

Fitness social media is positively associated with the use of performance-enhancing drugs among young men

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SUMMARY

The use of performance-enhancing drugs (PEDs) is at alarmingly high levels. Despite the risks associated with PEDs, young men are turning to these substances in pursuit of the perfect physique. One contributing factor to this pursuit may be the rise of fitness-related social media. The current study is set to examine the relationship between consumption of fitness social media and the intent to use PEDs among men who live in the United States (US) aged 18 to 35. The study also examines whether this relationship is moderated by attitudes toward muscularity. Specifically, we tested two hypotheses: (1) fitness social media positively predicts the intent to use PEDs; and (2) this relationship is stronger for individuals who value muscularity (i.e., idealized muscle size and definition). To that end, we measured usage of fitness social media, attitudes towards muscularity, and intent to use PEDs among 149 young men from the United States. We found that young men who consume fitness social media are more likely to use PEDs, but we did not find that this relationship is moderated by attitudes towards muscularity. These findings highlight the concerning influence fitness social media has on young men's illicit use of PEDs and can help to inform and guide the development of targeted interventions aimed at preventing the harmful usage of PEDs.

INTRODUCTION

Bulging muscles, popping veins, and biceps bursting through shirt sleeves—all staples of today's modern-day Adonis, but at what cost? The rise in the use of steroids among young men is a growing concern, as muscle-enhancing drugs increase the risk of early heart attacks, strokes, and other health-related issues (1, 2). With the number of performance-enhancing drug (PED) users at an alarmingly high level, estimated at 6.4% of men of the general population and 18.4% of men who engage in recreational sports, understanding the driving forces of muscle-enhancing drug use is increasingly important (3). One possible explanation for the rise in PED usage could be the consumption of fitness social media: media that promotes fitness in those who watch it. This led us to investigate whether the use of fitness social media is related to the use of PEDs.

The use of PEDs carries significant risks to long-term health (4, 5). However, these drugs have continually been used since the 1950's, as they provide an increase in muscle mass and strength for their users. With new developments,

such as high oral availability, PED use has become much more accessible to the general public (6). But with a popular consumer base comes the increased risk of ill-advised use and malpractice, potentially resulting in serious health problems such as heart attack, stroke, liver damage, infertility, depression, and aggression (4, 6).

One reason people may use PEDs is due to body dissatisfaction: a negative attitude towards one's own physical appearance (7). For women, body dissatisfaction typically leads to eating disorders like anorexia or bulimia. For men, body dissatisfaction is typically associated with excessive resistance training in pursuit of increased muscle mass (8). The media plays a significant role in creating men's ideal body standard, with images of bodybuilders, fitness models, and other highly muscular individuals' bodies frequently portrayed as attainable through hard work and dedication (9). However, some of the individuals showcased in fitness media may use PEDs to achieve their impressive physique without openly disclosing their PED use to their viewers.

This lack of transparency about influencers' PED usage directly impacts their viewers. The aspect in which young men compare themselves to others highly relates to the muscular body image portrayed by fitness-related social media (10). Typically, inspiring fitness among individuals, fitness social media provides information about physical health in terms of cardio, strength, endurance, body composition, and flexibility (11, 12). But the inspiration of positive fitness goals does not come without a cost. For example, fitness social media influencers often utilize photo filters and edit images to improve their appearance. This way, fitness social media perpetuates unattainable appearance ideals (12). Inadvertently, this may negatively impact their followers' body image. Believing such appearances are personally attainable, viewers go on a path of body comparisons and more often than not end at body dissatisfaction (8).

If hard work at the gym and healthy diets are not enough, young men might turn to other means of achieving their ideal: PEDs (13). Therefore, it stands to reason that the more a young man consumes fitness social media, the more he will be inclined to take PEDs. In fact, there is some evidence to suggest that fitness social media does influence PED usage. For example, teenage boys in Belgium who consumed fitness social media were found more likely to use PEDs than those who did not (14). The current study aimed to expand on this finding by looking at the relationship between fitness media and intent to use PEDs among men aged 18 to 35 years old in the United States.

