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My fitness pal usage in men: Associations with eating disorder symptoms and psychosocial impairment

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ABSTRACT

My Fitness Pal (MFP) is a calorie-tracking smartphone application that is gaining popularity worldwide. Although MFP has the potential to be a cheap and efficient weight-loss tool, concerns that MFP could trigger, maintain, or exacerbate eating disorder symptoms have been raised. Preliminary research has documented associations between MFP use and eating disorder symptoms in women with eating disorders and in undergraduate students. However, whether these associations exist additionally in a male-only sample has not been tested. Thus, we aimed to estimate MFP usage and examine its association with eating disorder symptoms and psychosocial impairment in a male sample. Cross-sectional data were analysed from 122 male participants (M_{age} = 28.4, SD = 8.93) recruited primarily through fitness-related social media sites. Around half (56%) of the sample reported having used MFP. Nearly 40% of users perceived MFP as a factor contributing to disorder eating symptoms to some extent. MFP users reported significantly higher levels of attitudinal (dichotomous thinking, shape, weight, and eating concerns) and behavioural (binge eating, dietary restraint) eating disorder symptoms and psychosocial impairment than non-users. Effect sizes were large. MFP use also predicted unique variance in global attitudinal symptoms after controlling for eating disorder behaviours, impairment, and demographics. That nearly one-third of men perceived MFP as a factor contributing to their disordered eating highlights the possible utility of enquiring about the use of calorie-tracking apps when screening and assessing for eating disorder symptoms in men.

1. Introduction

More and more people worldwide are using a smartphone (Andrews, Ellis, Shaw, & Piwek, 2015). With this has come a surge in the prevalence and popularity of people using smartphone applications (apps) that assist in the self-monitoring of various health-related behaviours, such as dietary intake and exercise activity (Luxton, McCann, Bush, Mishkind, & Reger, 2011). My Fitness Pal (MFP) is one of the most popular "health tracking apps" used by > 10 million people worldwide (Pagoto & Bennett, 2013). MFP is a calorie counting app that allows users to monitor their daily food intake. It also allows users to set personalized weight-related goals and provides feedback on how many calories and macronutrients are needed per day to achieve these goals. MFP also delivers a "warning signal" when pre-defined calorie and macronutrient levels are being approached, which may instil a greater sense of accountability toward one's weight-related goals (Evans, 2017). Compared to other calorie-tracking devises, MFP has one of the highest user satisfaction ratings (Consumer Reports, 2013).

Despite its potential as a cheap and efficient weight loss tool, some have raised concerns of MFPs (and other calorie-counting apps) potential to precipitate, intensify, or maintain eating disorder symptoms (Simpson & Mazzeo, 2017). Several hypotheses have been proposed to explain these concerns: For instance, unlike supervised self-monitoring used in standard eating disorder treatment, where the goal is to gain insight toward the nature, function, and pattern of disturbed eating behaviours (Fairburn, 2008), tracking calories through MFP for weight management purposes has been hypothesized to induce a pattern of dichotomous, perfectionistic, and obsessive thinking styles around numbers related to weight, calories, and macronutrients (Levinson, Fewell, & Brosof, 2017; Simpson & Mazzeo, 2017). Such thinking tendencies have been shown to be robust risk and/or maintaining factors for eating disorders (Pennesi & Wade, 2016). Moreover, some have also speculated that MFP may become a way for users to quantify their self-worth, thereby exacerbating the over-evaluation of weight and shape (Levinson et al., 2017). Initial findings suggest that MFP use is associated with eating disorder symptoms in undergraduate students (70% were female; Simpson & Mazzeo, 2017) and in females with an eating disorder (Levinson et al., 2017), although one study found no symptom

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differences in overweight individuals (65% females) who used MFP relative to other self-monitoring methods (Jospe et al., 2018). Importantly, Levinson et al. (2017) reported that more than one-third of participants (35%) felt that their MFP usage was largely contributing to their eating disorder. Overall, the fact that MFP could potentially trigger or exacerbate eating disorder symptoms suggests that such calorie-counting devices should be used with caution, particularly in "risky" populations (e.g., individuals with eating disorders, younger females).

In contrast, whether there are associations between MFP use and eating disorder symptoms in a male-only sample is not yet known. This is an important oversight, as identifying potential risk and exacerbating factors for eating disorder symptoms in males has, for many reasons, been increasingly recognised as an urgent topic of study (Strother, Lemberg, Stanford, & Turberville, 2012). For instance, empirical evidence suggests for the first time that certain eating disorder behaviours are increasing at a quicker rate in males relative to females in community-based settings (Mitchison, Hay, Slewa-Younan, & Mond, 2014). It is now estimated that between 4 and 8% of community-based males report engaging in binge eating, fasting, or compulsive exercise, and that as many as 85% of male students report being dissatisfied with their muscularity (Mitchison & Mond, 2015). In addition, research also suggests that the correlates and psychosocial consequences of eating disorder symptoms in males are equally severe as those reported in females (Mitchison, Hay, Slewa-Younan, & Mond, 2012; Raevuori, Keski-Rahkonen, & Hoek, 2014). Since men with interests in health and fitness have reported using MFP (or related calorie-tracking apps; IHS, 2013; Pagoto & Bennett, 2013), examining whether MFP has the potential to trigger or exacerbate eating disorder symptoms and related impairment in men is worthy of investigation, particular due to its implications around screening, preventing, and treating males at risk for an eating disorder.

We therefore aimed to build on this small body of literature by estimating MFP usage and testing the associations between MFP usage and eating disorder symptoms and impairment in males with a particular interest in health and fitness (see recruitment strategy in the method). Note that while we recognise the plethora of calorie-tracking apps available for use, the present study focused specifically on MFP. This was not only because MFP is one of the most popular calorie-tracking apps worldwide (Pagoto & Bennett, 2013), but also because we wanted to use the same methodological approach for assessing MFP use as Levinson et al. (2017) recent study (since there is currently no standardized measure of calorie-tracking app use), thereby extending from their work. Consistent with previous cross-sectional studies on MFP usage and eating disorder symptoms (Levinson et al., 2017; Simpson & Mazzeo, 2017), we hypothesized that MFP usage among males would be associated with more severe eating disorder symptoms and psychosocial impairment.

2. Method

2.1. Participants and procedure

Participants were 122 men recruited mostly through websites related to health and fitness. The mean age was 28.41 (SD = 8.93) and the mean BMI was 26.41 (SD = 4.35). Participants were primarily Caucasian (n = 95; 77.9%). Other ethnicities reported were: Asian (n = 12; 9.8%), Hispanic (n = 4; 3.3%), Pacific Islander (n = 3; 2.5%), African American (n = 2; 1.6%), and "other" (n = 6; 4.9%). None of the participants self-reported a diagnosed eating disorder. We recruited participants primarily through various social media outlets (i.e., Facebook, Instagram, Twitter etc.), online forums (e.g., Reddit), and word-of-mouth. To ensure a sufficient number of participants who use MFP, our advertisements were mainly distributed to fitness professionals' social media pages and to any fitness-related online forum/website. Eligible participants were males aged 18 years or older. Respondents were provided with a link to the online questionnaire. All participants completed the questionnaire instruments in the same order and at a time and location of convenience. No compensation was provided. Informed consent was provided by all participants. Ethics approval was obtained through Deakin University.

2.2. Measures

2.2.1. Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 1994)

The EDE-Q (version 6.0) is a 28-item self-report measure that assesses core behavioural and attitudinal symptoms of eating disorders experienced over the past 28 days. There are four subscales: eating concerns, weight concerns, shape concerns, and dietary restraint. A global score, which is a total measure of core attitudinal symptoms, is computed by averaging scores from all four subscales. Higher scores indicate greater symptoms. Internal consistency in this study was good for each EDE-Q subscale (α's = 0.72–0.92). Previous research has demonstrated good internal consistency (α's > 0.73; Reas, Øverås, & Rø, 2012; Rose, Vaewsorn, Rosselli-Navarra, Wilson, & Weissman, 2013) and temporal stability (r's > 0.79; Rose et al., 2013) for the EDE-Q global and subscale scores in male-only samples, although whether the four factor structure of the EDE-Q replicates in a male-only sample is not well-understood (for a review, see Berg, Peterson, Frazier, & Crow, 2012). However, evidence for a four-factor structure has been established in female samples (Berg et al., 2012). Objective binge eating was measured as the number of episodes in the past 28 days. Average number of episodes of self-induced vomiting, laxative misuse, and compulsive exercise was calculated to provide a measure of compensatory behaviour frequency.

2.2.2. Dichotomous Thinking in Eating Disorder Scale (DTES; Byrne, Allen, Dove, Watt, & Nathan, 2008)

We used the "eating subscale" of the 11-item DTES scale, which consists of four items that assess the tendency for one to think about food, dieting, and eating in an all-or-none fashion (e.g., diet success vs. diet failure or good food vs. bad food). Higher scores indicate a greater dichotomous thinking style. Internal consistency was excellent (α = 0.82). Evidence for validity (convergent validity, two-factor solution) and reliability (test re-test reliability, internal consistency) of this DTES subscale has only been established in a female-only sample (Byrne et al., 2008).

2.2.3. Clinical Impairment Assessment (CIA; Bohn et al., 2008)

The CIA is a 16-item self-report measure that assesses psychosocial impairment secondary to disordered eating symptoms (e.g., in the domains of work, relationships, mood, cognitive ability etc.) over the past 28 days. Items are summed to produce a total score. Higher scores indicate a greater degree of psychosocial impairment. Internal consistency was excellent (α = 0.96). The CIA has demonstrated internal consistency, test-retest reliability, and construct validity in female non-clinical, at risk, and clinical samples (e.g., Bohn et al., 2008; Reas, Rø, Kapstad, & Lask, 2010; Vannucci et al., 2012).

2.2.4. My fitness pal use

We used the same approach as Levinson et al. (2017) to assess MFP use. The two questions included (1) *Have you used My Fitness Pal to track your calories?* and; (2) *Did you feel that My Fitness Pal contributed to any pattern of disordered eating (e.g., binge eating) in any way*? The first question was a yes or no response. The second question was assessed on a 6-point scale, ranging from 1 (did not contribute in any way) to 6 (very much contributed).

3. Results

3.1. Preliminary analyses

Prior to conducting the main analyses, basic data screening and cleaning were performed. Missing data were first inspected. The BMI of four participants could not be calculated as height and weight were not provided. Moreover, 14 participants dropped out before the CIA was administered (the last measure). Thus, 14 participants had missing CIA scores and seven of these participants also had missing DTES scores. These data were missing completely at random, as indicated by Little's MCAR test: χ^2 (29) = 27.82, p = .527. Given this, and given that these data were missing for whole scale scores rather than for individual items, we present the results from an un-imputed dataset.[1] Outliers were then examined. Three univariate outliers (Z's > 3.29) were detected for compensatory behaviour frequency. Given these cases comprised only 2% of the total sample, and that the inclusion vs exclusion of these cases had no impact on our findings, we retained them in the analyses (Field, 2013). Normality was also inspected. As expected, binge eating and compensatory behaviour frequency were positively skewed. We therefore applied a log transformation to these variables. However, this transformation failed to improve the skewness. Non-parametric tests were thus used for these variables.

3.2. MFP use and contribution to disordered eating

Of the 122 male participants, 69 (56.6%) reported that they had used MFP to track their calories. Participants who reported using MFP were then asked whether they felt that MFP contributed to any pattern of disordered eating they may have experienced. As seen in Table 1, most participants (n = 29; 42.0%) indicated that MFP *did not contribute* to any pattern of disordered eating, and fewer participants reported that MFP *very much* (n = 7; 10.1%), *moderately* (n = 10; 14.5%), or *somewhat* (n = 9; 13.0%) contributed to any pattern of disordered eating.

3.3. MFP users vs. non-users

Group differences between MFP users and non-users on measures of eating disorder symptoms and psychosocial impairment were examined and are reported in Table 2. MFP users reported significantly higher scores on the EDE-Q global measure, the four EDE-Q subscales, objective binge eating frequencies, the DTES, and the CIA than non MFP users. Effect sizes were large. No significant group differences were observed for compensatory behaviour frequency (Table 2).

3.4. MFP as a unique predictor of eating disorder symptoms

We then tested whether MFP use could predict incremental variance in global attitudinal eating disorder symptoms (EDE-Q global scores) after controlling for eating disorder behaviours, dichotomous thinking, impairment scores, and demographics. Thus, we included age, BMI, binge eating frequency, compensatory behaviour frequency, dichotomous thinking scores, and CIA scores in Step 1. MFP use (coded as 0 = yes and 1 = no) was then entered in Step 2. Step 1 accounted for 80% of the variance in EDE-Q global scores, F (6, 97) = 64.37, p < .001. Step 2 accounted for 82% of the variance in EDE-Q global scores, F (7, 96) = 62.23, p < .001. MFP usage significantly increased the proportion of variance in EDE-Q global scores accounted for by the model (β = −0.15, p = .001), explaining a further 2% of unique variance: R^2_{change} = 0.020, F_{change} (1, 96) = 10.71, p < .001. