"Notjustgirls": Exploring Male-related Eating Disordered Content across Social Media Platforms

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ABSTRACT

Eating disorders (EDs) are a worldwide public health concern that impact approximately 10% of the U.S. population. Our previous research characterized these behaviors across online spaces. These characterizations have used clinical terminology, and their lexical variants, to identify ED content online. However, previous HCI research on EDs (including our own) suffers from a lack of gender and cultural diversity. In this paper, we designed a follow-up study of online ED characterizations, extending our previous methodologies to focus specifically on male/masculine-related content. We highlight the similarities and differences found in the terminology utilized and media archetypes associated with the social media content. Finally, we discuss other considerations highlighted through our analysis of the male-related content that is missing from the previous research.

CCS CONCEPTS

• **Human-centered computing** → *Collaborative and social computing*; Empirical studies in collaborative and social computing;

KEYWORDS

gender, eating disorder, manorexia, bigorexia, anorexia, bulimia, male, social media, Twitter, Tumblr, Instagram

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1 INTRODUCTION

Eating disorders (EDs) are a set of psychiatric disorders that share a central tenet – the individual becomes obsessed with food intake, weight, and perceived body image [5] and are pervasive regardless of culture, gender, or racial divide. In the United States, it is estimated that approximately 30 million people of all ages and genders suffer from an ED [41, 46], which is in line with recent European statisitcs[43]. Recent research has shown the increase in ED prevanece rates across Asia, especially in South Korea, China and Thailand where prevalence rates are potentially a higher percentage than the US and other Western societies [69].

Many stereotypes surround EDs, namely that they are believed to be limited to women striving to meet Western ideals of a slender ideal body type [33] or that they are diseases commonly found in wealthy, higher socio-economic classes [2]. Gender stereotypes posit that men have lower risk levels of EDs due to lower levels of cultural pressure [82]. While these stereotypes might still be in popular fashion, research has debunked these theories, showing that individuals of different class structures [67] and genders [55] are just as likely to show indicators of ED behaviors and patterns.

In recent years, HCI researchers have devoted serious attention to characterizing ED activities in online spaces [15, 20, 30, 35, 62, 64, 79] and methods for the classification and prediction of EDs. [13, 14]. However, HCI research on ED activities analyzes the community as a whole without focusing on specific representations of sub-communities. In our previous work, we also began our online research based on these biased clinical underpinnings to inform the methods we used to characterize general ED content online [15, 64]. The datasets that resulted from this research were homogeneous with respect to gender and cultural diversity. Therefore, in order to better understand male characterizations of online ED activities and behaviors, we conducted a comparison study using the same methodological approach as our 2016 study [64]. Further HCI research is needed to address the absence of cultural diversity in these datasets.

A critical aspect of this assessment is understanding how we approached the concept of gender for this research. We utilize the concept of gender expression to define 'male' and 'masculine'. Because we are reviewing data and unable to inquire about one's gender identity, we can only assess the external appearance of gender identity as expressed through the social media content [3]. We utilized the formal definitions of male ("an adult human male"

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[47]) and masculine ("having qualities or appearance traditionally associated with men, especially strength and aggressiveness" [48]) to situate our understanding of male gender expressions within the dataset. This research makes several key contributions:

(1) Validating and extending the various characterizations of online male-focused ED content through a multi-platform content analysis of publicly posted content;
(2) Updating and contributing to our platform-independent corpus of ED terminology; and
(3) Describing how these findings support and challenge other ED and mental health research within social computing and HCI.

The primary goal of this research is to understand and begin to address biases in researching ED online content. We used our previous work as a vehicle to look at these larger issues. As HCI research in this area continues to grow, our hope is to represent a more inclusive and accurate population of people with this mental illness. While our study does not provide a full comprehensive range of male/masculine presentations of EDs, it does offer insights into how behaviors are similar and different than the current knowledge base. We hope that by highlighting the unintentional biases in our own previous work, we will encourage other researchers to take a more holistic, inclusive view of their research methods and study designs. **CAUTION:** This paper includes media and discussion that could potentially be upsetting to the reader. Please use caution when reading, printing, or disseminating this work.

2 BACKGROUND

2.1 Characterizations of Gender

A critical component to this research is the concept of gender and how it is characterized. Historically, male presentations of EDs have been perceived as rare and atypical — a perception that has resulted in the systematic underrepresentation of males in ED research [58]. Since our own previous work shares this bias, in this study we were eager to gain a more gender-diverse understanding of ED presentations online. To do so, we drew from gender socialization theories that engage gender as a social role distinct from biological sex. These theories view gender as at once a spectrum (as posed elegantly in the relational theory of men's health, which views the presentation of gender through the lens of different cultural and societal constructs [18]) and quantized (as shown by the Sex Role Theory of socialization which focuses on"two fixed, static, and mutually exclusive roles" [44]).

We also take care not to view gender in isolation, but as a social role that interacts with other facets of an individual's identity. A useful theory here is Intersectionality, a framework that takes into consideration how gender connects with other aspects of social stratification like race [19] or sexual orientation [78] and is used to identify how interlocking systems of power impact marginalized individuals [17]. The pressure to conform to a specific gender role, especially within the highly gendered space of ED, can be considered a form of oppression, and many male-presenting individuals with EDs encounter intersectional challenges. For example, gay and bisexual men have a higher prevalence of EDs than heterosexual men [29] and are seven times more likely to admit to binging and purging than their non-gay peers [8]. Other HCI researchers have begun to examine the complexities of intersectionality and compounded marginalizations across a variety of domains such as ICTD [27, 40], management information systems [76, 77], and design [39, 81]. Furthermore, it is increasingly understood that gender is an essential element to an accurate understanding of health and illness [7].

Inspired by these concepts, in this research we seek not to define or assign a gender to any particular person, but to (to the best of our ability) understand the interaction between their gendered presentations and other online behaviors. This approach allows us to draw attention to differences within and similarities across gendered representations of ED content in online spaces. This research contributes to a growing body of HCI research in both gender and mental health domains.

2.2 Eating Disorders

ED is a broad term used to describe a set of psychiatric disorders that share a central tenet — the individual becomes obsessed with food intake, weight and perceived body image [5]. This broad definition covers a myriad of diseases that have unique characteristics like Anorexia Nervosa, Bulimia Nervosa, Binge Eating Disorder, and Avoidant/Restrictive Food Intake Disorder. Regardless of distinction, there are several shared characteristics across all types of EDs: a disturbance of eating habits or weight-control behaviors, clinically significant impairment of physical or psychosocial health, and the behavioral disturbance is the primary issue and not an associated aspect of another physical or psychiatric condition [5, 28]. Additionally, there are emergent ED behaviors that have not yet been codified in the Diagnostic and Statistical Manual of Mental Disorders (DSM), which is the American Psychiatric Association's taxonomic and diagnostic tool [5]. These include issues like orthorexia (pathologic obsession for healthy nutrition [11]), diabulimia (restriction or omission of insulin by diabetics as a form of weight control [32], and bigorexia (described in-depth in the next section).

Bigorexia, which is also sometimes called megarexia and reverse anorexia, is a type of body dysmorphic disorder (BDD) [68]. Like most EDs, BDD is characterized by having an increasing ingrained dissatisfaction with a perceived body image and an unhealthy, disordered relationship with food, tenets of the shared definition of ED behaviors [5]. For the case of bigorexia, this disorder manifests through a form of muscle dysmorphia where the individual become obsessed with the size of their muscles in addition to having concerns about appearing underdeveloped and physically weak [31]. Based on these characteristics, bigorexia affects predominately bodybuilders, many of which are male [54]. Some of the earliest work occurred in the early 1990's when Pope et al. assessed reverse anorexia characteristics in male bodybuilders, characterizing this perceived lack of muscularity as a health risk [71]. A recent study by the BBC showed that an estimated 1 in 10 men that utilize public gyms exhibit characteristics of bigorexia [4]. While males tend to be the predominant patient demographic for bigorexia, women also suffer from this disorder [72].

This research helped shape our initial understanding of the complexity of ED behaviors and how traditional gender roles play a

distinct role in the presentation of EDs. We extend this line of research by validating these behaviors hold true when expressed in social media platforms and uncover new patterns of behavior that emerge from our dataset.

2.3 Gender Representation in Eating Disorders

Male or masculine examples of EDs are not new as there are records going back to the late 1600s documenting a case of a 16 year old male with food restricting behaviors [53]. Unfortunately, EDs are commonly assumed to be a female issue. This bias means that males with EDs are often overlooked, understudied, and underreported [34]. Within the Anorexia Nervosa domain, males account for less than 1% of the populations researched [56]. These levels of representation are in conflict with reality that males represent a larger percentage of individuals struggling with EDs than what was previously believed. The NIH estimates that males represent 5% to 15% of patients with anorexia nervosa and 35% of patients with binge-eating disorder [1]. When non-ED settings are assessed, these rates can rise drastically as seen with males making up to 67% of avoidant/restrictive food intake disorder diagnoses [61]. Within the minority of studies focusing on men, a majority of the focus has been on the psychopathology [49], treatment outcomes [73], symptoms [80], and experiences while receiving services [73].

The clinical constructs that define EDs also show gender bias towards females. The current diagnostic framework for EDs, as it relates to males and masculine representations, has recently been called into question [12, 56, 59, 60]. While there have been positive movement to address this issue, most notably the removal of amenorrhea from the DSM criteria Anorexia Nervosa, there is still a lack of patterns attributed towards aspects of orthorexia or reverse anorexia that are more typical with male presentations. These tensions within the diagnostic criteria of EDs and male representations point to a possible inadvertent gender bias in data that has used clinical constructs as a framework and filter for online analysis. These studies highlight the growing need for a more inclusive approach to ED study design and research.

2.4 Eating Disorders Online

The HCI and health literature show a growing body of work related to the use of online spaces to share content and communications related to EDs. Interactions in digital spaces encourage the sharing of knowledge, behaviors, and best practices in an effort to justify and amplify pro-disease normality [10]. These communities utilize a wide range of digital technologies including bulletin boards, blogs, traditional websites, email listservs, and social media platforms [9]. Contemporary HCI research has focused on characterizing ED activities in online spaces [15, 20, 30, 35, 62, 64, 79] and methods for the classification and prediction of EDs. [13, 14, 79]. This research does not distinguish between any cultural or gender differences.

Our previous study of the online characterizations associated with basic ED terminology grounds this research [64]. This research utilized a mixed methods approach to understand how ED terms are utilized across Instagram, Twitter and Tumblr. The outcome was a corpus of ED terminology and a set of media archetypes that were identified across the platforms. Additionally, this study validated findings from other research that highlighted the ways that online language morphs and transforms as community and platform moderation aims to remove ED related content from their communities [15]. We directly adopted our research design and data analysis approach from the 2016 study for this analysis.

The 2016 study contained only one term associated with the male gendered ED term: menwithED. In an effort to ensure that we were searching on appropriate terminology, we looked to the health literature on male-related EDs. Murray et al. is one of the only current examples of a pro-male ED study which assessed the use of blogs and websites in the pro-muscularity/bigorexia community [57]. In his previous work, he highlights the symptomology associated with 'bigorexia' and 'manorexia' [60]. To our knowledge, there is no study of male patterns of ED across popular social media platforms.

To understand the impact of biased sampling of ED content online, including our past research, we designed a follow-on comparison study using similar methodology to our previous work [46]. This new study contributes male terminology, media practices, and behaviors related to EDs online, shedding light on online activity "hidden" by biased search strategies.

3 METHODS

In keeping with our original study, we chose to anchor this research within Instagram, Tumblr, and Twitter and employ a mixed methods approach to the data analysis. We treated each post holistically; analyzing any media (gif, image, video), hashtags, and text included with the post. Below we discuss the data collection and analysis.

3.1 Extending the ED Terminology Corpus

To build the dataset, we started off with the only male-related ED from our previous study's dataset (menwithED) as our initial search term. Using menwithED, we conducted an initial search of all posts from Instagram, Twitter, and Tumblr from January 1, 2018 to July 31, 2018. After removing the posts related to erectile dysfunction, we ranked the most popular tags across the platforms and thus identified the most relevant male-related search terms connected to the previous study's search terms. 'MenwithED' was a very limited search term yet resulted with additional terms 'menwithanorexia' and 'manorexia'. Expanding the search with these terms resulted in the addition of 'manorexic' and 'malethinspo'. Additionally, based on the literature we include the term 'bigorexia' in our final dataset [4, 31, 50, 52, 54, 72]. The final search terms used for this study included: manorexia, manorexic, malethinspo, and bigorexia.

3.2 Data Collection

Using the refined search terms, we collected data from January 1, 2018 to August 15, 2018 from Instagram, Tumblr, and Twitter. In an effort to comply with platform policies and community standards, the data for this study was collected manually utilizing the platforms' in-platform search tools. All public metadata was collected. Because the dataset is comprised of only public data, this study was not subject to our institute's Institutional Review Board (IRB). Even though this study does not meet the burden for human subjects research, we took ethical considerations for the public data we collected (please see the section Privacy and Ethical Considerations later in this paper).

As with our previous study, we collected only English language public posts. The dataset included a total of 664 posts: 480 from Instagram, 104 from Tumblr, and 71 from Twitter. We randomly sampled 50% of this dataset, ensuring that platforms and search terms were accurately represented within the final dataset. We qualitatively analyzed 332 posts.

3.3 Codebook

We took a deductive approach to setting up the codebook for this study - we started with the 2016 study codebook as a baseline. To build upon it, we took an iterative, inductive approach: we used the initial codebook to categorize the hashtags and posts within the dataset. If a category did not exist, we flagged the post. We met several times as a group to discuss these posts and the new concepts found within the data, finally refining them into an additional four new categories. Initial categories include: anorexia, body, bulimia, depression, fitness, food, general, ED, identity, inspiration, mental health, other, post composition, recovery, self-injury, social support, suicide, weight. New categories include: bigorexia, drugs, gender, sexual orientation, social elicitation.

We used these categories to organize and compare the terminology corpus and media analysis. A team of three researchers met to discuss the previous code book, and apply it to a randomized 10% of the new dataset (33 posts). The team discussed the content and agreed upon an updated expansion to the code book. The team then co-coded an additional 20 posts to ensure we obtained consensus. The codebook is outlined in Table 1. All bold codes are new additions to the codebook from the 2016 study.