Muscular body image may play a crucial role in the relationship between fitness social media and PED usage. Muscularity has become an increasingly popular trend in modern society, particularly among men (15). Muscularity is

defined as the degree to which the muscles are developed (16). Research has shown that individuals who highly value muscularity are more likely to use PEDs, as they perceive muscularity as a vital component of attaining their idealized physique (17). So, when it comes to fitness social media and the use of PEDs, attitudes toward muscularity probably matter. Therefore, the current study examined whether muscularity attitudes act as a moderating factor in the relationship between fitness social media consumption and PED usage among participants. Specifically, individuals with a more favorable attitude toward muscularity may be more susceptible than individuals with less favorable attitudes toward muscularity to the influence of fitness social media on their intention to use PEDs.

The current study aimed to investigate two hypotheses. First, that the consumption of fitness social media predicts the intention to use PEDs among adult males in the United States aged 18 to 35. Second, that favorable attitudes toward muscularity moderate the relationship between fitness social media and intention to use PEDs, such that the relationship between consumption of fitness social media and the intent to use PEDs will be higher among those with favorable, as opposed to unfavorable, attitudes toward muscularity.

We found that exposure to fitness social media is predictive of the intent to use PEDs among young men. We did not find that attitudes toward muscularity had a significant moderating effect on this relationship. These results shed light on potential PED prevention efforts, as they can be used to create more effective and targeted long-term interventions toward stopping PED usage, leading to lower rates of PED use among young men.

RESULTS

To test our hypotheses, we surveyed 152 participants via an online platform. Self-selecting to take the survey, participants chose to participate based on a brief description. We targeted men between the ages of 18 and 35, leaving us with 149 eligible participants. Participants completed four randomly ordered measures. They indicated (1) the average amount of time they spend on social media per day; (2) the percentage of social media use that was devoted to fitness-related content; (3) their willingness to use PEDs; and (4) their attitudes toward muscularity. Finally, they indicated their age and gender (**Table 1**).

A multiple linear regression model revealed that fitness social media positively predicts intent to use PEDs. To ensure that this is not an artifact of overall volume of social media use, we inserted general social media use as a control variable into the same model. It remains the case that, even with

both variables in the model, fitness social media positively predicts the intent to use PEDs (**Figure 1**). To account for potential outliers in the naturally skewed distributions of social media use, we conducted a robustness check with log-transformed values for fitness social media and overall social media usage. Again, a multiple regression model revealed a positive relationship between the log transformation of fitness social media and an individual's intent to use PEDs, adjusting for log-transformed overall social media use (**Table 2**). As another robustness check, we performed a binary conversion of the answer choices in the measure of intent to use PEDs and inserted that as an outcome variable in a new multiple linear regression model. In this binary conversion, intent to use PEDs was defined as any of the following answer options: definitely willing, probably willing, and somewhat willing. The overall prevalence of respondents who had intent to use PEDs was 28.19% of the whole sample. A multiple regression model revealed a positive relationship between fitness social media and the binary conversion of intent to use PEDs, adjusting for overall social media use (**Table 3**).

To test the moderating role of attitudes toward muscularity, we conducted a second multiple regression model. We did not find a significant interaction between fitness social media consumption and attitudes toward muscularity on the intent to use PEDs (**Table 4**). Although not statistically significant, it seems that the effect of fitness social media on the intent to use PEDs is stronger for those with favorable attitudes toward muscularity, as opposed to those with unfavorable attitudes toward muscularity (**Figure 2**). That said, because this pattern did not reach the threshold of statistical significance, we cannot confirm our second hypothesis.

DISCUSSION

In this study, we tested the effect of exposure to fitness social media on the intent to use PEDs among young men in the United States and the potential moderating role of attitudes towards muscularity. We found that individuals who spent more time on fitness social media were more likely to use PEDs. This finding is consistent with previous research that found fitness social media influenced the intent to use PEDs among adolescent boys in Belgium (14), and further expands on the research by verifying this trend among men aged 18 to 35 in the United States. The differences in both the age of the study population and the geographical location from previous research can provide valuable knowledge on the impact fitness media has on older age groups and in different cultural contexts, possibly highlighting the need for tailored means of prevention and intervention strategies to address the growing issue of PED abuse. In addition, as opposed to

	Mean	SD
Age	29.71	4.02
Hours spent on social media per day	3.67	3.22
Percentage of social media use that is devoted to fitness-related content	18.65	20
Willingness to use PEDs	1.97	1.17
Attitudes toward muscularity	28.89	6.79

Table 1: Sample descriptive statistics. Total N = 149. Willingness to use PEDs was measured as a mean score of a scale ranging from 1 to 5. Attitudes toward muscularity was measured as a sum score of eight items with a scale of 1 to 5 (scores range from 8 to 40).

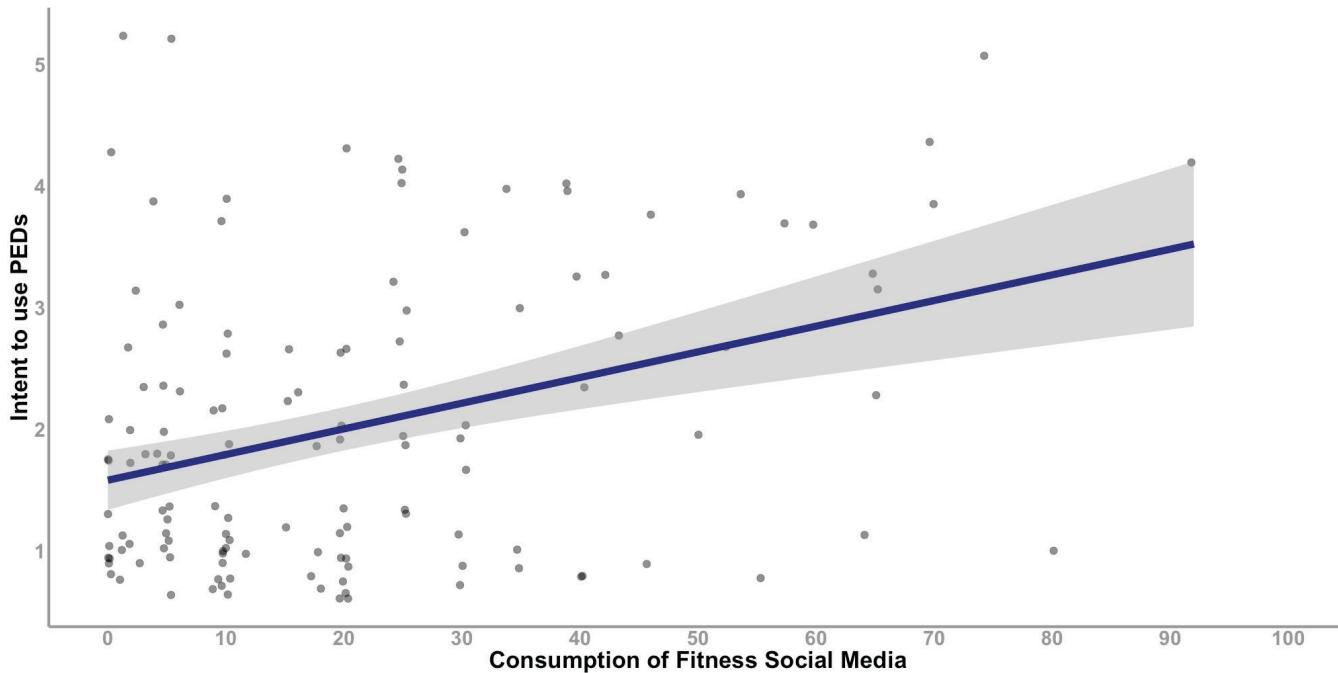


Figure 1: Fitness social media predicts the intent to use PEDs. Fitness social media predicts the intent to use PEDs, adjusting for overall social media use ($\beta = 0.39$, $t(146) = 4.37$, $p < .001$). The intent to use PEDs was measured on a 5-point scale (*Definitely Unwilling* to *Definitely Willing*). Consumption of fitness social media was measured as an estimated percentage of overall social media use. Data points in the plot are jittered.

	β	95% CI	t	df	p
Intercept	-0.00	[-0.18, 0.18]	0.00	116	.999
Fitness Social Media Use (Log)	0.24	[0.05, 0.43]	2.50	116	.014
Overall Social Media Use (Log)	0.03	[-0.16, 0.22]	0.33	116	.744

Table 2: Log-transformed fitness social media predicts intent to use PEDs, adjusting for log-transformed overall social media use. Beta coefficients are standardized.

	β	95% CI	t	df	p
Intercept	0.28	[0.21, 0.35]	8.20	146	<.001
Fitness Social Media Use	0.18	[0.10, 0.26]	4.53	146	<.001
Overall Social Media Use	-0.01	[-0.09, 0.07]	-0.28	146	.782

Table 3: Fitness social media predicts binarized intent to use PEDs, adjusting for overall social media use. The following answer options were coded as 1 (intending to use PEDs): *definitely willing*, *probably willing*, and *somewhat willing*. The rest of the answer options were coded as 0 (not intending to use PEDs). Beta coefficients are standardized.

	β	95% CI	t	df	p
Intercept	-0.02	[-0.19, 0.14]	-0.29	145	.775
Fitness Social Media	0.29	[0.12, 0.45]	3.34	145	.001
Attitudes Toward Muscularity	0.19	[0.02, 0.36]	2.16	145	.033
Fitness Social Media \times Muscularity	0.07	[-0.13, 0.27]	0.72	145	.475

Table 4: Attitudes toward muscularity do not moderate the relationship between fitness social media and the intent to use PEDs. Beta coefficients are standardized.

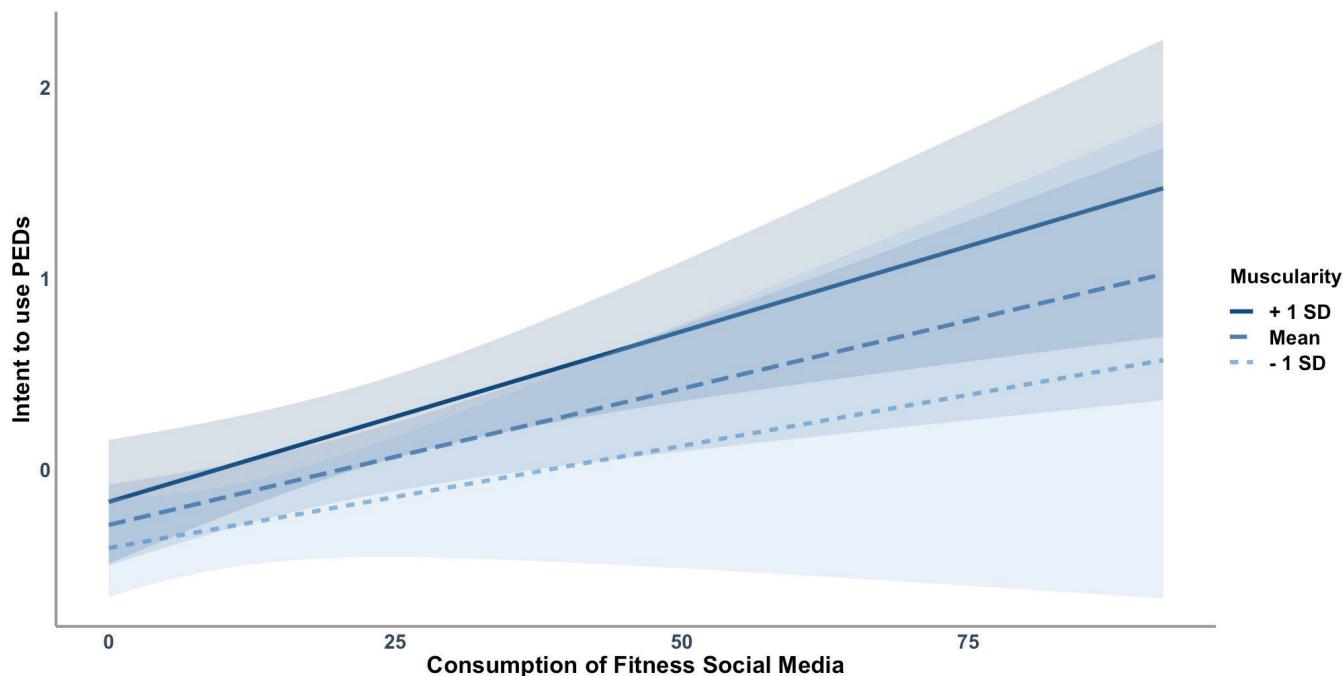


Figure 2: The relationship between fitness social media and the intent to use PEDs is not moderated by muscularity. Muscularity does not moderate the relationship between fitness social media and the intent to use PEDs, adjusting for overall social media use ($\beta = 0.07$, $t(3,145) = .72$, $p < .001$). Muscularity was measured as a sum score of eight items on a 5-point score (Strongly Disagree to Strongly Agree). The lines represent the mean, one standard deviation below the mean, and one standard deviation about the mean.

the widely studied effects of social media on women's body image, current findings highlight the less studied effect of fitness social media on men's body image.

We did not find an interaction between attitudes toward muscularity and fitness social media. We suspect that this smaller effect may be due to fitness social media reaching a broader demographic than those who highly value muscularity, with fitness social media attracting individuals who may be interested in improving overall health and fitness rather than solely achieving a muscular build. If an interaction exists between attitudes toward muscularity and fitness social media on the usage of PEDs in young men, greater statistical power would be necessary to detect it.

Despite the careful design of this study, there are still limitations that should be considered. First, the use of self-reported surveys from online platforms carries inherent limitations. Self-reported data are always subject to biases or memory related errors which can affect the accuracy of the reported frequency of social media engagement (18). Additionally, social desirability bias can be a factor that influences how participants choose to answer, even if completed anonymously (19). Combined with the limitations of data collection through online participant pool platforms, these limitations highlight the need for implementation of objective measures in future research (20). That said, self-reported measures still remain a valuable tool for research. Despite their limitations in predicting behavior, they have been found to be relatively predictive of social media use (21, 22, 23). And although concerns of sampling methods such as CloudResearch are valid, the benefits of these platforms far outweigh the costs (24). They offer great accessibility for participants and researchers, and they provide suitable data quality when combined with appropriate checks (25, 26).

Additionally, a limitation of this study concerns the generalizability of our findings. Participants did not indicate their location within the United States (US). Therefore, it is hard to estimate, based on the current study, the extent to which these findings generalized across the country. Further research efforts are needed to enhance the validity of the findings for the broader US through the inclusion of larger sample sizes and surveying participants from each region of the US. This would allow for a better understanding of the population-level impact and possibly show regional variations in the relationship between fitness social media and PEDs.

This current research does not claim a causal relationship between fitness social media and PEDs. As such, our investigation does not account for other possible variables involved in this relationship like socioeconomic status, self-esteem, influence of peers or social networks, athletic goals, etc. Instead, we show here that fitness social media and intent to use PEDs are related to one another. To fully account for potential third variables, a randomized intervention of exposure to fitness social media is needed. Current findings highlight the importance of examining this causal relationship in future applied research.

Nonetheless, the findings of this study have important implications for public health and possible future PED use prevention efforts related to fitness social media. Our findings suggest that exposure to fitness social media may be a risk factor for PED use among young men. We suggest future research study mechanisms of fitness social media that lead to the use of PEDs among young men in order to identify specific aspects of fitness social media that are particularly harmful. One such mechanism of fitness social media may be the constant exposure to unrealistic, muscular physiques like those of bodybuilders who post video logs, leading viewers

to create unrealistic expectations of their own bodies and fostering desires to achieve these naturally unattainable bodies. This, in turn, may lead individuals to engage in the use of PEDs to enhance their physical appearance to reach these standards. Experimentally manipulating the types of fitness social media participants are exposed to can inform its differential effects on the intent to use PEDs.

Another area that we believe will be important for future studies is the reason people view fitness social media to begin with. This may help to identify potential risk factors for PED use and inform prevention efforts. For example, results may find that men are drawn to fitness social media for social validation. In that case, prevention efforts may work towards emphasizing importance of self-acceptance rather than external validation. This could be studied with a mixed-method approach, using both qualitative interviews and quantitative surveys. Qualitative interviews could be conducted with men who actively engage with fitness social media to explore their experiences and perspectives. Then, quantitative surveys may be utilized to validate conclusions drawn from these qualitative interviews. With this mixed-method approach, a more comprehensive understanding of the motivation behind men's engagement with fitness social media and their intention to use PEDs can be achieved.

In conclusion, our research sheds light on the relationship between fitness social media and the use of PEDs. It is apparent that young men who live in the United States are negatively influenced by fitness social media in some regard, leading to the adoption of dangerous practices. This study emphasizes the need for immediate research among scholars and ensuing treatment among practitioners in order to develop interventions that target the harmful aspects of fitness media. Further research should look to better understand what these harmful effects are and how they affect body image, attitudes toward muscularity, and the use of PEDs.

MATERIALS AND METHODS

Participants

The 152 participants from the United States were recruited through Connect by CloudResearch. Participants self-selected into the survey based on pay and a short description of the study. Demographic criteria for participants in this study were men who lived in the United States aged 18 to 35. After excluding two women and one man older than 35 years from participation, the final sample consisted of 149 participants with an average age of 29.7 (SD = 4.02; range 18 to 35).

Social Media

To assess participants' social media use, we asked them to estimate the average number of hours (0 to 24 hours) they spend on any social media per day, including fitness social media.

Fitness Social Media

To measure the amount of time participants spend on fitness social media specifically, we asked them to estimate the percentage of their overall social media time that was spent on fitness social media (0 to 100%). Participants were provided with the following definition of fitness social media: *Fitness-related social media is any media that is intended to enhance one's physical health in terms of cardio, strength, endurance, body composition, or flexibility.*

Intents of Performance-Enhancing Drug (PED) Use

Participants were asked to indicate the extent to which they would be willing to use performance-enhancing drugs. They were provided with the commonly known names of nine different performance-enhancing drugs: Testosterone, Winstrol, Anavar, Tren, Anadrol, Ostarine, Testolone, Cardarine, and Ligandrol. Responses were collected using options that ranged from 1 (definitely unwilling) to 5 (definitely willing), with higher scores indicating a stronger intent to use performance-enhancing drugs.

Drive for Muscularity Attitudes Questionnaire

The 8-item Drive for Muscularity Attitudes Questionnaire (DMAQ) was used to assess participants' desire for muscularity (27). Participants were asked to indicate the extent to which they agreed or disagreed with statements related to the importance of being muscular and the desire to increase muscle size. The 8-item scale included six items like, *I would feel more confident if my lats (back muscles) were bigger*, as well as two reverse-scored items like, *I do not wish my arms were more muscular*. Responses were recorded on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total score for the questionnaire ranged between 8 and 40, calculated by summing the responses of all 8 items, with higher scores indicating a greater drive for muscularity. The internal consistency of the scale was sufficient at Cronbach's $\alpha = 0.88$. Externally, the 8-item DMAQ has been well validated and used in the past, demonstrating good psychometric properties (28).

Ethical Considerations

The study received exemption from IRB review (29) from the University of Toronto Research Ethics Board (REB) and was conducted in accordance with the Declaration of Helsinki.

Statistical Analysis

All analyses were completed using R version 4.2.2. Descriptive statistics were used to analyze participants' demographics, social media usage, and attitudes toward muscularity. Linear regressions were used to examine the relationship between fitness social media usage, overall social media usage, attitudes towards muscularity, and willingness to use PEDs.

Reproducibility

All materials, de-identified data, analysis scripts, and supplementary analyses can be found at the Open Science Framework: <https://osf.io/5zqub/>

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