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Original Research

# Appearance and performance enhancing drug usage and body image across three age cohorts of fitness enthusiast men

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## Abstract

**Background:** Because research findings on men's body image and compensatory behaviors (e.g., appearance and performance enhancing drug (APED) usage) across the lifecycle in men is contradictory, the purpose of this study was to examine the relationship between age and body image concerns, and to investigate the specific types of APEDs used across the three age cohorts (emerging, established, and middle-aged men). **Methods:** Using an online survey and a sample of 1020 fitness enthusiast men, we investigated (1) type of APED/supplements used across three periods of life (emerging adulthood, established adulthood, middle age), and (2) any relationship between period in life and body image. **Results:** emerging adult participants had significantly lower appreciation for body functionality compared to their older counterparts. Established adult men had higher drive for leanness and muscle dysmorphia symptoms compared to the other two groups. The data suggest that men vary in severity of body image dissatisfaction depending on their age. All participants in the current study participated in polypharmacy of APED usage, and the associations between age cohorts and APED consumption were significant. Established adult men endorsed a more muscular body, higher drive for leanness, and they proportionally consume more APEDs compared to their younger (and older) counterparts. **Conclusions:** At this stage of life, men may start noticing age-related changes to their body, which may lead to preoccupations with their health and functionality, and they may use products to help counteract a declining metabolism and overall shift in physical health. Findings of this study could be beneficial for familiarizing clinicians with focused knowledge of intergenerational dynamics, which allows for better understanding of the diversity of challenges and opportunities facing each age cohort with respect to the aging body.

**Keywords:** Body image; Muscle dysmorphia; Appearance and performance enhancing drugs; Fitness enthusiast; Age; Drive for leanness; Body appreciation

## 1. Introduction

Societal pressures have made muscularity and leanness central to men's body satisfaction, notions of masculinity, and overall identity. When men fall short of these ideals, they can experience body dissatisfaction and may engage in behaviors that they believe may help them achieve the ideals, including the use of Appearance and Performance Enhancing Drugs (APEDs) [1]. Research findings on men's body image across the lifecycle is contradictory. While some studies [2] have found that older men exhibit higher levels of satisfaction than younger men, others [3,4] have demonstrated that body image concerns in men do not improve over time, because of a general decline in health and well-being.

Periods in the lifecycle (i.e., life stages), as culturally constructed concepts, and their respective characteristics are not always agreed upon. However, scholars have attempted to conceptualize generational cohorts for the ease of study and understanding of their corresponding attitudes, behaviors, and experiences especially as related to developmental opportunities, risks, and challenges [5].

Emerging adulthood is defined as the period between the ages of 18–29 [5–7]. Younger emerging adults are characterized by instability, self-exploration, and developing cognitive maturity [6]. This period in the life course is often viewed as a delayed transition into adulthood, which is evidenced by the fact that many emerging adults enter or extend higher education, reside with, and depend financially upon their parents [6,7]. Meanwhile, slightly older emerging adults may be establishing independence and self-sufficiency through their burgeoning careers and even starting their own families [5].

Ages 30 to 44 years mark(s) the developmental period known as established adulthood [5]. According to Mehta *et al.* [5], established adults are preoccupied with negotiating family life and careers, while others experience divorce and pivotal changes in their social lives and familial responsibilities. Cognitively, established adults demonstrate enhanced development, more optimism, and higher general life satisfaction compared to emerging adults.

Middle age is the life stage between the ages of 45 and 65 years, which is considered a critical life moment because of the new challenges facing the aging individual [5]. Mid-life is characterized by a general decline in phys-



ical health, cognitive functioning, and major transitions in work and family life, such as increasing responsibilities for aging parents [3,5]. However, several opportunities present themselves at this life stage, such as peak financial status, committed relationships, and higher positive affect [3,5].

### 1.1 Men and body image

While body image research has primarily concentrated on the experiences of girls and women [8,9], scholars now recognize that men are also susceptible to societal pressures that result in similar bodily concerns; and therefore, more studies are directed at the examination of the relationship between societal pressures with men's psychological health and physical well-being [10,11]. For men, societal appearance pressures endorse taller, leaner, and more muscular bodies [12]. If they fail to conform to these masculine body ideals (i.e., leanness and muscularity), men can experience body dissatisfaction and psychological distress, which may encourage body-changing behaviors (e.g., use of muscle building supplements) that they believe will help them to approximate the ideal body [12–14].

Despite commonly accepted social ideals, there is variability in terms of body dissatisfaction, body type preference, and adherence (and challenges) to traditional masculine gender roles [15]. For example, competitive and recreational athletes and bodybuilders disproportionately exhibit higher rates of body dissatisfaction [16–18], disordered eating, and other harmful compensatory behaviors (e.g., anabolic steroid usage) [19–21]. Studies have also suggested that male fitness enthusiasts (i.e., those who follow a healthy lifestyle, workout routine, and regular gym-use) also report higher levels of body image disturbance [22,23].

### 1.2 The aging body

Further variability in men's body image is apparent when looking across age cohorts. Studies on body image indicate the prevalent and destructive effects of sociocultural pressures on young adult men to adhere to appearance and body ideals [24–26], specifically the traditional images of masculinity via muscularity, which makes them more disposed to body image disorders, poor psychological well-being, and subsequent compensatory behaviors [27,28].

As with women, men's views of their bodies shift as they age, endure physiological changes, and decline in functionality [29]. Compared to aging women, aging men generally hold a more relaxed, and even positive, view of their overall body appearance [4,15,30,31]. Although limited, studies on older adult men [2,31,32] provide evidence of higher rates of body satisfaction even as they move further from the socially constructed ideals of beauty (i.e., thinness, muscularity, and youthfulness). Once in middle age, body aesthetics become secondary to performance and appreciation for overall health [4,29,32,33]. For example, men tend to engage in healthier eating habits and reduced

overall risky behaviors after their twenties, as they redirect their focus on physical health [5].

However, findings across body image research on men are contradictory and reveal body-related ambivalence. Some studies [2,34,35] have found that older men exhibit lower levels of body satisfaction than their younger counterparts, because of social pressures to maintain a youthful appearance indicating that they are psychologically and emotionally influenced by the aging process [36]. The importance of health increases with age along with the belief that health issues are associated with being overweight [36]. Therefore, poorer body satisfaction in aging men may also correlate with a decline in general physical health, a slowing metabolism, lower physical activity rates, which are conditions that potentially threaten their health maintenance and fitness goals [3,4,29].

### 1.3 APED usage in men

Appearance and Performance Enhancing Drugs (APEDs) refers to a range of pharmacological substances that are used to alter one's physical appearance, regulate general health, or improve physical performance [1,37]. Research on the \$46 billion industry [38] and the use of APEDs has increased in recent years, and has generally examined the use of anabolic-androgenic steroids (AAS), illicit ergo/thermogenics (i.e., weight and fat loss substances, thyroid hormones), and legal over-the-counter (OTC) supplements (e.g., protein powders, vitamins) and legal ergo/thermogenics (e.g., fat burners) as predictors of body image disturbance, mental health issues (e.g., depression, anxiety), and physical health complications [12,13,39].

While some research has linked muscularity-enhancing behaviors to lower levels of depression and even relief of body image concerns among men [30,41], other research has linked APED usage to body image disturbances [12,42,43]. Therefore, research on APED use and body image is less conclusive in terms of their associations with each other and the magnitudes of effects.

According to Hildebrandt and Lai [1], age affects the strength of the relationship between body image and vulnerability to APED usage. Emerging adulthood is a period of experimentation that coincides with young men's initial exposure to and use of a variety of APEDs, including anabolic-androgenic steroids, which may become an established habit [44–46]. Social pressures often emphasize body concerns, which may lead to risky body modification behaviors, such as APED usage [47,48]. With a hyper focus on appearance, young men may believe that APEDs will provide positive, instantaneous aesthetic outcomes, and to a lesser extent, immediate performance enhancement [47]. A “quick fix” may include the simultaneous consumption (i.e., polypharmacy) of licit (e.g., protein powders and vitamins) and illicit APEDs (e.g., anabolic-androgenic steroids) [41,45,48]. Some studies [44] claim that the emerging adult

age cohort is more likely to use APEDs than the general population, while others [48] suggest that APED usage is not as pernicious a problem in this population.

There is little research on the use of APEDs by older (i.e., middle-aged) men, and those studies have predominantly focused on the use of anabolic-androgenic steroid usage [11,49,50] with little attention to other substances (e.g., legal over the counter supplements). Furthermore, as men transition into established adulthood and middle age, they continue to experiment with a variety of classes of APEDs, which can lead to ancillary drug usage, including anabolic-androgenic steroids [51,52]. Despite this evidence, older men, compared to the emerging adult men, report taking fewer and smaller doses of APEDs. During this life stage, users of both licit and illicit APEDs are expected to be more knowledgeable and intentional [46], motivated by developing health conditions, weight loss, fitness performance, and the desire to combat the aging process [49,50,52,53]. For example, men over the age of 40 are often the target for male testosterone supplementation, which is often marketed as an elixir for sexual dysfunction, muscle enhancement, fat reduction, and endurance [53]. According to Ivanov [53], the market for testosterone is growing and easily accessible via the internet, often without a prescription.

APED misuse is prevalent in older men and generally associated with polypharmacy as a means to slow the aging process and maximizing the benefits of APEDs by combining them with others [46,50]. According to Hildebrandt *et al.* [49], as men age and experience new, age-related bodily changes, they are more likely to experiment with different methods of appearance modification, which may include a transition between classes of drugs (e.g., anabolic-androgenic steroids, ergo/thermogenics, dietary supplements) [50].

According to Hildebrandt *et al.* [41], the polypharmacy associated with APED use is likely to account for the variability among users, which suggests that there are subtypes of APED users with distinct risk factors. For example, peer groups, at any age, may influence APED usage through organized sports (e.g., school teams), gym culture, fitness clubs and communities, and other social groups (e.g., gay community) [1]. Within men's competitive sports and body building cultures, there are significantly higher rates of body preoccupation (e.g., desire for muscle mass) that precipitate higher rates of APED usage in a pursuit of perfectionism and to achieve competitive goals [21,54,55]. Studies on regular gym users, recreational athletes, and body builders demonstrate growing numbers of men who use a wide range of licit and illicit APEDs to improve performance and enhance appearance through weight gain and building bulk [19,20,56–59].

## 1.4 Purpose

Considering the general lack of research focused on older men, especially established and middle-aged men, with respect to body image and well-being, the importance of this research is underscored by the amount of health issues and life events that men within this period of life experience and the precipitous growth of our midlife population due to increased longevity [3,5]. Furthermore, population-based studies about APED usage other than anabolic-androgenic steroids are limited or inconclusive, thus, this study also examines the role of age in relation to APED usage. According to Hildebrandt *et al.* [41], research that attempts to gain a better understanding of types of APED usage can help to identify possible indicators of pathologies (e.g., body image disturbances) and risk profiles.

Therefore, based on the recommendations from other studies [1,12,34,41], the objective of the current study was to (1) to examine the relationship between age and body image concerns (i.e., functional appreciation, drive for leanness, and muscle dysmorphia), and (2) investigate the specific types of APEDs (i.e., muscle/mass building APEDs, ergo/thermogenics, and health and well-being APEDs) used across the three age cohorts in a sample of fitness enthusiast men. Within the context of our research questions, our research hypotheses were as follows:

H1a: Emerging adult men will exhibit lower functional appreciation, higher drive for leanness, and higher levels of muscle dysmorphia compared to established adult and middle-aged participants.

H1b: Established adult participants will exhibit higher rates of body image disturbance compared to middle-aged participants.

H2a: There will be significant differences between age cohorts and their respective patterns of APED usage (i.e., class(es) used). Emerging adult men will participate in more polypharmacy behaviors (i.e., consume all categories of APEDs) compared to established adult men and middle-aged men.

H2b: Middle-aged men will use more health and well-being APEDs than emerging and established adult men.

H3: There will be significant differences between age cohorts and the specific types of APED products they use.

## 2. Method

### 2.1 Participants

The final sample for the study comprised of 1020 participants. The majority were heterosexual (83.2%,  $n = 849$ ), gay (10.0%,  $n = 102$ ), bisexual (4.2%,  $n = 43$ ), and the remaining were other/asexual (2.5%,  $n = 26$ ). In terms of ethnicity, 16.0% ( $n = 163$ ) reported being Hispanic; regarding racial status, 49.2% ( $n = 590$ ) indicated they were White, 15.0% ( $n = 180$ ) Black, 2.3% ( $n = 31$ ) Asian American, and 2.5% ( $n = 30$ ) Native American. The majority were



married or in domestic relationships (48.5%,  $n = 495$ ) and had either some college education or a bachelor's degree or higher (32.0%,  $n = 326$ ). Participants were primarily employed full-time (66.7%,  $n = 680$ ) or part-time (12.9%,  $n = 132$ ). In terms of household income, 29.4% ( $n = 300$ ) reported earning more than \$100,000 per year, 21.1% ( $n = 215$ ) between \$25,000.00 and \$49,999.00, and 19.1% ( $n = 195$ ) between \$55,000.00 and \$74,999.

The sample included 500 emerging adults (18–29 years;  $Mage = 23.61$ ,  $SD = 4.08$ ), 372 established adults (30–44 years;  $Mage = 36.95$ ,  $SD = 4.39$ ), and 148 middle-aged adult men (45–65 years;  $Mage = 50.09$ ,  $SD = 7.44$ ). The overall mean age of participants was 32.32  $SD = 10.68$ .

## 2.2 Instruments

### 2.2.1 Demographics and sexual orientation

Participants provided their age, education, relationship status, and race/ethnicity. We used the one-item Kinsey Scale to assesses sexual orientation [60]. The men indicated their sexual orientation using the 7-point Kinsey scale that conceptualized sexuality as non-dichotomous. Scores range from 0 (exclusively heterosexual with no homosexual contact) to 3 (equally heterosexual and homosexual) to 6 (exclusively homosexual with no heterosexual contact). We used the scale as originally intended and included all seven points on the orientation continuum to assess the men's sexuality, which is consistent with previous studies that have examined sexual orientation [61]. Consistent with other research [62], we classified men as "gay" men who selected any of the three "homosexual" response options and men as heterosexual if they selected any of the "heterosexual" responses.

### 2.2.2 Functional appreciation

The seven-item Functionality Appreciation Scale (FAS) [63] was used to measure an individual's bodily experiences and capabilities. On questions such as, "I feel that my body does so much for me", participants responded on a scale 1 (strongly disagree) to 5 (strongly agree) and high score indicated high body appreciation. Alleva *et al.* [63] reported a Cronbach's alpha 0.86 for the combined sample of women and men. Cronbach's alpha from the current study was 0.90.

### 2.2.3 Drive for leanness

The six-item Drive for Leanness scale [64] assesses a desire for a well-toned physique with low body fat. On survey statements such as "Athletic looking people are the most attractive people" the men responded from 1 (never) to 6 (always). The total score is the mean of the items, where a higher score indicates a stronger drive for leanness. Smolak and Murnen [64] reported a Cronbach's alpha of 0.79 in a sample of men, and information regarding the scale's differentiation from measures of drive for muscularity and

drive for thinness. Alpha in the current study was 0.91.

### 2.2.4 Muscle dysmorphia

To assess a man's focus on muscularity we utilized the 13-item Muscle Dysmorphic Disorder Inventory (MDDI) [67]. This measure assesses preoccupation along three dimensions: drive for size, appearance intolerance, and functional impairment. Participants responded to items, such as "I think my chest is too small", on a scale of 1 (never) to 5 (always). The total score for each dimension is the mean of the items, where higher scores indicate higher levels in each dimension. Hildebrandt *et al.* [67] reported 0.81 in a sample of 245 men and provided extensive information on the scale's validity. Alphas from the current study were 0.90 (size), 0.87 (appearance), and 0.90 (functional).

### 2.2.5 APED usage

To assess APED usage in men we asked the participants consider whether they had taken and drugs or supplements in the past month (i.e., 30 days) and then to indicate how many times per week they used the drug or supplement (e.g., 0 = never and 7 = every day of the week) [41]. Based on previous study [68], the APEDs were categorized into three primary groups: muscle/mass building, ergo/thermogenics, and health and well-being. There were a total of 15 muscle/mass building APEDs listed (e.g., protein powder, human growth hormone, anabolic steroids); 6 commonly used ergo/thermogenic APEDs (e.g., stimulants, diuretics); and 4 health and well-being APEDs (e.g., immune system enhancers, vitamins). Participants could also write in other substances that they consumed.

## 2.3 Procedure and data analysis

After receiving approval from the authors' university IRB, participants between the ages of 16 and 65 were recruited directly from a pre-arranged pool of respondents in the U.S. who have agreed to be contracted by the market research service (i.e., Qualtrics). Men who self-identified as fitness enthusiasts were purposely targeted because of their likelihood for consuming APEDs. Qualtrics targeted heterosexual and gay men who self-identified as fitness enthusiasts and used APEDs (licit and illicit) as potential participants. Qualtrics participants in this study each received \$5.00 financial compensation.

Data were analyzed using SPSS version 26 (IBM Corp., Armonk, NY, USA). The means and frequencies of demographic information (i.e., age, sexual orientation, race/ethnicity, relationship status, income) are presented in Table 1.

Initially, 1068 people entered the website and completed the consent form. Of these, 48 responses were removed because they left >5% of questions blank. For the remaining 1020 participants, missing values were found to be randomly distributed across items and replaced with multiple imputation using expectation maximization. Less

**Table 1. Descriptive statistics and between group comparisons for age cohort.**

Variable	Emerging adults		Established adults		Middle aged		Total	
	n	%	n	%	n	%	n	%
Sample size	500	49	372	36.5	148	14.5	1020	100
Sexual orientation								
Heterosexual	398	46.9	322	37.9	129	15.2	849	83.2
Gay	61	59.8	27	26.5	14	13.7	102	10.0
Bi-sexual	26	60.5	13	30.2	4	9.3	43	4.2
Other/Asexual	15	57.7	10	38.5	1	3.8	26	2.5
Hispanic/Latino/a/x								
Yes	113	69.3	41	25.2	9	5.5	163	16.0
No	387	45.2	331	38.6	139	16.2	857	84.0
Race/Ethnicity								
White	187	31.7	285	48.3	118	20.0	590	68.8
Black	133	73.9	33	18.3	14	7.8	180	21.0
Asian	27	87.1	3	9.7	1	3.2	31	3.60
Middle Eastern	4	100	0	0	0	0	4	0.50
African	6	85.7	1	14.3	0	0	7	0.80
Alaskan	2	100.0	0	0	0	0	2	0.20
Bi-racial	2	33.3	2	33.3	2	33.3	6	0.70
Native American	23	76.7	4	13.3	3	10	30	3.5
Other	3	60.0	2	40.0	0	0	5	0.60
Non-specified	2	100.0	0	0	0	0	2	0.20

than 0.01% data points was missing from the dataset. Variables were created by averaging summed responses to items. Resultant variables also met criteria for normality (in relation to both skewness and kurtosis).

We conducted a one-way MANCOVA to determine a statistically significant difference between the independent variable of age cohort (i.e., emerging, established, and middle-aged adults) on the dependent variable of measures of body image (i.e., functional appreciation, drive for leanness, muscle dysmorphia). We used sexual orientation as a covariate, consistent with past research [12], which allowed us to isolate the relationship between age and the dependent variables independent of the participants' sexual orientation. For the post-hoc comparisons, we used Bonferroni Adjustment to reduce the possibility of a Type I error. Alpha was set at 0.05 for all analyses. Partial eta squared was used to determine effect size ( $\eta^2 = 0.01$  is small effect size,  $\eta^2 = 0.06$  is medium effect size,  $\eta^2 = 0.14$  is large effect size) [65].

We then examined the participant's responses to the APED questions to determine which types of drugs and supplements were used and at what frequency. Given the patterns of men's use (i.e., all participants used more than one type of APED), we created 4 levels of APED usage: (1) muscle building and health and well-being; (2) ego/thermogenics and health and well-being; (3) combination of muscle building, ego/thermogenics, and health and well-being, and (4) health and well-being only.

To examine our second and third hypotheses concerning the use of APEDs across the three age cohorts, a series of chi-square tests of independence were employed to examine whether there is an association between participants' age cohort and APED usage (i.e., class of APED used, specific types of APEDs). Cramér's V was utilized to determine effect size ( $>0$  is no or weak effect,  $>0.05$  is weak effect,  $>0.10$  is moderate effect,  $>0.15$  is strong effect,  $>0.25$  is very strong effect) [66].

Multiple logistic analysis was utilized to test whether participants' age predicted type of APED usage. However, due to the small sample size of certain APED products, we were not able to conduct a useful analysis of this relationship.

### 3. Results

After adjusting for sexual orientation, the one-way MANCOVA demonstrated that there was a statistically significant difference of medium effect between the age groups for the combined body image variables, Pillai's trace  $F(10, 2026) = 15.42$ ,  $p < 0.001$ , partial  $\eta^2 = 0.07$ ; sexual orientation was a significant covariate ( $p < 0.001$ ).

Given this significant multivariate interaction, univariate main effects were examined.

Further inspection of the main effect for age revealed that the three age cohorts differed significantly in terms of the following body image dimensions: functional appreciation, drive for leanness, and muscle dysmorphia. Post-hoc

**Table 2. Adjusted means and standard error for body image by gender.**

Variable	Emerging adults (n = 500)		Established adults (n = 372)		Middle aged (n = 148)		F Value	Partial $\eta^2$
	Adj. M	SE	Adj. M	SE	Adj. M	SE		
FAS	3.50	0.039	4.01	0.045	4.06	0.072	48.83*	0.09
DFL	3.73	0.053	4.48	0.061	4.20	0.096	44.93*	0.08
MDDI-AI	2.94	0.052	3.32	0.059	3.12	0.093	12.29*	0.02
MDDI-DFS	2.91	0.052	3.36	0.059	2.90	0.094	18.59*	0.04
MDDI-FI	2.84	0.052	3.33	0.060	2.84	0.095	21.64*	0.04

Note. FAS, Functional Appreciation; DFL, Drive for Leanness; MDDI-AI, Muscle Dysmorphic Disorder-Appearance Intolerance; MDDI-DFS, Drive for Size; MDDI-FI, Functional Impairment.

\* $p < 0.001$ .

<sup>1</sup> Degrees of Freedom were 2, 1016 for all *F*-tests.

Sexual Orientation served as a covariate in each analysis.

pairwise comparisons revealed significant differences between the three age cohorts. Table 2 presents means and standard deviations of all measures by age cohort.

Concerning the covariate, sexual orientation was significantly related to each of the body image outcomes ( $p < 0.001$ ), except all dimensions of muscle dysmorphia ( $p > 0.5$ ).

### 3.1 Functional appreciation

For functionality appreciation there was a statistically significant difference of medium effect in score of the three age cohorts,  $F(2, 1016) = 48.83, p < 0.001$ , partial  $\eta^2 = 0.09$ . Consistent with hypothesis 1a, emerging adult men had significantly lower appreciation of the body experiences and capabilities. However, hypothesis 1b was not supported by the data. There was no difference in scores between established and middle-aged men.

### 3.2 Drive for leanness

There was a statistically significant difference of medium effect between the three age cohorts with respect to drive for leanness,  $F(2, 1016) = 44.93, p < 0.001$ , partial  $\eta^2 = 0.08$ . The data did not support hypothesis 1a, because emerging adult men actually had the lowest drive for leanness.

Established adult men had statistically significant higher drive for leanness scores compared to the other two groups, which partially supported hypothesis 1b.

### 3.3 Muscle dysmorphia

There was a significant difference between the age cohorts for the endorsement of muscle dysmorphia (MD) symptoms. More specifically, there were differences of small effect between age cohorts and MD appearance intolerance  $F(2, 1016) = 12.29, p < 0.001$ , partial  $\eta^2 = 0.02$ ; MD drive for size  $F(2, 1016) = 18.59, p < 0.001$ , par-

tial  $\eta^2 = 0.04$ ; and MD functional impairment  $F(2, 1016) = 21.64, p < 0.001$ , partial  $\eta^2 = 0.04$ . Overall, established adult men indicated a stronger endorsement for muscle dysmorphia symptoms across the three subscales, which was inconsistent with hypothesis 1a, but consistent with hypothesis 1b. Post-hoc analysis demonstrated no difference between emerging adult and middle-aged men for appearance intolerance, drive for size, or functional impairment.

### 3.4 APED usage

All participants in the current study participated in polypharmacy (i.e., simultaneous consumption of multiple products). The most reported weekly consumption pattern of APEDs included all three classes—muscle building, ergo/thermogenic, and health and well-being APEDs ( $n = 786; 77.1\%$ ); 16.0% of participants ( $n = 163$ ) consumed a combination of muscle building and health and well-being APEDs weekly; only 1.3% ( $n = 13$ ) consumed a combination of ergo/thermogenics with health and well-being APEDs; and 5.7% ( $n = 58$ ) took only health and well-being APEDs weekly.

A chi-square test of independence demonstrated that the age cohort a man belongs to is strongly associated with the pattern of APED usage,  $\chi^2(6, n = 1020) = 61.37, p < 0.001, V = 0.25$  (see Table 3). Hypothesis 2a was not supported. Established adult participants, not emerging adult men, are more likely to take a combination of all three classes of APED weekly compared to the other two age cohorts. Consistent with hypothesis 2b, middle-aged participants are more likely to consume a combination of muscle building and health and well-being APEDs compared to emerging adult and established adult participants. They are also more likely to consume only health and well-being APEDs (12.2%) than emerging adult participants (6.6%), while only 1.9% of established adult participants consumed only health and well-being APEDs weekly.



**Table 3. Frequencies and chi-square results for age cohort and aped usage by category.**

Variable	Emerging adults		Established adults		Middle aged		Total	$\chi^2(2)$	Cramer's <i>V</i>
	(n = 500)		(n = 372)		(n = 148)		(n = 1020)		
	n	% <sup>a</sup> (% <sup>b</sup> )	n	% <sup>a</sup> (% <sup>b</sup> )	n	% <sup>a</sup> (% <sup>b</sup> )	n (% <sup>c</sup> )		
APED use								61.37*	0.25
MB & HW	99	19.8 (60.7)	29	7.8 (17.8)	35	23.6 (21.5)	163 (16.0)		
WFL & HW	7	1.4 (53.8)	3	0.8 (23.1)	3	2.0 (23.1)	13 (1.3)		
MB, WFL, HW	361	72.2 (45.9)	333	89.5 (42.4)	92	62.2 (11.7)	786 (77.1)		
HW only	33	6.6 (56.9)	7	1.9 (12.1)	18	12.2 (31.0)	58 (5.7)		

Note. MB, muscle building APEDs; WFL, ergo/thermogenics; HW, health and well-being APEDs.

\* $p < 0.001$ .

<sup>a</sup> reflects the percentage within the age cohort.

<sup>b</sup> reflects the percentage within the APED category.

<sup>c</sup> reflects the percentage of the full sample.

Chi-squared tests of independence revealed significant associations between age cohort and the consumption of individual types of APEDs with effect sizes that ranged from moderate to strong ( $V = 0.17$ – $V = 0.24$ ). Consistent with hypothesis 3, there were significant differences between age cohorts and the specific types of APEDs they consumed. Compared to established and middle-aged men, emerging adult men were more likely to consume all APEDs except myostatin inhibitors, hormone boosters, pro-hormones, and anabolic androgenic steroids. Established adult men are also more likely to consume diuretics and laxatives compared to the other two cohorts.

For all three age cohorts, protein powders and protein shakes are the most popular muscle building APEDs. Synthetic metabolic stimulants are the most popular ergo/thermogenics for both emerging and established adult men, while xanthines/natural stimulants are the most popular for middle-aged men. Multivitamins are the most utilized health and well-being APED across all three age cohorts. In fact, multivitamins are the most popular APED consumed for all men (88.6% of participants used multivitamins). See Table 4 for a complete list of APED usage frequencies by age cohort.

## 4. Discussion

### 4.1 Age and body image concerns

As demonstrated in prior studies [17,23], fitness enthusiasts place more importance on their body appearance (i.e., leanness and muscularity) and performance, which may result in higher levels of disturbance. Even though all the participants in the current study were fitness enthusiasts, the data suggest that men vary in severity of body image dissatisfaction depending on their age. The findings further highlight the idea [49] that body dissatisfaction is not a simple trait. Body image disturbances are characterized by a combination of changes in leanness and body size that

vary in severity and pathology across time and context [49]. Furthermore, men's perception of their health and physical fitness is also a significant determinant of how men feel about their bodies [34].

The outcomes of the muscle dysmorphia measures illustrate the complexity of body image. Although physical appearance preoccupations are generally associated with younger men [2], older men are not immune to body dissatisfaction. Established adult men in the current study experienced higher degrees of muscle dysmorphia characteristics across all three dimensions compared to their younger and older counterparts. At this stage of life, men may start noticing age-related changes to their body, such as stomach weight gain, which may lead to preoccupations with their health and functionality [5,29]. Simultaneously, age-related changes shift men's physical appearance further from western cultural ideals, which may lead to appearance dissatisfaction. Established adult men's drive for muscularity may be a coping mechanism as they come to terms with aging in a society where muscularity is socially synonymous with health, youthfulness, and sexual prowess [29,69]. Therefore, cultural influences and pressures to maintain youthful beauty standards are not exclusive to emerging adult men.

The lower rates of muscle dysmorphia in middle-aged men may indicate a stabilization in body image or a shift in personal values as men focus more on their health and well-being. For middle-aged men, weight gain (i.e., increase in fat) becomes a health challenge versus a marker of physical attractiveness [29,70,71]. Peat *et al.* [2] also argue that older men are more likely to conform to traditional gender roles that overemphasize the importance of physical appearance in women, but not men.

Such forms of gender role socialization may protect men from elevated body dissatisfaction.

In terms of drive for leanness, results of the current study were also inconsistent with expectations. Established

**Table 4. Frequencies and chi-square results for individual substance usage according to age cohort.**

Variable	Emerging adults		Established adults		Middle aged		Total	$\chi^2(2)$	Cramer's <i>V</i>
	(n = 500)		(n = 372)		(n = 148)		(n = 1020)		
	n	% <sup>a</sup> (% <sup>b</sup> )	n	% <sup>a</sup> (% <sup>b</sup> )	n	% <sup>a</sup> (% <sup>b</sup> )	n (% <sup>c</sup> )		
<b>Muscle Building</b>									
Protein Powder	409	47.7 (82.0)	342	39.9 (91.9)	106	12.4 (71.6)	857 (84.1)	36.02*	0.19
Protein shake	392	46.3 (78.9)	341	40.3 (91.7)	113	13.4 (76.4)	846 (83.2)	30.68*	0.17
Creatine	334	46.2 (67.3)	304	42.0 (81.9)	85	11.8 (57.4)	723 (71.2)	38.18*	0.19
Glutamine	308	44.7 (62.2)	291	42.2 (78.6)	90	13.1 (60.8)	689 (68.0)	30.40*	0.17
Amino acids	351	47.0 (70.8)	310	41.5 (83.8)	86	11.5 (58.5)	747 (73.7)	39.17*	0.20
$\beta$ -Hydroxy	286	45.1 (57.5)	275	43.4 (74.9)	73	11.5 (49.3)	634 (62.6)	40.23*	0.20
Pre-Workout	339	47.4 (68.3)	298	41.7 (81.0)	78	10.9 (53.1)	715 (70.7)	42.19*	0.20
Weight-gainer	297	45.2 (60.0)	286	43.5 (78.4)	74	11.3 (50.0)	657 (65.2)	48.80*	0.22
Myostatin reuptake inhibitor	275	44.2 (55.9)	278	44.7 (75.7)	69	11.1 (46.6)	622 (61.8)	51.94*	0.23
Hormone booster	271	43.9 (54.9)	273	44.2 (74.0)	73	11.8 (49.3)	617 (61.0)	42.47*	0.21
Insulin for muscle growth	259	44.7 (52.4)	255	44.0 (69.7)	66	11.4 (44.6)	580 (57.5)	37.48*	0.19
Insulin-like growth factor 1	261	45.5 (52.8)	255	44.4 (69.3)	58	10.1 (39.2)	574 (56.8)	45.29*	0.21
Human growth hormone (HGH)	259	44.3 (52.4)	258	44.1 (69.9)	68	11.6 (46.3)	585 (57.9)	36.11*	0.19
Prohormones	254	44.1 (51.5)	256	44.4 (69.6)	66	11.5 (44.6)	576 (57.1)	39.05*	0.20
Anabolic-androgenic steroids	249	43.2 (50.4)	258	44.8 (69.9)	69	12.0 (46.6)	576 (57.0)	40.39*	0.20
<b>Ergo/Thermogenics</b>									
Thyroid Hormones/cutting drugs	275	44.9 (55.4)	267	43.6 (72.0)	71	11.6 (48.0)	613 (60.4)	35.40*	0.19
Synthetic metabolic stimulants	295	44.9 (59.5)	291	44.3 (78.9)	71	10.8 (48.0)	657 (64.9)	56.57*	0.24
Xanthines/natural stimulants	285	45.0 (57.2)	276	43.6 (74.4)	72	11.4 (48.6)	633 (62.2)	40.27*	0.20
Appetite Suppressants	285	44.7 (57.2)	282	44.3 (76.0)	70	11.0 (47.3)	637 (62.6)	49.46*	0.22
Diuretics/water pills	273	43.2 (54.8)	284	44.9 (76.5)	75	11.9 (50.7)	632 (62.1)	52.36*	0.23
Laxatives	266	44.1 (53.4)	271	44.9 (73.0)	66	10.9 (44.6)	603 (59.3)	49.45*	0.22
<b>Health and Well Being</b>									
Immune system enhancer	366	45.6 (73.9)	328	40.9 (88.4)	108	13.5 (73.0)	802 (79.1)	30.78*	0.17
Multivitamins	399	45.1 (82.6)	346	39.1 (94.3)	139	15.7 (93.9)	884 (88.6)	32.97*	0.18
OTC mood enhancers	315	44.3 (63.9)	305	42.9 (82.4)	91	12.8 (61.5)	711 (70.3)	41.30*	0.20
OTC sedatives	315	45.1 (63.9)	294	42.1 (79.9)	89	12.8 (60.1)	698 (69.2)	31.94*	0.18

Note. The responses reflect the type of APEDs used at least once per week over the past 30 days. <sup>a</sup> reflects the percentage within the APED category. <sup>b</sup> reflects the percentage within the age cohort. <sup>c</sup> reflects the percentage of the combined age cohorts.

\* $p < 0.001$ .

adult and middle-aged men had higher drives for leanness than the youngest emerging adult participants. This finding can possibly be attributed to the fact that weight gain is more common in older men due to a slowing metabolism [3,5]. As age-related weight gain becomes more apparent, the drive to lose the extra weight may become more compelling [71].

The focus on health and well-being further explains higher body appreciation (i.e., appreciation of body function and performance) in established adult and middle-aged participants compared to emerging adult men, who may take their bodies (health and performance) for granted. Compared to established and middle-aged men, emerging adult men exhibited lower functional appreciation, which is to be expected in individuals who still experience relatively normal physical functioning of their bodies [5]. Because

they are not feeling the effects of aging on physical health and well-being, their identity exploration is focused on a higher investment in body appearance versus body function [5,6].

#### 4.2 Use of APEDs across age cohorts

The current study demonstrates a high prevalence of polypharmacy across the three age cohorts, which may be attributed to the fact that all participants were self-professed fitness enthusiasts who consume APEDs. Furthermore, polypharmacy is inherent in APED use, especially amongst men who endorse societally based ideals of muscularity and leanness [2,41]; thus the current findings are not at all surprising.

The most popular APEDs across the age cohorts are protein powders and shakes, which are legal and easily ac-

cessible over the counter. In a sample of fitness enthusiasts, the high consumption of multivitamins and immune enhancers is also expected, considering their accessibility and reasonable cost compared to other APEDs. Across all three age cohorts, the combined use of appetite suppressants, diuretics, and stimulants (e.g., xanthines), perhaps indicates the desire for immediate, short-term weight loss. The collective use of amino acids, such as glutamine, is also to be expected in a sample of fitness enthusiasts because of their underlying benefits of muscle growth and endurance enhancement [72].

The associations between age cohorts and APED consumption in the current study are weak to moderate indicating that specific consumption behaviors are not exclusive to any one generation. Furthermore, the lack of strong significant findings supports the assertion by Hildebrandt *et al.* [41] that the typology of the average APED user is quite challenging. Despite the difficulty in identifying typologies, the data of the current study indicate that there are subtle distinctions in the types of APEDs used by each age group.

Although the findings of previous studies indicate that younger men experience greater body dissatisfaction [2,13], the current study finds that established adult men endorse a more muscular body, higher drive for leanness, and proportionally consume more APEDs. As previously mentioned, weight gain is more common at this age, so older men may be looking for extra help to lose the weight. This supports research stating that established adults are more invested in their health and well-being, and they can generate the resources required to consume multiple (potentially expensive) products that may help counteract a declining metabolism and overall shift in physical health. However, this is only conjecture because weight gain was not controlled for in the current study. Furthermore, age, maturity, and experience do not necessarily serve as protective factors from body image issues; many men of this age not only desire to slow down the aging process and boost their energy, but also enhance their sexual performance.

The most apparent difference between middle-aged men and the two younger cohorts was that they did consume (proportionally) more health and well-being APEDs, and thyroid hormones. At an age when men are concerned about fat and weight gain, cutting drugs and thyroid hormones can be used to regulate the function of the thyroid and reduce fat.

#### 4.3 Limitations and future research

Like all studies, this study had limitations that warrant discussion. First, although the overall sample was large and represented a diverse group of men, we had an insufficient number of men who reported use of certain APEDs. Because of this deficiency, we were unable to conduct useful multinomial logistic regression analysis to determine whether body image outcomes predicted the use of spe-

cific types of APEDs. Thus, for future studies we will need to oversample potential participants to ensure a sufficient sample size for meaningful analysis. Second, the significant effects of the sexual orientation covariate indicate a need for future research, especially because sexual orientation has been established as a risk factor for body dissatisfaction [12]. Therefore, it may strengthen the relationship between age and body image concerns. Future studies might also take into consideration the interaction of other variables, such as ethnicity and income, in relation to attitudes and behaviors on body image measures and APED usage. Thus, it is possible our results may underestimate the strength of some of the relationships among the variables. Finally, by restricting the current study to fitness enthusiasts, we did not gain any information on a significant part of the population—men who are less invested in health and fitness.

## 5. Conclusions

Because body image is a current topic of interest across many disciplines (e.g., psychology and health studies), our findings have multiple implications. The findings from this study may inform mental health professionals who work specifically with men with body image disorders and at-risk populations. The findings could also be beneficial in clinical settings by familiarizing clinicians with focused knowledge of intergenerational dynamics, which allows for better understanding of the diversity of challenges and opportunities facing each age cohort with respect to the aging body.

This study confirms that body image concerns are not exclusive to younger men, and they continue to play a significant role in the maintenance of men's self-schema as they age. Although we cannot make causal claims regarding the association between age and body satisfaction, our study offers new insight on the body experiences of the aging male, especially the established adult age cohort that has been largely overlooked in research of the adult lifespan [5]. Our findings suggest that aging men are just as invested in their appearance as their younger counterparts, and as the case with established adult men, even more invested than younger men.

## Abbreviations

AAS, anabolic-androgenic steroid; APED, appearance and performance enhancing drug; MD, muscle dysmorphia.

## Author contributions

Conceptualization—JS; Data curation—JS; Formal analysis—JS; Funding acquisition—JS; Methodology—JS; Project administration—JS; Supervision—JS; Visualization—JS, XG; Writing—original draft—JS, RL; Writing—review and editing—JS, RL.

## Ethics approval and consent to participate

The authors complied with the American Psychological Association's ethical standards in the treatment of human subjects and received IRB approval for this study. IRB Ref #: 1540860-3. All research participants provided informed consent for this study.

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## Conflict of interest

The authors declare no conflict of interest.

## Materials and/or code availability

The data set associated with this study can be requested from the authors. It is currently not in a data repository.

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