3.3.1 Category Definitions. We maintained the definitions of the parent codes from the previous study [64]. In this section, we define the new categories specific to this analysis (see Table 4). The *drug* category consists of variations related to anabolic steroids, and other drugs including testosterone, hgh (human growth hormone), dope and crack cocaine. The *bigorexia* category consists of lexical variations of the term bigorexia like 'bigorexique' and 'big0rexia'. The *gender* category is comprised of gendered terms like man, male, and trans. The *sexual orientation* category consists of terms related to sexual orientation like gay, queer, and bisexual and imagery like the pride flag. Finally, *social elicitation* is defined by terms or phrases used to elicit a social connection and primarily consisted of 'likes for likes,' 'follows for follows,' 'likes for follows,' and their lexical variations.

3.3.2 Assigning Codes. When assigning codes to the hashtags and the social media posts, we took a straightforward approach. First, the only category where the researchers made inferences on the content was the *Mood* category. During the iterative process, the researchers discussed type of mood that the hashtags and posts exuded and thus is a subjective assessment. For the *Sexual Orientation/LGBTQ* and *Gender* categories, no inferences were made. These categories included child codes of 'not given' to indicate if no specific text or media content indicated a specific gender or sexual orientation. It should also be noted that we are not inferring that the individual posting is representing a specific gender or sexual orientation, only that their specific post had representations of these categories.

Table 1: Modified Codebook

Parent Codes	Child Codes (new 2019 codes in bold)
Body Part	arm(s), back, breast/chest, collarbone(s), face/head, full body, hands, hip(s), leg(s), ribs/stomach, thighs, waist, **buttocks, feet, neck, shoulder**
Image Attribute	black and white, color, drawing, food/beverage, image (individual), image (group), image (other), selfie video
Mood	angry, artistic, happy, inspirational, neutral, painful, provocative, sad/ depressed, **anxious, promotional, secretive, strength**
Text	candid, inspiration (pro-disease), inspiration (pro-recovery), no text, **not disease related, not pro-disease**
Identification	identifiable, unidentifiable, **not me**
Focus	informational, neutral, pro-disease, pro-recovery, **deception, informal, showcase/display**
Sexual Orientation/ LGBTQ	**bisexual, heterosexual (context), heterosexual (denoted), homosexual (context), homosexual (context), not given, pansexual**
Gender	**androgynous, female, gender fluid, male, not given, transgender**

Some of the hashtags in our dataset represent multiple categories. These include tags like 'edtransboy,' 'transrex,' 'compulsive exercise,' and 'gayanorexia'. For this reason, we attached multiple codes to each term to reflect the various categories that these more complex terms represent.

3.4 Privacy and Ethical Considerations

There are differing views within the HCI community as it relates to public data and the ethics behind using it in research and in dissemination. For this research, we leveraged public data from Instagram, Tumblr, and Twitter and thus this research does not qualify for review under our IRB. This work does not make any diagnostic claims about EDs of the population we studied.

In our own past research, we have varied our methodology associated with de-identifying the content within our publications. There is a growing consensus amongst HCI researchers focused in mental health domains that content –including media and text –should be de-identified or paraphrased as to conceal the identities of the public accounts from where the data originates [6, 37, 64]. All of the images and text from posts that are presented here are either modified or paraphrased. If a piece of media could not be manipulated, we looked for similar images in popular news or magazine articles to serve as a proxy for the original media. We put each image presented in this paper into the Google Image Search

Table 2: Hashtag Analysis

Platform	Total Tags	Avg. tag/post	Std. Dev.	Range
Instagram	7598	15.54	8.65	1-30
Tumblr	923	9.05	6.38	1-29
Twitter	241	3.39	2.15	1-10

Table 3: Comparison of Individual Hashtags

	Instagram	Twitter	Tumblr
% of posts discoverable using 2016 search terms	29.8%	14.1%	85.3%
% of posts discoverable using 2016 corpus	77.1%	45.1%	93.1%
% of posts that would not have been collected using results from 2016 study	22.9%	44.9%	6.9%

engine to ensure that they could not be traced back to the individual accounts.

4 ANALYSIS

4.1 Hashtag Analysis

We analyzed the presence of hashtags used in masculine ED-related social media content and provide a categorized corpus of the terms. A total of 8762 hashtags were attached to the 664 total posts in the full dataset - 2570 of which were unique. On average there were 13.2 tags per post (SD = 8.9; range 1-30). This is comparable to the 2016 study which had an average of 11.7 tags per post with a SD = 9.0 and a range of 2 to 33. Table 2 shows the breakdown of these statistics by individual platform.

4.1.1 Validating the need for expanded search terms. We were interested to know how many of the posts in our dataset would have been found using only search terms from the 2016 study. Using only the final search terms from the 2016 study to filter our current dataset, 36.7% of the current dataset would have been collected. When we expanded this to include the entire ED terminology corpus, only 76.1% of the dataset was accounted for. This means that without the expansion of the terminology found in this study, 23.9% of the dataset would be missing from the knowledgebase generated from this expansion to the previous research. We compared the hashtags against the corpus from the previous and removed all duplicates. General ED, body parts, and fitness categories all contained greater number of terms than than the 2016 study. Table 4 highlights the breakdown of discoverable content per social media platform.

4.1.2 Categorical Assessment. While there is similarity between the previous study and our current study with respect to the hashtag metrics, the distribution across the organizing categories are drastically different. Table 4 shows these stark differences. The anorexia and bulimia category saw the greatest decreases when comparing the results of this study with the 2016 study's findings;

Table 4: Comparison of Hashtag Category Prevalence

Category	Previous Study (%)	Current Study (%)	△
Anorexia	15.0	4.9	-10.1
Bulimia	9.5	2.1	-7.4
General ED	8.9	11.9	2.0
Body	4.0	2.8	-1.2
Depression	4.0	1.5	-2.5
Fitness	0.9	9.0	8.1
Food/Diet	3.4	2.1	-1.3
Identity	3.3	13.4	10.1
Inspiration	7.4	8.5	1.1
Mental Health	3.3	5.2	1.9
Recovery	5.1	6.7	1.6
Self-Injury	7.1	0.1	-7.0
Social Support	1.7	1.7	-
Suicide/Death	5.2	0.2	-5.0
Weight	7.6	5.2	-2.4
Drugs	-	*0.6*	-
Bigorexia	-	*5.4*	-
Gender	-	*4.9*	-
Sexual Orientation	-	*1.9*	-
Social Elicitation	-	*0.2*	-

10.1% and 7.4% respectively. The male-focused dataset also saw less prevalence of self-injury and suicidal hashtags.

To contrast these findings, identity and fitness tags saw the greatest increase compared to the previous results. Identity terms were highly varied. The included terms associated with how an individual might characterize themselves ('grunge,' 'handsome,' 'body-builder,' 'model,' 'blogger,' and 'self-made') or related to their religion ('Christian,' 'Muslim'). Behavioral identity aspects were also identified in the dataset ('shameless,' 'shallow,' and 'superficial'). Other terms were associated with specific aspects of identity like 'body-image' and 'appearance'. Fitness tags focused mainly on 'bodybuilding,' 'workouts,' 'bulking,' 'gym,' and 'exercise.'

4.1.3 Lexical Variations. Like previous studies [15, 64], we also saw lexical variations across the different platforms and different hashtags. Examples include 'annorexya' and 'anoreskya' for the root-term 'Anorexia' and 'big0rexia' and 'bigorexique' for the root-term 'Bigorexia'. While the patterns of variation are similar to the previous research in this domain, we found less lexical variations than these studies.

4.1.4 Gender Descriptors. In the previous study, there was scant representation of gender in the dataset. By purposefully utilizing a lens of male gender and masculinity, our approach insured that the current dataset has a larger corpus of male gender-related terms. 4.9% of all hashtags were directly related to a gender marker. It should be stated that we are not inferring the gender of the individual posting the content or the subject of the content, we are merely assigning a category to the hashtags attached to the post.

Table 5: Comparison of Post Composition

Category	Previous Study (%)	Current Study (%)	△
Black and White	52.0	14.3	-37.3
Color	44.2	59.7	15.5
Drawing	3.7	3.9	0.2
Food & Beverage	9.4	0.2	-9.2
Image (individual)	54.1	57.1	3.0
Image (group)	3.1	6.5	3.4
Image (other)	25.9	9.1	-16.8

The gendered terms in our dataset were not just male-focused — of the 4.9%, 86.5% were explicitly male oriented and 11.9% were explicitly female oriented. Since one of the major search terms bigorexia is gender neutral, we anticipated seeing some slight variance in the gendered markers associated with the content yet were surprised by high prevalence of explicit female/feminine tags. We explore this further in the Discussion section.

4.1.5 LGBTQ/Sexuality Descriptors. Sexual orientation was another category of tags that was not present in the 2016 study. This category accounted or 1.9% of all tags. The hashtags in our dataset ranged across a spectrum of LGBTQ tags from gay to queer to bisexual to trans. Also included were slang terms used in the LGBTQ communities like 'twink,' 'musclebear,' and 'instagay.' Examples of posts are further explored in the *Media Analysis* section. As previously stated with gender-specific hashtags, no inference was made to the sexual identities of the poster or the subject of the post, just the assignment of a category to hashtags attached to the post.

4.2 Media Analysis

Of the 332 posts in our dataset, 69.4% had media attached to the post. Based on the technical affordances, 100% of the Instagram posts had media attached to the post. 56.9% of posts on Twitter and 33% of posts on Tumblr had only text associated with the post. As with the comparison of the hashtags, there are very drastic differences in the media composition (see Table 5). The color of images is one of these, with having 37% less black and white images than the previous study. We also found less images within the other category, which includes images of places and things. Additionally, there was a drastic decrease in the amount of images directly focused on specific foods and beverages (9.2%). The rest of the image attributes showed little variance between the previous and current studies.

In our dataset, 74.0% of the images contain one or more individuals, an increase from the previous study's 59.5%. We coded these images for the body parts that were the most prevalent in the image. The original codebook had ten body parts, to which we added an additional four. These posts averaged 2.5 of unique body parts per image (SD = 1.66) with 27.3% featuring the entire body. Table 8 shows the breakdown and how the code class compares to our previous data.

Figure 1: Examples of malethinspo

There are stark differences between the body parts that are highlighted in general and masculine ED posts. In this study, the masculine posts tend to showcase the arms, breast/chest, and shoulders where the previous study found posts focused mainly on the face/head, ribs/stomach, and thighs.

4.3 Media Archetypes

Our analysis of the dataset validated the archetypes found in the previous study while identifying new archetypes not found in the previous study. The archetypes described below are not comprehensive, but are representative of a majority of the posts within the dataset.

4.3.1 Thinspiration (Malespiration). Similar to the previous study, we found examples of text and media supporting thinspiration. In the diary-style documentation of an individual's ED, they shared, "Today is a great day! I am 723 calories today and have been exercising since 10 am. I really happy since I haven't logged that." While this post could be viewed as an important aspect of the individual using the social media platform to document or keep a diary of their progress, this also serves as a form of social support and 'thin inspiration'. Within the thinspiration category there were also similar patterns of sharing images focused on specific body parts viewed as desirable or ideal. Figure 1 highlights these ideals, from the both the bigorexia and anorexia perspectives.

4.3.2 ED Journey. The journey of typical EDs is a current status check of weight loss. Examples of this archetype within the male genre are represented within the dataset. Unlike the previous study, ED journey posts and media typically do not string together momentary updates on weight status as they typically have a starting image and an image of the individual in the moment and are void of metadata like weight, girth, and height. For the bigorexia genre, documenting the journey is the inverse of weight loss where additional muscle is the desired ideal. Additionally, there were several examples in the dataset of connecting the bigorexia and gender transition journeys. Figure 2 represents an ftm and bigorexia post.

4.3.3 Diet & Food. Food and beverage play a central and fundamental role in any given ED. Unlike the previous study, the diet and food tags did not display examples of fruits, vegetables, or portioned meals. We observed a focus on protein and protein supplements used for building muscle mass as well as diet drinks and cigarettes as means to suppress the urge to eat. Figure 3 highlights media related to these descriptions.

Figure 2: Bigorexia + gender transition journey example

Figure 3: Popular diet/food media

4.3.4 Missing Media Archetypes. The dataset for this study contains few examples of the self-harm and suicidal ideation that were more prevalent in the previous study. The infrequency of these posts in our dataset means it is not representative to include it in the discussion of media archetypes for male ED. An example of text associated with the one self-harm post included 'cutboys' attached to an image of a razor blade. Examples of text associated with the suicidal ideation posts include 'male suicide,' 'suicide,' and 'suicidal'. The media attached to these posts were mainly black and white images or images of thinspiration.

Additionally, there are no representations of the mismatch that the previous study found represented in their data. This archetype was defined in the previous study as a post where the author uses media and text that share no relationship to one another. An example of this would be a post where the post text describes excitement about a football game, but the attached media is of thinspiration and the hashtags support pro-ED behaviors. Therefore, there will not be a discussion of these media archetypes in this paper.

4.4 New Media Archetypes

We uncovered several new media archetypes in the analysis of the male dataset, which are discussed in detail below.

4.4.1 Sexuality Representation/LGBTQ. In the previous study, one term in the ED terminology corpus was related to any expression of sexual preference: homosexual. The current study contained 48 unique LGBTQ-related terms that spans five categories within our dataset. Examples of these terms include: gayarab, gaybooty, gaylord, gaymuscle, homo, instagay latinotwink, lgbt, musclebear, queer, trans, transrexic, and twinks. The dataset does not contain any female-focused expressions of sexuality; given the focus of the paper this observation was not surprising. However, gay, bisexual, and queer terminology were all present in the dataset.

There were several different general types of LGBTQ posts in our dataset. The first type was where the individual would leave no other context of sexuality except for one or two hashtags. In these posts, the media attached have limited to no indicators of sexual identity of any kind. Examples of hashtags that were attached to these types of posts include 'gaymuscle,' 'gaytwink,' and 'queen'. Other posts used LGBTQ imagery, like the pride flag, in addition to related terminology.

Figure 4: Denial of ED Behaviors example

4.4.2 Female Representation. Bigorexia tends to be discussed mainly within male or masculine contexts. In our dataset, we found exemplars of women displaying the same patterns of their ED journey and inspiration pictures that showcase specific body parts. We also found media consistent with the archetypes found in the 2016 study, including thinspiration focused on thigh gaps and artistic expressions of sadness and depression.

We also found female content using the 'bigorexia' tag. This content departs from the traditional feminine examples of the before and after media that focuses on becoming thinner and is similar to the masculine bigorexia media that focuses on the development of muscle definition and tone.

4.4.3 Social Capital Elicitation. While analyzing the Instagram data, we found a group of posts that were broadcasting both ED content and behaviors while eliciting the development of social ties through the use of 'like for a like' or 'follow for a follow'. Other examples include: 'follow4follow,' 'follow4followback,' 'like4like(s),' 'like4follow(s)' and 'followforfollowback'. There was no context given in any of these posts as to why this convention was used and there were no commonalities across the posts in this category. Other themes and behaviors were distributed across the other categories without any perceived patterns.

4.4.4 Direct Denial of ED Behaviors While Using ED Tags. During our analysis of the dataset, we found an interesting characteristic within the Tumblr and Instagram data: the use of 'Not me' in the text of a post that is related to EDs. Figure 4 highlights the tension between this tag and the surrounding images and text in the post. This pattern was not reported in the previous study nor was it present in any of the female-related posts in this study's dataset. The 'not me' phrase was utilized in 19% of the posts in our dataset.

5 DISCUSSION

This study was designed to understand if there are differences between masculine and feminine characterizations of online ED behaviors and if differences do exist, to describe those characterizations. Our findings demonstrate that while there are similarities in the online presentation, there are stark differences between the

previous and current study. Below we will elaborate and describe these differences and discuss why these differences matter to HCI.

There are tensions in the literature related to gender and the characterization of EDs. Existing clinical ED frameworks are biased, as they are built upon a body of research that over samples female patients [51, 55]. Most definitely, social stigmas play a role in this sexual dimorphism. Additionally, males are less likely to seek help from a mental health professional in part due to these social stigma [38]. Due to this complex foundation, it would be expected that the online expressions related to this domain are equally, if not more, complex in their composition.

In our previous research, there was a fundamental assumption that the search terminology used, which is based on clinical symptomology and terminology, was inclusive of all genders struggling with EDs. We explicitly stated that we choose to utilize clinical terminology in order to bridge the divide between HCI and traditional health research in the technology and ED domain [64, 65]. Our study illuminates the gender bias within the health discourse of EDs is also present in previous ED-focused HCI research [14, 30, 64, 65, 79].

5.1 ED Social Media Content and Gender

Our data highlights the differences in the online presentation of EDs when gendered terminology is included. From a lexical standpoint, new variations of traditional ED terminology were found — both in a traditional sense that supports previous work in this domain like 'rexie' [15, 64] and new variations that take into consideration gender markers and the ED terminology (e.g. 'edtransboy', 'rexyboy'). New media archetypes were also found: social capital elicitation, direct denial of ED behaviors, and expressions of sexual orientation. The social capital elicitation, or 'follow-for-follow' in relation to ED posts was not only a new concept, but was not found in any of the explicit female/feminine posts in our dataset. While similar to the findings in the previous study where individuals would fast for a day for each like they received on a post [64], this archetype goes beyond in that it is an actual platform mechanism that could make the content more viral or accessible to a wider audience. Researchers focusing on developing and building interventions that sit within these platforms should be aware of these activities that manipulate the online community construction in favor of supporting their pro-disease activity.

The fact that 63.3% of this dataset would not have been collected using the 2016 search terms highlights the potential importance of examining and potentially expanding the methodologies used in HCI when conducting online characterizations of not just ED activities, but any type of human behavior. Even when we expanded the analysis to compare the entire 2016 study terminology corpus, 23.9% of the current dataset would not have been captured. This research raises concerns related to inclusivity and representation. We argue that researchers conducting work of this type should reflect on their data, focusing not on just what was found, but also what is missing. If we are conducting research focused on health, unless focusing on specific gender contexts is a core component of the research, we should strive to have greater representation within our datasets. By using a more multidimensional lens for the assessment [78], we were able to generate new knowledge and understanding of both the lexical patterns and the different media archetypes found associated with the online content.

5.2 Exploring the Inclusivity of Digital Self-Harm

In previous work, we define digital self-harm as the online communications and activities that leads to, supports, or exacerbates the intentional harm or impairment of an individual's physical well-being [65]. This definition follows the pattern we employed in our 2016 study – relying on clinical constructs to anchor our research, and unintentionally integrating the inherit bias embedded in those clinical constructs into our methodology. We encourage other researchers to reexamine their knowledge base, incorporating a lens of inclusivity, and assessing how this more inclusive framing changes their understanding of this critical domain.

The research that we present here highlights a need to re-examine our definition of digital self-harm, focusing on how a more purposeful and nuanced integration of gender and culture might lead to critical updates and expansions to the definition. Our community needs additional research to understand the prevalence and impact of gender and other cultural biases in the greater context of mental health and computing. The use of social media data to identify and predict mental illness has been a robust vein of research [14, 16, 24, 25, 36, 42, 63, 74, 79]. If a key goal is to build algorithms and tools that are released and used publicly, it is imperative that as a community we focus on these potential biases like this research and other emergent work [26].

5.3 Validating Previous Research

The research on cross-sectional data suggests that males with ED have distinct differences from females with ED. One of the key differences presented by Striegel-More et al. is that males are more likely to report a greater array of psychiatric comorbidities [75]. Compared to our previous study, our current male-focused study had an increase of 1.9% in declarations of comorbid mental health issues with an additional nine new terms, most of which focused on ADHD, OCD, and obsessive tendencies.

When assessing differences in characteristics of specific EDs, we find that the data from this study further validates past research findings that offline behaviors are consistent with online presentations. Within the anorexia community, men tend to focus on different dietary goals, those that enhance leanness and muscularity over thinness and emaciation [70]. Our data confirms this finding through the content within the identity, fitness, and diet categories of our content analysis. When we compared the terms associated with the presentation of weight, the 2016 study (utilizing more feminine based root terminology) found terms associated with thinness like 'thyn,' 'size0,' and 'beskinny' compared to the current study (utilizing more masculine root terminology) which found terms more associated with muscularity like 'thick,' 'jacked,' and 'gains.'

With respect to bulimia, males have been found to be less likely to engage in activities like purging and the abuse of laxatives and are much more likely to practice extreme dietary restriction and excessive exercise [75]. Our data supports these observations with

an 8.1% change from the previous study with respect to different fitness activities found within the social media posts. Additionally, the previous study reported mentions of diuretics and different weight loss aides like laxatives. In our current study, the term diuretic and laxative do not appear in the dataset, yet drugs like anabolic steroids and hgh are 3x more prevalent than disclosures of self-injury or suicidality.

5.4 Further Exacerbation of Healthcare Disparities in Eating Disorders

HCI researchers are building upon our shared knowledge of how different types of mental illness are characterized online in an effort to detect if someone is at risk for exhibiting symptoms or characteristics of a given mental illness [21–24, 45, 63, 66]. These are critical first steps in an ultimate goal of creating tools that potentially intervene at the early stages of self-presentation or initial searching for the type of content outlined in this paper and in the work of those trying to predict mental illness. Therefore, it is critical that the foundational knowledge used to build tools that strive to detect mental illness is as holistic and inclusive as possible.

If this knowledge base is limited in its capacity to identify individuals of different genders, cultures, or other type of segmentation of the general population, the technology runs the risk of further exacerbating existing healthcare disparities. In the previous section, we reviewed that males have additional social stigmas and both structural and cultural barriers to care with regards to traditional avenue of treatment for an ED. If the assumptions underlying technological advances in early detection and screening do not address these deficits, then the technology is primed to further compound healthcare disparities related to gender and culture.

6 LIMITATIONS & FUTURE WORK

There are several key limitations to this work. First, there is the potential to have over-sampled from the manorexia and bigorexia sub-communities, neglecting other hidden expressions of male EDs because of the limited nature of our final set of search terms. There is also the limitation that this work makes inferences that may include potential mischaracterizations of online content. For example, the term 'cut' appears in the lexical dictionary for this study in relation to both a self-harm action and a slang workout term. A benefit of our mixed methods approach is that it allows the researcher to view the full context of the post while making a final characterization. That said, unless we were to directly ask the individual about the motivation for using certain terms, all research that takes this approach will face this type of methodological constraint. Additionally, our dataset contained very little cultural variance. The media presented in this paper includes representation from western, middle eastern and latin cultures. Future work should build upon this foundation and expand to more nuanced articulation of gender and cultural expressions of ED behaviors online. Finally, the chosen platforms for analysis provide a limitation to this analysis. While males use Instagram, Twitter and Tumblr, there are other online communities that are more popular with this population, especially young males (e.g. Reddit and Youtube). For the sake of consistency in the development of this comparison study, we chose to limit our analysis to the three sites mentioned above.

7 CONCLUSION

The lack of a more inclusive and multidimensional understanding of the presentation of ED content online stems from, and further exacerbates, the marginalization of males in health-focused ED research. While it has been important to utilize clinical terminology and contexts in the grounding of HCI research focused in this domain, it is equally as important to recognize the limitations. These limitations include the potential disparities associated with frameworks biased to female-centric symptomology and psychopathology. As the HCI field continues to develop methods and technologies for the detection and treatment of EDs, we must take into consideration the complexities outlined in this discussion. If we don't, we run the risk of further exacerbating embedded healthcare disparities that we might not know even existed in the first place.

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