items from the ACQ along with the two factors with which each question is associated. Factor 1, Psycho-social effects of physical appearance, demonstrated a Cronbach's alpha value of 0.69, while Factor 2, Control of physical

appearance, showed a Cronbach's alpha value of 0.60. These values are considered reliable for interpretation, as the acceptable range for reliability coefficients is typically between 0.6 and 0.8.

A summary of the extracted values from Table 4.10 are indicated in Table 4.11. Table 4.10 consolidates key findings or important data points from Table 4.10. Table 4.11 provides a streamlined view of the most significant values for easier reference and analysis.

Table 4.10: Factor structure and loadings associated with the ACQ generated from 196 participants in five gymnasiums within the eThekweni region.

Factors of MD	Factor 1 (PS)	Factor 2 (CON)
C11 How often have you avoided being seen by other people because of your appearance concerns (for example, not going to school, work, social events, or out in public?	0.622	
C10 How often have appearance-related concerns or activities compromised your job or career (or academic performance if you are a student)? For example, have you been late, miss work or school, worked below your potential or lost opportunities for advance?	0.517	
C3 How often do you avoid having all or part of your body seen by others? For example, how often do you avoid locker rooms, swimming pools or situations where you have to take your clothes off? Alternatively, how often do you wear certain clothes to alter?	0.501	
C13 How often have you used more extreme measures (other than drug use) to change your appearance, such as excessive exercising; working out even when injured; fasting or other unhealthy dietary activities; vomiting or unconventional techniques for muscle?	0.489	
C9 How often has your sex life been compromised by your appearance concerns?	0.488	
C2 How often are you distressed by your appearance concerns (that is feeling upset, anxious or depressed)?	0.477	

Table 4.10 (cont.): Factor structure and loadings associated with the ACQ generated from 196 participants in five gymnasiums within the eThekweni region.

Factors of MD	Factor 1 (PS)	Factor 2 (CON)
C1 How much time do you spend each day worrying about some aspect of your appearance (not just thinking about it, but actually worrying about it)?	0.428	
C8 How much have your appearance related-activities undermine your social relationships? For example, have your workout activities, dietary practices, or other appearance-related behaviours compromised your relationships with other people?	0.356	
C6 How often do you engage in dieting, eating special foods (for example high protein or low-fat foods), or taking nutritional supplements specifically to improve your appearance?		0.630
C7 How much of your income do you spend on items designed to improve your appearance (for example diet food, nutritional supplements, hair products, cosmetics and cosmetic procedures, workout equipment or gym memberships)?		0.615
C5 How much total time do you spend each day on physical activities to improve your body appearance, such as lifting weights, doing sit-ups, or running on a treadmill?		0.529
C4 How much total time do you spend each day involved in grooming activities to improve your appearance?		0.405

Table 4.11: Factors of MD amongst 196 participants in five gymnasiums within the eThekweni region.

Factor	Construct	Items included	Variance extracted	Cronbach's alpha
1	Psycho-social effect of physical appearance	1, 2, 3, 8, 9, 10, 11, 13	18.83	0.69
2	Control of physical appearance	4, 5, 6, 7	9.14	0.60

4.5 Risk factors for the development of MD

The Wilcoxon Signed-Rank test, a non-parametric test utilised in this study, was employed to examine whether the average value significantly differed from a value of 2.5, being the central score, on Likert scale questions (Hendry, 2024). This test was utilised to ascertain significant agreement or disagreement with each of the statements (Hendry, 2024).

Table 4.12 displays the questions concerning the risk factors associated with MD prevalence. The results indicate that participants significantly disagreed that they had ever experienced anxiety ($Z = -7.688$; $p < 0.001$), depression ($Z = -10.349$; $p < 0.001$), or were bullied as children ($Z = -6.574$; $p < 0.001$). Conversely, there is a significant agreement amongst participants that social media has altered their perception of an "ideal" male physique ($Z = -12.535$; $p < 0.001$), and that they consider themselves perfectionists ($Z = -5.256$; $p < 0.001$). Whether the participants struggled with maintaining a healthy relationship with food ($Z = -2.350$; $p = 0.019$) was not statistically significant.

Table 4.12: Level of agreement amongst 196 participants in five gymnasiums within the eThekweni region (%).

Item	Responses as Frequency (%)						Z	p-value
	Strongly disagree	Disagree	Agree	Strongly agree	Disagreement	Agreement		
I have battled with low self-esteem during my life	45 (23.0)	49 (25.0)	87 (44.4)	14 (7.1)	94	102	-1.690	0.091
I have suffered or am currently suffering with anxiety	65 (33.2)	78 (39.8)	49 (25.0)	4 (2.0)	143	53	-7.688	<0.001*
I have suffered or am currently suffering with depression.	86 (43.9)	81 (41.3)	28 (14.3)	1 (0.5)	167	29	-10.349	<0.001*
I was bullied or victimised as a child	70 (35.7)	64 (32.7)	52 (26.5)	10 (5.1)	134	62	-6.574	<0.001*

(*) Indicates statistical significance

Table 4.12 (cont.): Level of agreement amongst 196 participants in five gymnasiums within the eThekweni region (%).

Item	Responses as Frequency (%)						Z	p-value
	Strongly disagree	Disagree	Agree	Strongly agree	Disagreement	Agreement		
I have battled with low self-esteem during my life	45 (23.0)	49 (25.0)	87 (44.4)	14 (7.1)	94	102	-1.690	0.091
Indicate your level of agreement that social media (Instagram, TikTok, YouTube, Influencers in the bodybuilding community) have altered your perception of what the “ideal” level of musculature in a physique is.	0	0	99 (50.5)	97 (49.5)	0	196	-12.535	<0.001*
I would consider myself a perfectionist	8 (4.10)	51 (26.0)	119 (60.7)	18 (9.2)	59	137	-5.256	<0.001*
I struggle with having a healthy relationship with food.	24 (12.2)	89 (45.4)	70 (35.7)	13 (6.6)	113	83	-2.350	0.019

(*) Indicates statistical significance

4.5.1 Objectives analysis

Objective 2: To determine which of the selected risk factors have a significant effect on the level of MD prevalence present.

To investigate this relationship, two statistical tests were performed – Spearman's Rank Correlation and Regression Analysis.

4.5.1.1. Relationship between Muscle Dysmorphia and Mental Health Factors

This measures the strength and direction of association between ordinal variables. Therefore, since the factors are measured on an ordinal scale (4-point agreement scale), Spearman's correlation was used.

Table 4.13 shows that there was a weak positive correlation between the level of MD prevalence and suffering from anxiety ($\rho=0.242$, $n=196$, $p=0.001$); suffering from depression ($\rho=0.211$, $n=196$, $p=0.003$); being bullied during childhood ($\rho=0.232$, $n=196$, $p=0.001$); and being a perfectionist ($\rho=0.161$, $n=196$, $p=0.024$). There is a negative correlation between the level of MD prevalence and the level of agreement that social media (Instagram, TikTok, YouTube and Influencers in the bodybuilding community) have altered the perception of what the "ideal" level of musculature in a physique is ($\rho= -0.96$, $n=196$, $p=0.181$).

Table 4.13: Spearman's Rank Correlation results between select risk factors of MD and ACQ scores amongst 196 participants in five gymnasiums within the eThekweni region.

	Correlation Coefficient (rho)	p-value
I have suffered or am currently suffering with anxiety	0.242	0.001*
I have suffered or am currently suffering with depression.	0.211	0.003*
I was bullied or victimised as a child	0.232	0.001*
I would consider myself a perfectionist	0.161	0.024
Indicate your level of agreement that social media (Instagram, TikTok, YouTube, Influencers in the bodybuilding community) have altered your perception of what the "ideal" level of musculature in a physique is	0.96	0.181

(*) Indicates statistical significance

4.5.1.2. Relationship between Risk factors and Muscle Dysmorphia prevalence

This was used to determine which of the risk factors, if any, significantly affect MD prevalence. Regression analysis estimates the coefficients of the linear equation, involving one or more independent variable that best predict the value of the dependent variable.

Regression analysis of risk factors:

To evaluate the relationship between the independent variables and MD prevalence, a backward elimination regression analysis was performed. The p-value indicates the significance of the independent variables' impact on MD prevalence. Following a backward elimination linear regression, Table 4.14 shows that anxiety, victimisation and influence of social media accounted for 10.4% ($R^2 = 0.104$) of the variance in MD prevalence, ($F_{(3; 191)} = 7.380$, $p < 0.001$). Anxiety ($\beta = 1.061$, $t = 2.40$, $p = 0.017$) and victimisation ($\beta = 0.874$, $t = 2.20$, $p = 0.029$) significantly affect MD prevalence indicating that victimisation and anxiety resulted in a higher level of MD prevalence

probability. Social media was also found to affect MD prevalence to some extent ($\beta = 1.274$, $t = 1.96$, $p = 0.051$).

Table 4.14: Analysis of MD risk factors: anxiety, victimisation and influence of social media amongst 196 participants in five gymnasiums within the eThekweni region.

Independent variables	R ²	F	df1; df2	p-value	B (regression coefficient)	t	p- value
Anxiety	0.10	7.38	3; 191	<0.001	1.06	2.40	0.017*
Victimisation					0.87	2.20	0.029*
Influence of social media					1.27	1.96	0.051*

Dependant Variable = MD overall score

(*) Indicates statistical significance at 95% level

Following a backward elimination linear regression analysis, Table 4.15 shows that “anxiety”, “victimisation” and “having an unhealthy relationship with food” accounted for 19% ($R^2 = 0.19$) of the variance in MD prevalence, ($F_{(3; 191)} = 14.73$, $p < 0.001$). A healthy relationship with food, was found to affect MD prevalence to some extent ($\beta = 0.076$, $t = 0.04$, $p = 0.041$).

Table 4.15: Analysis of risk factors: anxiety, victimisation and unhealthy relationship with food amongst 196 participants in five gymnasiums within the eThekweni region.

Independent variables	R ²	F	df1; df2	p- value	B (regression coefficient)	t	p-value
Anxiety	0.19	14.73	3; 191	<.001	0.14	3.59	<0.001*
Victimisation					0.08	2.21	0.029*
Unhealthy relationship with food					0.08	2.06	0.041*

Dependant Variable = MD PS (factor 1)

(*) Indicates statistical significance at 95% level

Following a backward elimination linear regression, Table 4.16 shows that self-esteem and perfectionism accounted for 3.9% ($R^2 = 0.39$) of the variance in MD prevalence, ($F_{(2; 192)} = 3.912$, $p = 0.022$). Self-esteem ($\beta = -0.112$, $t = 0.021$, $p = 0.021$) and perfectionist ($\beta = 0.114$, $t = 0.083$, $p = 0.083$) significantly affected MD prevalence indicating self-esteem and perfectionism resulted in a higher level of MD prevalence probability.

Table 4.16: Analysis of risk factors: self-esteem and perfectionist amongst 196 participants in five gymnasiums within the eThekweni region.

Independent variables	R²	F	df1; df2	p-value	B (regression coefficient)	t	p-value
Self-esteem	0.39	3.91	2;192	p=0.022	-0.11	-2.33	0.021*
Perfectionist					0.11	1.74	0.083

Dependant Variable = MD CON (factor 2)

(*) Indicates statistical significance at 95% level

4.6 Quality of life

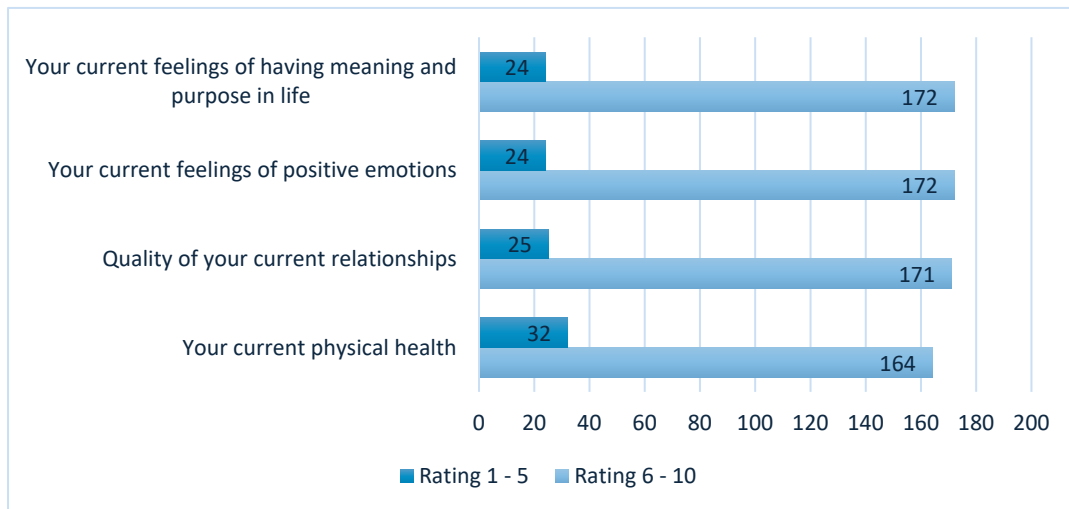


Figure 4.5: Participants' level of agreeability to Quality of life variables amongst 196 participants in five gymnasiums within the eThekweni region.

4.6.1 Objective analysis

The participants were asked to rate their quality of life on a scale of 1 (very poor) to 10 (excellent). The following tests were utilised:

1. A correlation between prevalence of MD (total) and the Quality of Life variables – Pearson's correlation, was used as it is a continuous scale (rating of 1 – 10) which would measure the strength of the relationship between MD prevalence and the Quality of life variables.
2. Regression analysis: The Dependant Variable is the Quality of Life questions and the Independent Variables are the two Factors of MD prevalence; Factor 1 (PS) and Factor 2 (CON).

No statistically significant correlation exists between the level of MD prevalence and any of the 4 Quality of Life variables (Table 4.17). The quality of current relationships was not significantly affected by these aspects of MD prevalence, Factor 1 (PS), and Factor 2 (CON), as indicated by the p-value being greater than 0.05.

Table 4.17: Pearson's Rank Correlation results between select risk factors of MD and ACQ scores amongst 196 participants in five gymnasiums within the eThekweni region.

	Correlation Coefficient	p-value
Your current physical health	0.49	0.500
Quality of your current relationships	-0.58	0.416
Your current feelings of positive emotions	-0.65	0.368
Your current feelings of having meaning and purpose in life	0.13	0.855

Regression analysis was applied, as previously, to the Dependant Variable (each Quality of Life question) and the Independent Variables: Factor 1 (PS) and Factor 2 (CON). Following a backward elimination linear regression, current physical health accounted for 2.8% ($R^2 = 0.028$) of the variance in MD prevalence, ($F_{(1; 193)} = 5.567$, $p = 0.019$). The prevalence of MD (CON) has a significant effect on perceived physical health, therefore, an increase in the development of MD (CON), results in perception of better current physical health (Table 4.18).

Table 4.18: Analysis of Quality of Life variable amongst 196 participants in five gymnasiums within the eThekweni region.

Independent variables	R²	F	df1; df2	p-value	B (regression coefficient)	t	p-value
Your current physical health	0.028	5.57	1; 193	$p=0.019^*$	0.42	2.36	$p=0.019^*$

(*) Indicates statistical significance at 95% level

Following a backward elimination linear regression, 6.3% of the variance in MD prevalence was accounted for in the statements "Current feelings of positive emotions" and "Current feelings of having meaning and purpose in life." Prevalence of MD had a significant ($p=0.002$) effect on the feelings of emotions and feelings of having meaning and purpose in life (Table 4.19).

Table 4.19: Analysis of Quality of Life variables amongst 196 participants in five gymnasiums within the eThekweni region.

Independent variables	R ²	F	df1; df2	B (regression coefficient)	t	p-value
Current feelings of positive emotions	0.06	6.52	2; 193	-0.93	-3.10	p=0.002*
Current feelings of having meaning and purpose in life	0.1	10.61	2; 193	-0.94	-3.13	p=0.002*

(*) Indicates statistical significance at 95% level

4.7 Conclusion

The results from this study revealed that the alternate hypothesis was supported. The results of the data analyses obtained assisted the researcher in determining/investigating the aims and objectives of the research study.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter presents the results of a study examining the prevalence and associated risk factors of MD among amateur male bodybuilders, comparing these findings with existing literature.

The research adopted a quantitative, cross-sectional approach, focusing on a sample of amateur male bodybuilders. A total of 200 questionnaires were distributed, with 196 completed and valid responses included in the analysis. Participation was entirely voluntary, with participants providing consent by signing the informed consent form (Appendix C). Authorisation was obtained from gym managers (Appendix D) prior to distributing the questionnaires.

5.2 Demographic Data

5.2.1 Age

The current study found that the mean age of participants was 27 years and 8 months, ranging from 18 to 50 years. This finding aligns with Hitzeroth *et al.* (2001) who studied 28 competitive bodybuilders in South Africa with a similar mean age (26 years and 3 months) and Babusa; Túry (2012), who studied 60 non-competitive male bodybuilders in Hungary with a similar mean age (27 years and 7 months). The current study's participant's age differs to the findings by Cella (2012), who compared competitive male bodybuilders to amateur male bodybuilders and found that the mean age of these groups was 30.63 and 30.86 years, respectively.

5.2.2 Race

The current study's results revealed that 42% of participants were from the Indian community, while only 1% were Asian. This contrasts with studies, such as Hallsworth *et al.* (2005) and Nieuwoudt *et al.* (2016), which examined psychological traits and age ranges (typically 18–40 years), without reporting on racial or cultural demographics.

Currently there is limited literature available that provides a breakdown of the racial composition of bodybuilders, particularly within the South African context. This lack of demographic data highlights a gap in the existing research. The current study was conducted in a region with a predominantly Indian population (a racial minority in South Africa) therefore this offers a new perspective by contributing insight into a group that may be underrepresented in other studies.

5.2.3 Occupation

The results show that the highest representation among participants was from the academic group (42%), followed by the public sector (38%), skilled labour workers (11%), and sport occupations (9%). Currently there are no specific published studies on the investigation of amateur bodybuilders and their occupations in relation to MD prevalence.

5.2.4 Marital status

The results indicate that the majority of participants (74%) were single, while only a small percentage (3%) were divorced (Figure 2). Currently there are no specific published studies on the investigation of amateur bodybuilders and their marital status in relation to MD prevalence.

5.3 Training History

5.3.1 Number of days training per week

Participants trained three to seven days weekly, with a median of five days. Forty percent trained five days, while only 0.5% trained two days or less (Figure 3). This aligns with Grgic *et al.* (2019), who found that resistance-trained individuals typically train four to six days weekly, with hypertrophy outcomes driven by total volume rather than frequency.

5.3.2 Number of hours training per day

Most participants (55.1%) trained for two hours or less daily, 41.3% for two to four hours, and 3.6% for four to six hours. Kandemir *et al.* (2024) reported similar findings among Turkish gym-goers, averaging two-hour sessions 4.82 days weekly. Lower training durations in this current study may explain the low MD prevalence, as prolonged sessions are linked to MD (Cella, 2012; Tovt *et al.*, 2021).

5.3.3 Years of bodybuilding style training

Of participants in the current study, 12.8% had over ten years of training, 29.6% had four to ten years, and 57.7% had at least two years. Zheng *et al.* (2021) noted that longer training durations correlate with increased MD symptoms, suggesting that this current study's moderate training experience contributes to lower MD prevalence.

5.3.4 Types of training techniques

The findings from the “types of training techniques” category revealed that the largest proportion of participants (39.8%) engaged in a mix of hypertrophy, strength, and endurance training. Another 35.2% combined hypertrophy and strength training, while 13.8% focused solely on hypertrophy, and 11.2% followed strength-only programs. These results suggest that most participants adopted diverse training approaches aimed at enhancing muscle size, strength, and endurance key attributes valued in the bodybuilding community.

Currently, there is limited published data detailing bodybuilders who exclusively follow hypertrophy/strength or hypertrophy and strength training combinations. However, the relatively low proportion of participants using strength-only routines (11.2%) implies that hypertrophy-oriented training is generally preferred, likely due to its aesthetic benefits. According to existing literature, societal influences often push individuals with MD to prioritise muscle size over functional strength (Cerea *et al.*, 2018; Amblard, 2021; Tovt *et al.*, 2021; Zheng *et al.*, 2021). These findings suggest that certain training

patterns particularly those focused on achieving a muscular appearance may be linked to a higher risk of developing MD symptoms.

5.3.5 Words that describe the perfect physique

Most participants in this study (85.2%) reported that the term “Muscular” was a key factor in identifying the “perfect physique”. This was followed by “Strong” (69.4%) and “Lean” (66.8%) (Figure 4). This was supported by Blashill *et al.* (2020) who explored how societal pressures shape “traditional masculine norm” body image ideals. The participants noted that having a “Muscular” physique was valued as the primary trait associated with an ideal physique. This emphasis on muscle size reinforces the belief that muscle mass is a critical marker of strength and masculinity. Individuals who are susceptible to developing MD, tend to create a distorted body image which results in excessive compulsive training behaviours.

5.4 Adonis Complex Questionnaire

The Adonis Complex Questionnaire (Riccobono, 2020) is a self-report tool used to assess the extent of an individual's preoccupation with muscularity and their perceived need to achieve an idealised, muscular physique. The minimum score was 0.00, and the maximum was 29.00. It is performed by aggregating the scoring of all 13 items in the questionnaire (Riccobono, 2020).

ACQ

Minor concern	0-9
Mild to Moderate concern	10-19
Serious concern	20-29
Severe Forms MD	30-39

5.4.1 Factor analysis of ACQ

The factor analysis of the Adonis Complex Questionnaire (ACQ) is a statistical approach used to uncover patterns in participant responses by grouping related items into specific categories or “factors.” In this study, two key factors emerged: Psycho-social effects of physical appearance (PS) and Control over physical appearance (CON). The PS factor reflects the extent to which individuals are concerned about how others perceive their bodies, while the CON factor assesses the degree of personal preoccupation with one’s physical appearance (Riccobono, 2020).

To evaluate the reliability of the ACQ, Cronbach’s alpha was used. This measure assesses internal consistency, or how well the items within a factor relate to one another, and is a standard tool for evaluating the reliability of psychometric scales (Hendry, 2024).

In this study, the average ACQ score was 8.1 ± 4.7 , indicating a relatively low level of concern regarding MD. The findings revealed that 65.8% of participants had minor concerns, 32.1% had mild to moderate concerns, and only 2% showed a serious concern for MD. This suggests a lower prevalence of MD among the amateur male bodybuilders in this sample.

These results are in line with Riccobono (2020), who found that out of 322 Italian male participants aged 18 to 55, 85.4% reported minor concerns, 13.7% had mild to moderate concerns, and just 0.9% exhibited serious concern for MD. One possible explanation for differences in MD severity may relate to age. Bashir (2021) found that younger competitive bodybuilders in Pakistan (ages 18–25) had a stronger drive for muscularity than older individuals (26 and older). This trend was also reflected in the current study, where the average participant age was 26 years and 8 months, suggesting that younger men may be more vulnerable to experiencing more severe MD symptoms due to increased social and psychological pressures

5.5 Prevalence of MD

The current study revealed that, most participants (65.8%) reported only minor concerns related to MD, while 32.1% expressed mild-to-moderate concerns and just 2% showed signs suggesting a serious risk. With an average ACQ score of 8.14, only a small fraction met the threshold for severe MD. This comparatively low rate of serious cases mirrors findings by Cella (2012) and Cerea *et al.* (2018), who observed that competitive bodybuilders tend to display more rigid training and dietary habits, greater use of performance-enhancing substances, and stronger perfectionistic and anxious traits than their non-competitive counterparts. Because the current sample consisted of amateur lifters, they likely faced less pressure to meet elite aesthetic standards, which may explain the milder symptom levels observed.

A similar pattern emerged in Riccobono's (2020) Italian study using the same questionnaire: 85.4% of non-competitive participants had minor concerns, 13.7% had mild-to-moderate concerns, and only 0.9% exhibited serious MD risk. In contrast, research consistently shows higher prevalence among competitive athletes. Devrim *et al.* (2017) found markedly higher MD rates in competitive than recreational bodybuilders, and Cella (2012) likewise documented elevated symptom severity among those who compete. These results indicate that MD risk rises with competitive pressure, whereas culturally diverse or less competitive settings such as that of the current study are associated with milder manifestations of the disorder.

5.6 Risk factors of MD development

Findings in the current study underscore various psychological and social risk factors contributing to the development of MD among amateur bodybuilders. These factors include OCD, perfectionism, low self-esteem, anxiety and social cultural influences.

5.6.1 Obsessive Compulsive tendencies

A weak positive correlation was observed between MD prevalence and obsessive-compulsive tendencies, particularly perfectionism in the current study which aligns with

existing research. For example, Chandler *et al.* (2009) and McPhail *et al.* (2022) investigated the connections among anxiety, obsessive-compulsive symptoms, and MD, noting that these psychological factors often coexist due to shared underlying mechanisms. Individuals with MD experience dissatisfaction with their body image, which triggers anxiety and persistent thoughts about muscularity. These concerns are temporarily mitigated through compulsive actions such as excessive exercise or rigid dietary practices, perpetuating a cycle of obsession and compulsion (Chandler *et al.*, 2009). The link between anxiety and obsessive-compulsive behaviours is further tied to perfectionism, a common characteristic in MD, where individuals feel intense pressure to achieve unattainable physique ideals, intensifying their symptoms (Cerea *et al.*, 2018; Chatzopoulou, 2021). This pattern mirrors obsessive-compulsive tendencies in other disorders, where anxiety fuels repetitive behaviours to alleviate distress. Most participants in this study showed minimal concern for MD prevalence, but the 2% with significant concern support findings that perfectionism and obsessive-compulsive behaviours are more pronounced among bodybuilders with MD, reflecting a broader trend of rigidity and compulsivity in body image-related behaviours.

5.6.2 Psychological factors

In the current study, psychological factors such as perfectionism, low self-esteem, and anxiety showed a weak positive correlation with the prevalence of MD. These results align with Chandler *et al.* (2009), who studied 97 male participants from the USA aged 18–30, and Cerea *et al.* (2018), who examined 125 individuals aged 18–40, both identifying perfectionism, anxiety, and self-criticism as characteristics associated with MD. The most prominent psychological factor in this study was the influence of social media on participants' perceptions of an “ideal” physique, consistent with findings by Chatzopoulou (2020) and Underwood (2023), who highlighted social media's significant impact on body image. Participants reported relatively low levels of perfectionism, self-criticism, and anxiety, which were associated with body dissatisfaction and the pursuit of muscularity. This indicates that MD prevalence in this study may be more heavily driven by external sociocultural factors, particularly social media and idealised body standards, as participants exhibited lower levels of internal

psychological traits like perfectionism, anxiety, and self-criticism, which have been more pronounced in other research.

5.6.3 Sociocultural influences

Participants in the current study unanimously identified sociocultural pressures particularly media influence and societal standards of muscularity as key contributors to the development of MD. This finding is supported by current literature. Chatzopoulou (2020), who interviewed 20 male Instagram users aged 18–30, and Vuong *et al.* (2021), who surveyed 1,153 adolescents (55.4% of whom were male), both found that media representations of the "ideal" muscular physique significantly fuel body dissatisfaction and an increased drive for muscularity in males. Similarly, participants in the present study ($n = 196$) reported frequent exposure to media and a strong sense of societal pressure to attain an ideal body, further emphasising the influential role of sociocultural factors in the emergence of MD symptoms.

5.7 Amateur versus Competitive bodybuilders

The current study focused on amateur male bodybuilders, which provided a unique perspective given a paucity in the literature on MD prevalence in this group of athletes. Majority of existing studies on MD focused on professional or competitive bodybuilders, who are more likely to exhibit extreme training behaviours, supplementation use and body dissatisfaction, leaving amateur bodybuilders largely understudied. A study done by Cella (2012), compared 217 male competitive bodybuilders against 98 non-competitive bodybuilders and found a higher MD prevalence rate (13.6%) amongst competitive bodybuilders. This differs with the current study's results as it revealed that majority (65.8%) of amateur male bodybuilders showed a mild concern for MD prevalence. This difference may be due to the reduced pressure on amateur bodybuilders to meet competitive (stage) aesthetic standards, resulting in lower levels of body image concern and less compulsive training behaviours compared to competitive bodybuilders.

5.8 Quality of life and MD prevalence

The current study also investigated the impact of MD on quality of life. Most participants (98%) showed no significant MD symptoms and reported positive ratings for physical health (84%) and personal relationships (87%) (Figure 5). In contrast, Olivardia *et al.* (2000) examined 54 men (24 with diagnosed MD and 30 non-competitive weightlifters) aged 18–30 from 23 gyms in Boston, USA, finding that individuals with MD often prioritise exercise over social connections, leading to isolation. However, the amateur bodybuilders in this study, likely experiencing less pressure than professional competitors, appeared to maintain healthier social relationships. This contrasts with competitive bodybuilders, who frequently forgo social interactions to adhere to rigorous training and dietary regimes (Olivardia *et al.*, 2000). The difference in lifestyle may account for the discrepancy between these findings and existing literature.

Participants in this study reported high levels of positive emotions (88%) and a sense of life purpose (88%), reflecting the low prevalence of MD among the majority. This suggests that body image concerns and the drive for muscularity have a limited negative impact on psychosocial well-being. Tod (2015), who studied 78 men aged 18–30, noted that dependence on bodybuilding may indirectly harm quality of life, even if it yields short-term emotional benefits. These observations align with the current study's findings, which suggest that while psychosocial factors, such as control over appearance, can enhance emotional well-being, they may also contribute to unhealthy behaviours.

5.9 Implications for healthcare interventions

Bodybuilders with MD often get injured due to exercise addiction/excessive exercise, insufficient recovery and an obsessive drive for muscularity. This drive for muscularity leads to high-intensity weight training that exceeds the individual's physical limits. Furthermore, inadequate rest between workouts prevents muscle recovery, making bodybuilders more susceptible to overuse injuries like tendonitis, stress fractures, chronic joint inflammation, ligament injuries, sacroiliac syndrome, impingement

syndrome, rotator cuff pathology, muscle strains or tears and spinal disc injuries. Despite being in pain, individuals with MD often ignore injuries due to their compulsive need to maintain their physique, exacerbating damage and prolonging recovery time (Griffiths *et al.*, 2015; Tovt *et al.*, 2021).

When bodybuilders with MD are forced to stop training due to injury, their psychological distress intensifies, as their primary coping mechanism “exercise” is removed (Griffiths *et al.*, 2015). This period of inactivity can lead to heightened anxiety, depression and increased body image dissatisfaction, as athletes perceive a loss of muscularity and physical progress (Griffiths *et al.*, 2015). The inability to train reinforces feelings of inadequacy and exacerbates disordered thoughts about body image, potentially worsening symptoms of MD and triggering compensatory behaviours such as extreme dietary restrictions, potential steroid use and social withdrawal (Tovt *et al.*, 2021).

This creates a vicious cycle in which psychological distress from inactivity drives individuals to return to training prematurely, often before full recovery, thereby increasing the likelihood of re-injuring themselves. The mental health impact of this cycle is severe, with studies linking prolonged inactivity in individuals with MD to elevated stress, low self-esteem (Griffiths *et al.*, 2015), rumination over their muscularity, social withdrawal and experiencing a lower quality of life, which can lead to long lasting depression and suicidal thoughts (Tod *et al.*, 2016; Tovt *et al.*, 2021). Addressing these risks require a multidisciplinary approach, incorporating structured rehabilitation plans focusing on rest, injury prevention strategies, psychological support and education regarding the importance of balanced eating and training strategies for recovery (Leone *et al.*, 2005; Martenstyn *et al.*, 2021).

Chiropractic healthcare can play an important role in this process by assisting with pain management, improving joint mobility and promoting overall musculoskeletal health (Gevers-Montoro *et al.*, 2021). Chiropractors can use manual therapy techniques such as spinal and extremity adjustments, soft tissue therapy and rehabilitation exercises to support injury recovery and reduce biomechanical imbalances that contribute to overuse injuries (Hawk *et al.*, 2009; Gevers-Montoro *et al.*, 2021). Additionally, chiropractors can educate bodybuilders on proper posture, movement mechanics and injury prevention strategies, ensuring a safer return to training and mitigating the likelihood of a future re-injury (Gevers-Montoro *et al.*, 2021).

It is imperative for chiropractors to work collaboratively with other healthcare professionals and also refer patients who show signs and symptoms of developing MD to psychologists, nutritionists and physicians to provide comprehensive healthcare for these individuals. By working together, healthcare professionals can create integrated treatment plans that consider all aspects of an individual's health (Martenstyn *et al.*, 2021). This holistic approach can improve overall treatment outcomes, as it ensures that all contributing factors to MD development are addressed.

Although, a slight positive relationship was observed between MD prevalence and psychological distress, such as anxiety, depression, victimisation and obsessive-compulsive tendencies, 98% of participants do not exhibit serious concern for MD development. The 2% of participants in the current study necessitates a focus on mental health interventions. Research by Chandler *et al.* (2009), evaluated 87 male participants from an American university, aged 18–30 and Cerea *et al.* (2018) assessed 125 participants aged 18–40 in Italy, and highlighted similar concerns, noting that MD is often accompanied by levels of anxiety and compulsive behaviours. This is due to their shared underlying mechanisms (Chandler *et al.*, 2009). The anxiety in individuals with MD manifest in obsessive thoughts such as excessive exercise or strict dieting (Chandler *et al.*, 2009). The compulsions serve as a way to temporarily reduce anxiety, reinforcing the cycle of obsession and compulsion (Chandler *et al.*, 2009).

5.10 Conclusion

This study supports the growing body of literature on the prevalence and risk factors associated with MD development in amateur male bodybuilders. These findings show that body dissatisfaction, compulsive behaviours and psychological factors were not associated with high MD prevalence. Moreover, the sociocultural influences unique to bodybuilding culture play a significant role in the development of MD, even among non-competitive athletes. Addressing these factors through targeted mental health interventions, chiropractic care and a multidisciplinary approach that fosters healthier body image ideals within bodybuilding communities will be essential in reducing the prevalence and impact of MD.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Main Findings

This research was conducted to investigate the prevalence of MD amongst amateur male bodybuilders in the eThekweni Municipality. The results revealed that none of the participants met the criteria for a clinical diagnosis of MD (Riccobono, 2020) and the majority did not display severe symptoms associated with the condition. However, MD prevalence was reported as a minor concern in 65.8% of the participants, 32.1% reported a moderate concern, while only 2% showed a serious concern for MD prevalence. This suggests that MD-related concerns were not significantly present within this population.

Despite the weak positive correlations amongst the multiple self-reported risk factors, the prevalence of MD related symptoms was low. These included low self-esteem, anxiety, depression, childhood victimisation, perfectionism, exposure to social media, and an unhealthy relationship with food. Despite the presence of these symptoms, the majority of participants reported high self-ratings for quality of life. Eighty four percent rated their current physical health between 6 and 10, and 88% rated their sense of positive emotion and purpose in life within the same range. This suggests that while symptoms were reported, they did not significantly impact the participants day-to-day functioning, psychological well-being, or perceived life satisfaction.

Importantly, these findings have direct relevance for chiropractic practice. Chiropractors are primary care healthcare providers for bodybuilders due to the physical demands of their training. Therefore, they are in a strategic position to identify early signs of psychological strain, including MD-related symptoms. Raising awareness among chiropractors about the psychological aspect of musculoskeletal concerns could enable timely referral or guidance, promoting a well-rounded approach to patient wellbeing.

6.2 Limitations and Recommendations

The study's sample was limited to English-literate amateur male bodybuilders from specific gymnasiums in the eThekwin area, and therefore, it may not provide a comprehensive view of the larger population. The reliance on self-reported measures, despite anonymity, may have introduced response biases, especially given the stigma associated with body image concerns. The use of multiple statistical tests without adjustment for Type 1 error inflation, could result in an increased risk of false positives. Psychological risk factors were assessed via participants' subjective self-reports rather than validated psychometric instruments, which may introduce bias and reduce objectivity. This was due to the scope of practice limitations.

Future studies recommendations:

- Use a larger and more diverse sample including gymnasiums from various parts in the eThekwin Municipality.
- Include non-English speakers through translated questionnaires (e.g., isiZulu).
- Make use of qualitative investigations, such as interviews with fitness influencers or athletes, to provide clearer insight into the emotional and occupational pressures in this industry
- Apply Bonferroni method to enhance the reliability of findings.
- Incorporate use of validated psychometric instruments to assess risk factors.
- Explore how chiropractors can be educated and trained to screen for MD symptomology and understand the psychological aspects of body image disorders in their patients.

Although the prevalence of MD symptoms in the current study was low, it remains important for chiropractors to be knowledgeable of the condition. Due to their role in managing musculoskeletal concerns within fitness-oriented populations, chiropractors are well positioned to be early detectors of potential MD cases. Incorporating psychosocial screening tools and making use of interdisciplinary collaboration with

mental health professionals can enhance their ability to identify at-risk individuals and facilitate timely referrals. This ultimately supports a more preventative and holistic approach to healthcare.

REFERENCES

- Abdoli M, Scotto Rosato, M, Desousa, A, Cotrufo, P. 2024 'Cultural differences in body image: A systematic review', *Social Sciences*, 13(6): 305.
- Amblard I, Freire GM, de Moraes, JFVN. 2021. Orthorexia, Muscle Dysmorphia and exercise addiction: Comparison between amateur running, fitness functional and bodybuilding athletes. *Brazilian Journal of Science and Movement*, 29(2): 1-15.
- Antonacci, R. 2023. Bullying and Body Image: Body image disturbance in emerging adults with a history of bullying victimization. *Electronic Theses and Dissertations*, University of Windsor.
- Babusa B, Túry F. 2012 Muscle dysmorphia in Hungarian non-competitive male bodybuilders. *Eating and weight disorders*: 49-53.
- Barreto, M; Ferreira, A; Vallio, V; Manzoni, A. 2024. Epidemiological profile and main musculoskeletal injuries that affect bodybuilders. *Brazilian Journal of Physical Therapy*, 28(1):100928.
- Bashir, U, Rehman, S, Zahra, FT. 2021. Drive for muscularity and tendencies of muscle dysmorphia among Pakistani bodybuilders: A prevalence study. *Journal of Pakistan Medical Association*, 1(1): 1350-1352.
- Bhandari, P. 2022. *What Is Face Validity? | Guide, Definition & Examples*. [Online]. Scribbr. Last Updated: 22 June 2023. Available at: <https://www.scribbr.com/methodology/face-validity/>
- Blashill AJ, Grunewald W, Fang A, Davidson E, Wilhelm S. 2020. Conformity to masculine norms and symptom severity among men diagnosed with muscle dysmorphia vs. body dysmorphic disorder. *Plos One* 15(8).
- Bo S, Zoccali, R, Ponzo, V, Soldati, L, De Carli, L, Benso, A, Fea, E, Rainoldi, A, Durazzo, M. 2014. University courses, eating problems and muscle dysmorphia: are there any associations? *Journal of translational medicine*, 12 (1): 1-8.
- Boulter MW, Sandgren, SS. 2022. Me, myself, and my muscles: associations between narcissism and muscle dysmorphia. *Eating Disorders*, 30(1): 110-116.
- Brytek-Matera A, Czepcor K. 2017. Models of eating disorders: a theoretical investigation of abnormal eating patterns and body image disturbance. *Archives of Psychiatry and Psychotherapy*, 1(1): 16-26.
- Cakmak MN, Güllüpinar, F 2023. The signification of the body: a sociological field study of body-building and fitness practitioners. *Sport in Society*, 26(5): 774–798.
- Cella, S, Lannaccone, N, Cotrufo, P. 2012. Muscle Dysmorphia: A Comparison between Competitive Bodybuilders and Fitness Practitioners. *Journal of Nutritional Therapeutics*, 1(1): 12-18

- Centers for Disease Control and Prevention (CDC) 2021. *Risk and Protective Factors for Mental Disorders*. Retrieved from <https://www.cdc.gov/intimate-partner-violence/risk-factors/index.html>
- Cerea, S, Bottesi, G, Pacelli, QF. 2018. Muscle Dysmorphia and its Associated Psychological Features in Three Groups of Recreational Athletes. *Science Report* 8: 8877
- Chandler, CG, Grieve, FG, Derryberry, WP, Pegg, PO. 2009. Are Anxiety and Obsessive-Compulsive Symptoms Related to Muscle Dysmorphia? *International journal of men's health*, 8 (2):143-154.
- Chatzopoulou, E, Filieri, R, Dogruyol, SA. 2020. Instagram and body image: Motivation to conform to the “Instabod” and consequences on young male wellbeing. *The Journal of Consumer Affairs*, 1(54): 1270-1297.
- Christine, A, 2025. Ethical Considerations and Best Practices in Detecting and Managing Steroid Abuse: Balancing Patient Privacy and Intervention. ©IDOSR PUBLICATIONS, 10(1): 14-18.
- Collis, N, Lewis, V, Crisp, D. 2016. When Is Buff Enough? The Effect of Body Attitudes and Narcissistic Traits on Muscle Dysmorphia. *Journal of Men's Studies*, 24(2): 213-225.
- Cooper, M, Eddy, KT, Thomas, JJ, Franko, DL, Carron-Arthur, B, Keshishian, AC. 2020. Muscle dysmorphia: A systematic and meta-analytic review of the literature to assess diagnostic validity. *International Journal of Eating Disorders*, 53(10): 1583–1604.
- Corina, T, Valentin, C, Raluca, C. 2018. Life quality of amateur bodybuilders. *Ovidius University Annals, Series Physical Education and Sport / science, movement and health*, 28(2): 427-431.
- d'Arripe-Longueville, F, Lentillon-Kaestner, V, Scoffier-Mériaux, S. 2019. Drive for muscularity behaviours in male bodybuilders: a trans-contextual model of motivation. *Journal of eating disorders*, 1: 1-11.
- David, B. Mark, S. 2011. Childhood victimisation as a predictor of muscle dysmorphia in adult male bodybuilders. *The Irish journal of psychology*, 32 (3): 105-115.
- David, T. Christian, E. and Leuan, C 2016. Muscle dysmorphia: current insights. *Psychology research and behaviour management*, 9:179-188.
- de Oliveira, DV, Freire, GLM, Souza, MF, Xavier, SES. 2023. Comparison of the indicative of muscle dysmorphia among recreational and competitive Crossfit athletes. *Muscle dysmorphia among recreational and competitive athletes*, 25(1): 1-8.
- Devrim, A, Bilgic, P, Hongu, N. 2018. American journal of Men's Health. *Is There Any Relationship Between Body Image Perception, Eating Disorders, and Muscle Dysmorphic Disorders in Male Bodybuilders?* 12 (5): 1746-1758.
- Di Pasquale. 1995. *The Anabolic Diet*. Canada: Optimum Training Systems: 1-111.

Dlagnikova, A; van Niekerk, RL. 2015. The prevalence of body dysmorphic disorder among South African university students. *South African Journal of Psychiatry*, 21(3): 104-106.

Ebbeck, V, Watkins, PL, Concepcion, RY, Cardinal, BJ, Hammermeister, J. 2009. Muscle dysmorphia symptoms and their relationships to self-concept and negative affect among college recreational exercise. *Journal of applied sport psychology*, 21(3): 262-275.

Editors of the Encyclopaedia. 1998 *Bodybuilding*. Britannica. Last Updated: 1 August 2023. Available at: <https://www.britannica.com/sports/bodybuilding>

Eichstadt, M, Luzier, J, Cho, D, Weisenmuller, C. 2020. Eating Disorders in Male Athletes. *Sports Health*, 12(4): 327-333.

Fitranti, DY, Widyastuti, D, Noer, ER. 2022. Muscle Dysmorphia in Fitness Center Members: It's Affecting Factors and Impacts. *Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*, 17(2): 120-128.

Ganson, K.T., Pang, N., Testa, A. 2024. Adverse Childhood Experiences and Muscle Dysmorphia Symptomatology: Findings from a Sample of Canadian Adolescents and Young Adults. *Clinical Social Work J*, 52: 274–286

George, T. 2021. *What is a Focus Group | Step-by-Step Guide & Examples*. [Online]. Scribbr. Last Updated: 22 June 2023. Available at: <https://www.scribbr.com/methodology/focus-group/>

Gevers-Montoro, C, Provencher, B, Descarreux M, Ortega de Mues, A. 2021. *Clinical Effectiveness and Efficacy of Chiropractic Spinal Manipulation for Spine Pain*. *Frontiers in Pain Research*, 2, 765921.

Gomes, AR, Simaes, C, Dias, O, Almeida, C, Gonçalves, S. 2019. Drive for Muscularity and Disordered Eating Behavior in Males: the Mediating Role of Cognitive Appraisal. *Journal of Human Kinetics*, 70(1): 287-295.

Gosmann, NP, Costa, MA, Jaeger, MB, Motta, LS, Frozi, J. 2021 Selective serotonin reuptake inhibitors, and serotonin and norepinephrine reuptake inhibitors for anxiety, obsessive-compulsive, and stress disorders: A 3-level network meta-analysis. *PLoS Med* 18(6).

Greenway, C, Price, C. 2018. A qualitative study of the motivations for anabolic-androgenic steroid use: The role of muscle dysmorphia and self-esteem. *Performance Enhancement and Health*, 6(1): 12-20.

Grgic, J; Schoenfeld, B; Latella, C. 2019. Resistance training frequency and skeletal muscle hypertrophy: A review of available evidence. *Journal of Science and Medicine in Sport*, 22(3): 361-370

Grieve, F. 2007. A Conceptual Model of Factors Contributing to the Development of Muscle Dysmorphia. *Eating Disorders*, Vol. 15, No. 1, October 2006: pp. 1–32 Eating Disorders A Conceptual Model. *Eating Disorders*, 15(1): 63-80.

Griffiths, S, Foster, A, Shorter, G. 2015. Muscle dysmorphia: Could it be classified as an addiction to body image? *Journal of Behavioural Addictions*, 4(1): 1-5.

- Gruber, A. J., & Pope, H. G. 1999. Compulsive weight lifting and anabolic steroid abuse among women rape victims. *Comprehensive Psychiatry*, 40(4): 273-277.
- Hale, BD, Briggs, M, Weaver, K. 2013. Exercise dependence and muscle dysmorphia in novice and experienced female bodybuilders. *Journal of Behavioral Addictions*, 2(4): 244-248.
- Hallsworth, L, Wade, T. 2005. Individual differences in male body-image: An examination of self-objectification in recreational body builders. *British Journal of Health Psychology*, 10(1): 453-465.
- Hawk, C, Lisi, AJ, Evans, MW. 2007. Chiropractic care for non-musculoskeletal conditions: a systematic review with implications for whole systems research. *The Journal of Alternative and Complementary Medicine*, 13(5): 491-512.
- Helms ER, Aragon AA, Fitschen PJ. 2014. Evidence-based recommendations for natural bodybuilding contest preparation: nutrition and supplementation. *Journal of International Society Sports Nutrition*. 12; 11:20.
- Hildebrandt, T, Chung, T, Schlundt, D. 2006. Presence of Muscle dysmorphia symptomology among male weightlifters. *Comprehensive Psychiatry*, 47(2): 127-135.
- Hitzeroth, V, Wessels, C, Stein, DJ. 2001. Muscle dysmorphia: A South African sample. *Psychiatry and Clinical Neurosciences*, 55: 521-523.
- Kanayama, G, Pope Jr, HG. 2008. Long-term psychiatric and medical consequences of anabolic-androgenic steroid abuse: A looming public health concern? *Drug and Alcohol Dependence*, 98(1-2): 1-12.
- Kanayama, G, Pope Jr, HG. 2018. History and epidemiology of anabolic androgens in athletes and non-athletes. *Molecular and Cellular Endocrinology*, 464(1): 4-13.
- Kandemir HE, Cipriano A, Rosato MS, Ünsalver BÖ, Stabile M, Cella S. 2024. Muscle Dysmorphia in Gym-Going Men: The Role of Narcissism Vulnerability and Perfectionism. *Clin Neuropsychiatry*. 21(3):182-188.
- Khalili, S, Barati, M, Khoshravesh, S, Mahjoub, H, Faradmal, J. 2023. Androgenic-anabolic steroids use among bodybuilders in western Iran: application of ridge logistic regression model. *BMC Sports Science, Medicine and Rehabilitation*, 15(7): 1-7.
- Klein, AM. 1993. *Little Big Men: Bodybuilding Subculture and Gender Construction*. SUNY Press.
- Klimek, P, Murray, SB, Brown, T. 2018. Thinness and muscularity internalization: Associations with disordered eating and muscle dysmorphia in men. *International Journal of Eating Disorders*, 51(4): 352-357.
- Kreider RB, Kalman DS, Antonio J, Ziegenfuss TN, Wildman R, Collins R, Candow DG, Kleiner SM, Almada AL, Lopez HL. 2017. International Society of Sports Nutrition position stand: safety and efficacy

of creatine supplementation in exercise, sport, and medicine. *Journal of International Society Sports Nutrition*. 14:18.

Lavallee, D, Sandgren SS. 2023. Intervention Development for People with Muscle Dysmorphia Symptoms: Best Practice and Future Recommendations. *Journal of Loss and Trauma*, 28(4): 283-420.

Lechner, TE, Gill, EM, Drees, MJ. 2019. Prevalence of Disordered Eating and Muscle Dysmorphia in College Students by Predominant Exercise Type. *International Journal of Exercise Science*, 12(4): 1001-1012.

Leone, JE, Sedory, EJ, Gray, KA. 2005. Recognition and Treatment of Muscle Dysmorphia and Related Body Image Disorders. *Journal of Athletic Training*, 40(4): 352-359.

Lowe, N. 2019. What Is a Pilot Study? *JOGNN Editorial*, 1(48): 117-118.

MacPhail, DCG, Oberle, CD. 2022. Seeing Shred: Differences in muscle dysmorphia, orthorexia nervosa, depression, and obsessive-compulsive tendencies among groups of weightlifting athletes. *Performance Enhancement & Health*, 10(1): 1-8.

Martenstyn, JA, Touyz, S, Maguire, S. 2021. Treatment of compulsive exercise in eating disorders and muscle dysmorphia: protocol for a systematic review. *Journal of eating disorders*, 9 (1): 1-7.

Mitchell, L, Murray, SB, Cobley, S, Hackett, D. 2016. Muscle Dysmorphia Symptomatology and Associated Psychological Features in Bodybuilders and Non-Bodybuilder Resistance Tr. *Sports Medicine*, 47(1): 233-259.

Mitchell, L, Murray, SB, Hoon, M, Hackett, D. 2017. Correlates of muscle dysmorphia symptomatology in natural bodybuilders: Distinguishing factors in the pursuit of hyper-muscularity. *Body Image*. 22 (1): 1-5.

Mitchison, D, Griffiths, S, Mond, J. 2022. Prevalence of muscle dysmorphia in adolescents: Findings from the EveryBODY study. *Psychological Medicine*, 52(14): 3142-3149.

Murray, SB, Rieger, E, Karlov, L, & Touyz, S. W. 2012. An investigation of the Trans diagnostic model of eating disorders in the context of muscle dysmorphia. *European Eating Disorders Review*, 21(2), 160–164

Nagata, J, Compote, EJ, Maguire, FH. 2021. Community norms of the Muscle Dysmorphic Disorder Inventory (MDDI) among cisgender sexual minority men and women. *BMC Psychiatry*, 21(297): 1-9.

Nagata, JM, Brown, TM, Lavender, JM. 2022 'Associations among romantic and sexual partner history and muscle dysmorphia symptoms, disordered eating, and appearance- and performance-enhancing drug and supplement use among cisgender gay men', *Body Image*, (41): 67-73

Nieuwoudt, JE, Zhou, S, Coutts, R. 2016. Evaluating the reliability and validity of the proposed muscle dysmorphia criteria. *International Journal of Sport and Exercise Psychology*, 14(3): 195-209.

Nunes, JP, Campa, F, Shoenfeld, BJ. 2022. Changes in intra-to-extra-cellular water ratio and bioelectrical parameters from day-before to day-Of competition in bodybuilders: A pilot study. *Sports*, 10(2): 23.

Odrliin, G. 2023. *Understanding the Different Competitive Bodybuilding Divisions for Men and Women*. Fitness Volt. Last Updated: 2023. Available at: <https://fitnessvolt.com/27290/understanding-the-difference/>

Olave, L, Estevez, A, Momene, J. 2021. Exercise Addiction and Muscle Dysmorphia: The Role of Emotional Dependence and Attachment. *Frontiers in Psychopathology*, 12(1): 1-12.

Olivardia, R, Blashill, A, Hoffman, J. 2025. *Muscle Dysmorphia*. [Online]. International OCD foundation. Last Updated: 2025. Available at: <https://bdd.iocdf.org/expert-opinions/muscle-dysmorphia>

Olivardia, R, Pope Jr, HG, Hudson, JI. 2000 *Muscle dysmorphia in male weightlifters: A case-control study*. *American Journal of Psychiatry*, 157(8): 1291-1296.

Phillips, SM. 2017. Current concepts and unresolved questions in dietary protein requirements and supplements in adults. *Frontiers in Nutrition*, (4): 13.

Pope Jr, HG, Gruber, AJ, Choi, P, Phillips, KA. 1997. Muscle Dysmorphia an under recognized Form of Body Dysmorphic Disorder. *Psychosomatics*, 38(1): 548-557.

Pope, H, Phillips, KA, Olivardia, R. 2000. *The Adonis Complex: The Secret Crisis of Male Body Obsession*. New York: Simon & Schuster.

Riccobono, G, Pompili, A. 2020. *An instrument for the evaluation of muscle dysmorphia: The Italian validation of the adonis complex questionnaire*.

Ridgeway, SO. 2022. Body Size and Well-being in Adolescents: The Roles of Bullying Victimization and Body Image. *Sociological Perspectives*, 66(4).

Robert, Courtney A; Munroe-Chandler, Krista J; Gammage, Kimberley L. 2009. The Relationship between the Drive for Muscularity and Muscle Dysmorphia in Male and Female Weight Trainers. *Journal of Strength and Conditioning Research* 23(6):1656-1662

Rodrigue, C, Turcotte, O, Begin, C. 2018. Muscle dysmorphia and eating disorders: Comparison on self-esteem and personality traits. *International Journal of Psychology and Psychoanalysis*, 4(2): 1–8.

Rubio-Aparicio, M, Longobardi, C, Fabris, MA. 2019. A reliability generalization meta-analysis of self-report measures of muscle dysmorphia. *Clinical Psychology Science and Practice*, 27(1): 1-24.

Sagoe, D, Molde, H. 2014. The global epidemiology of anabolic-androgenic steroid use: A meta-analysis and meta-regression analysis. *Annals of Epidemiology*, 24(5), 383-398.

Sandgren, SS, Lavalley, D. 2018. Muscle Dysmorphia Research Neglects DSM-5 Diagnostic Criteria. *Journal of Loss and Trauma*, 23 (3): 211-243.

- Schafer, M, Crandall, J, Grieve, R. 2024. Effects of Training Environment on Muscle Dysmorphia Symptomatology in Men and Women. *Journal of Sport Behaviour*, 47(1): 74-82.
- Schneider, C., Agthe, M., Yanagida, T. 2017. Effects of muscle dysmorphia, social comparisons and body schema priming on desire for social interaction: an experimental approach. *BMC Psychol* 5, 19
- Schoenfeld, B, Fischer, J, Horn, C. 2021. Resistance Training Recommendations to Maximize Muscle Hypertrophy in an Athletic Population: Position Stand of the IUSC. *International Journal of Strength and Conditioning*, 1(1): 1-30.
- Schoenfeld, BJ, Aragon, AA. 2013. The effect of protein timing on muscle strength and hypertrophy: a meta-analysis. *Journal of the International Society of Sports Nutrition*, 10(53): 1-13.
- Setia, MS. 2016. Methodology Series Module 3: Cross-sectional Studies. *Indian Journal of Dermatology*, 61(3): 261-264.
- Shimomura, Y, Yammamoto, Y, Sato. 2006. Nutraceutical effects of branched-chain amino acids on skeletal muscle. *The Journal of Nutrition*, 136(2): 529-532.
- Taber, KS. 2017. The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. *CrossMark*, 48(1): 1273–1296.
- Tinsley, GM and La Bounty, PM. 2015. Effects of intermittent fasting on body composition and clinical health markers in humans. *Nutrition Reviews*, 73(10): 661-674.
- Tod, D, Edwards, C. 2015. Relationships among muscle dysmorphia characteristics, body image quality of life, and coping in males. *Journal of Science and Medicine in Sport*, 1(18): 585-589.
- Tod, D; Edwards, C; Cranswick, L. 2016. Muscle dysmorphia: current insights. *Psychology Research and Behavior Management*. 1 (1): 179-188.
- Tovt, S, Kajanova, A. 2021. Introduction to Bigorexia. *Journal of Nursing and Social Sciences Related to Health and Illness*, 23(2): 133-137.
- Underwood M, Olivardia R. 2022 'The day you start lifting is the day you become forever small': Bodybuilders explain muscle dysmorphia. *Health*. 2022; 27(6):998-1018.
- Vuong, At, Jarmin, HK, Doley, JR. 2021. Social Media Use and Body Dissatisfaction in Adolescents: The Moderating Role of Thin- and Muscular-Ideal Internalization. *International Journal of Environmental Research and Public Health*, 18(24):13222.
- Zheng, Y, Zhang, LF, Shao, P. 2021. The association of muscle dysmorphia, social physique anxiety, and body checking behaviour in male college students with weight exercise. *Frontiers in Psychology*, 12, Article 726032.

APPENDIX A: QUESTIONNAIRE



This questionnaire should take you 5 minutes to complete and there are no right or wrong answers.

Section A: Demographics

1. What is your age in years? _____

2. What is your race? (Select the ONE response option that best applies to you)

Black	White	Asian	Indian	Coloured
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3. What is your occupation? _____

4. What is your marital status? (Select the ONE response option that best applies to you)

Single	Married	Divorced/Separated
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Section B: Training History

For each question, select the ONE response option that best applies to you

1. On average, how many days a week do you train?

1	2	3	4	5	6	7
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2. On average, how many hours do you train per day training?

Less than 2 hours	2-<4 hours	4-<6 hours	6-8hours	More than 8 hours
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3. How many years have you been doing bodybuilding style training?

Less than 2 years	2-<4 years	4-<6 years	6-10 years	More than 10 years
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4. What kind of training techniques do you use to increase muscle size (tick all that apply)?

Hypertrophy (To get bigger)	Strength (To get stronger)	Combination of hypertrophy and strength	Endurance (To get fitter)	Combination of all	Other
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5. What 3 words would you use to describe the perfect physique?

Muscular	Strong	Athletic	Lean	Sculpted	Thin
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Section B: Adonis Complex Questionnaire (ACQ) (Riccobono 2020)

For each question, select the ONE response option that best applies to you.

1. How much time do you spend each day worrying about some aspect of your appearance (not just thinking about it, but actually worrying about it)?

Less than 30 minutes	30 to 60 minutes	More than 60 minutes
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2. How often are you distressed by your appearance concerns (that is feeling upset, anxious or depressed)?

Rarely	Sometimes	Frequently
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3. How often do you avoid having all or part of your body seen by others? For example, how often do you avoid locker rooms, swimming pools or situations where you have to take your clothes off? Alternatively, how often do you wear certain clothes to alter or disguise your body appearance- such as baggy clothes to hide your body?

Rarely	Sometimes	Frequently
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4. How much total time do you spend each day involved in grooming activities to improve your appearance?

Less than 30 minutes	30 to 60 minutes	More than 60 minutes
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5. How much total time do you spend each day on physical activities to improve your body appearance, such as lifting weights, doing sit-ups, or running on a treadmill?

Less than 60 minutes	60 to 120 minutes	More than 120 minutes
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6. How often do you engage in dieting, eating special foods (for example high protein or low-fat foods), or taking nutritional supplements specifically to improve your appearance?

Rarely	Sometimes	Frequently
--------	-----------	------------

7. How much of your income do you spend on items designed to improve your appearance (for example diet food, nutritional supplements, hair products, cosmetics and cosmetic procedures, workout equipment or gym memberships)?

Negligible (not a lot)	Substantial amount but not creating financial problems	Enough to cause financial problems
------------------------	--	------------------------------------

8. How much have your appearance related-activities undermine your social relationships? For example, have your workout activities, dietary practices, or other appearance-related behaviours compromised your relationships with other people?

Rarely	Sometimes	Frequently
--------	-----------	------------

9. How often has your sex life been compromised by your appearance concerns?

Rarely	Sometimes	Frequently
--------	-----------	------------

10. How often have appearance-related concerns or activities compromised your job or career (or academic performance if you are a student)? For example, have you been late, miss work or school, worked below your potential or lost opportunities for advancement because of your appearance-related needs or self-consciousness?

- | | | |
|--------|-----------|------------|
| Rarely | Sometimes | Frequently |
|--------|-----------|------------|
11. How often have you avoided being seen by other people because of your appearance concerns (for example, not going to school, work, social events, or out in public)?

Rarely	Sometimes	Frequently
--------	-----------	------------

12. Indicate which ONE of the following options applies MOST to you regarding your taking of any type of drug (legal or illegal) in order to gain muscle, lose weight or otherwise improve your appearance.

I never take drugs for that purpose	Only legal drugs purchased over the counter or by prescription	Illegal use of steroids, diet pills or other
-------------------------------------	--	--

13. How often have you used more extreme measures (other than drug use) to change your appearance, such as excessive exercising; working out even when injured; fasting or other unhealthy dietary activities; vomiting or unconventional techniques for muscle development?

Rarely	Sometimes	Frequently
--------	-----------	------------

Section C: Risk factors for the development of Muscle Dysmorphia

Please rate how much you agree with each of the statements below.

1. I have battled with low self-esteem during my life.

Strongly disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

2. I have suffered or am currently suffering with anxiety.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

3. I have suffered or am currently suffering with depression.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

4. I was bullied or victimised as a child.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

5. Indicate your level of agreement that social media (Instagram, TikTok, YouTube, Influencers in the bodybuilding community) have altered your perception of what the "ideal" level of musculature in a physique is.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

6. I would consider myself a perfectionist.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

7. I struggle with having a healthy relationship with food.

Strongly Disagree	Disagree	Agree	Strongly Agree
-------------------	----------	-------	----------------

Section D: Quality of life

Quality of life includes physical health, good relationships, experiencing positive emotions, as well as having meaning and purpose to life.

On a scale of 1-10 (where 1 is very poor and 10 is excellent) please rate:

Your current physical health.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Quality of your current relationships.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Your current feelings of positive emotions.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

Your current feelings of having meaning and purpose in life.

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

APPENDIX B: GATEKEEPERS FORMS



25th of October 2023

Request for Permission to Conduct Research

Dear Conrad

My name is Sachin Govender, a 6th year Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters Dissertation involves the prevalence and selected risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

I am hereby seeking your consent to hand out my questionnaire at the gym you manage.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the DUT-Institutional Research Ethics Committee (DUT-IREC).

If you require any further information, please do not hesitate to contact me by email, sachingovender1435@gmail.com or 078 844 9069. Thank you for your time and consideration in this matter.

Yours sincerely,

Sachin Govender
Durban University of Technology

Conrad-James Mingay (CGM Umhlanga)
0637350176



25th of October 2023

Dear Craig

My name is Sachin Govender, a 6th year Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters Dissertation involves the prevalence and selected risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

I am hereby seeking your consent to hand out my questionnaire at the gym you manage.

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If you require any further information, please do not hesitate to contact me by email, sachingovender1435@gmail.com or 078 844 9069. Thank you for your time and consideration in this matter.

Yours sincerely,

Sachin Govender
Durban University of Technology

Craig Thomas

1/11/2023



25th October 2023

Dear Elite Health Club

My name is Sachin Govender, a 6th year Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters Dissertation involves the prevalence and selected risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

I am hereby seeking your consent to hand out my questionnaire at the gym you manage.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the DUT-Institutional Research Ethics Committee (DUT-IREC).

If you require any further information, please do not hesitate to contact me by email, sachingovender1435@gmail.com or 078 844 9069. Thank you for your time and consideration in this matter.

Yours sincerely,

Sachin Govender
Durban University of Technology

Manager
Taahir lutchman
060 631 4006



25th of October 2023

Dear Navin Leeladhar

My name is Sachin Govender, a 6th year Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters Dissertation involves the prevalence and selected risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

I am hereby seeking your consent to hand out my questionnaire at the gym you manage.

I have provided you with a copy of my proposal which includes copies of the data collection tools and consent and/ or assent forms to be used in the research process, as well as a copy of the approval letter which I received from the DUT-Institutional Research Ethics Committee (DUT-IREC).

If you require any further information, please do not hesitate to contact me by email, sachingovender1435@gmail.com or 078 844 9069. Thank you for your time and consideration in this matter.

Yours sincerely,

Sachin Govender
Durban University of Technology

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transparency · honesty · integrity · respect · accountability
fairness · professionalism · commitment · compassion · excellence

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25th October 2023

Dear Sir

My name is Sachin Govender, a 6th year Chiropractic student at the Durban University of Technology. The research I wish to conduct for my Masters Dissertation involves the prevalence and selected risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

I am hereby seeking your consent to hand out my questionnaire at the gym you manage.

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If you require any further information, please do not hesitate to contact me by email, sachingovender1435@gmail.com or 078 844 9069. Thank you for your time and consideration in this matter.

Yours sincerely,

Sachin Govender
Durban University of Technology

LEWIS VIRIRI

031 065 59 72

APPENDIX C: PERMISSION FROM AUTHOR

Permission from Author of questionnaire:

Assunta Pompili

Università degli Studi dell'Aquila

Dear Sachin,
for me you can use the questionnaire.
Good work!
Assunta

Email: no-reply@researchgatemail.net

From Assunta Pompili

APPENDIX D: LETTER OF INFORMATION AND CONSENT FORM



LETTER OF INFORMATION

Title of the Research Study: The prevalence and risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

Principal Investigator/s/researcher: Professor Cindy Pienaar, PhD Human, Movement Science; NSCA, CSCS

Co-Investigator/s/supervisor/s: Dr Kirsten van Heerdan, BSc (hons), MA Clinical Psychology, DPhil

Brief Introduction and Purpose of the Study: Good day. Thank you for considering participating in my study. This letter serves to provide you with some background of my study. My name is Sachin Govender, I am currently a 6th year chiropractic student. I will be conducting my research on the prevalence and risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality. Muscle dysmorphia (MD) is a subtype of Body Dysmorphic Disorder and is a mental health condition that is increasing in prevalence around the world, this may be because individuals have become more self-aware of the importance of living a healthy lifestyle. Muscle dysmorphia is predominantly found in the sport of bodybuilding. This may be due to the fact that bodybuilding is an appearance-based sport that focusses on maximising hypertrophy of musculature whilst lowering body fat percentage to visually compare levels of musculature development (hypertrophy) amongst participants. There has been research done in developed countries on the topic of muscle dysmorphia in bodybuilders, however there is a lack of research in this area in developing countries such as South Africa. In addition, it has been suggested that further investigation is needed into the development of certain risk factors as well as the pathogenesis of the preoccupation of muscularity in muscle dysmorphia. This will assist practitioners in identifying MD risk factors in patients and will assist them in having a better understanding of how to manage the patient.

What is Research?

You as the participant, may ask as many questions as you wish because it is important that you fully understand the study. You are entitled to discuss the study with your family and friends and are under no obligation to commit at this stage. For this purpose, a copy of the Letter of Information document will be given to you to take home.

Outline of the Procedure: You as the participant, will be given the adapted ACQ questionnaire to complete if you meet the inclusion criteria outlined below. This will be determined by the researcher before handing out the questionnaire. The questionnaire will take 10 to 15 minutes of your time to complete. Once you have completed the questionnaire please hand it back to the researcher at the gym you collected it from. All hard copies of the data collection sheets will be stored in a secure cabinet within the Department of Chiropractic's, only accessible by the primary researchers of the project. The copies will be kept for a duration of five years after which it will be destroyed according to the DUT policy. The electronic data (data transferred to excel and

stats programs) will be saved on a secure USB device and secured with a password, kept in a secure cabinet within the Department of Chiropractic's, and will also be destroyed after a period of five years by deletion.

The aim of this study is to determine the prevalence and risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni Municipality

Objectives:

1. To determine the prevalence of muscle dysmorphia in amateur male bodybuilders.
2. To determine the selected risk factors (low self-esteem, OCD, childhood victimisation, anxiety, depression, eating disorders, performance enhancing drugs and social media) associated with muscle dysmorphia in amateur male bodybuilders.
3. To determine the influence/effect (psychosocial, physical, mental) muscle dysmorphia has on amateur male bodybuilders in terms of quality of life.

Before completion of this questionnaire, make sure you fall under the inclusion criteria below.

Sample characteristics (Inclusion criteria): Bodybuilders must meet the following criteria

1. Participants must be a biological male to ensure homogeneity
2. Must be a non-competitive bodybuilder
3. Between the ages of 18 to 50 years' old
4. Minimum of 3 hours divided into 3 sessions of training per week
5. Minimum of 2-3 years of bodybuilding style training
6. Participants prioritise weight lifting techniques such as hypertrophy and strength training
7. Participants prioritise having a physique that consists of medium to high muscle mass and relatively low body fat percentage (Mesomorph physique)
8. Participant considers himself an amateur male bodybuilder.
9. Participant must be able to read and understand the English language
10. Participants have read and signed the informed consent form

Exclusion criteria:

1. Competitive bodybuilders
2. Those who no longer wish to participate in the study
3. Participants that cannot read and understand English.
4. Participants who have not read and signed the informed consent form

Risks or Discomforts to the Participant: There will be no risks or discomfort to the participant in participation of this study

Explain to the participant the reasons he/she may be withdraw from the Study: The research may be terminated early in particular circumstances such as non-compliance, illness, and adverse reactions. You may withdraw from the study at any time if you wish to do so and will still continue to receive the appropriate standard of care. I as the researcher, may under certain circumstances, decide to withdraw you from the study if certain inclusive criteria are not met by you.

Benefits: There will be no benefits from completion of this questionnaire.

Remuneration: There will be no remuneration for completion of this questionnaire.

Costs of the Study: There will be no costs or expense from you as the participant in completion of this questionnaire.

Confidentiality: I as the researcher will maintain privacy and confidentiality of your information. All results published will be anonymously. Only myself as the researcher and my supervisors will have access to the data obtained from this study.

Results: All results will be published anonymously to maintain confidentiality and privacy of participants.

Research-related Injury: There will be no risk of injury in completion of this questionnaire.

Storage of all electronic and hard copies including tape recordings: All results obtained will be stored on a password protected flash drive and only myself as the researcher will have access to it.

Persons to contact in the Event of Any Problems or Queries: Please contact myself (078 844 9069), my supervisors (Prof Pienaar 031 373 5376) (Dr van Heerdan 031 312 7960) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Acting Director: Research and Postgraduate Support RPS Director (Lavisha Deonarian 031 373 2375) on TtiDirector@dut.ac.za



CONSENT

Full Title of the Study: The prevalence and risk factors of muscle dysmorphia in amateur male bodybuilders in the eThekweni municipality.

Names of Researcher/s: Sachin Govender

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Sachin____ (name of researcher), about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: _____,
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age and initials will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant Thumbprint	Date	Time	Signature / Right

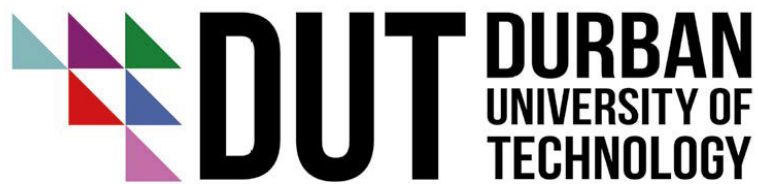
I, Sachin Govender (name of researcher) herewith confirm that the above participant has been fully Informed about the nature, conduct and risks of the above study.

Sachin <u>Govender</u>	_____	_____
Full Name of Researcher	Date	Signature
_____	_____	_____
Full Name of Witness (If applicable)	Date	Signature

Full Name of Legal Guardian (If applicable) Date

Signature

APPENDIX E: ADVERTISEMENT OF STUDY



Attention:

Calling All Amateur Male Bodybuilders Aged 18–50!

Are you eager to participate in a compelling research project exploring Muscle Dysmorphia? Join our study to contribute to valuable insights in health sciences

Do you have 2 to 3 years of weightlifting training experience? Do you prioritise having a Mesomorph physique (medium to high muscle mass with relatively low body fat)?

Participation will include:

- Taking the questionnaire from the researcher at the reception of your gym.
- Taking the Letter of Information and consent forms from the researcher at the reception of your gym
 - Filling out said questionnaire, LOI and Consent forms
- Returning the questionnaire and forms back to the researcher at the reception of your gym



Participation is anonymous and the questionnaire will only take 10 to 15 minutes of your time.

Contact:
Sachin Govender- 078 844 9069
Or
sachingovender1435@gmail.com

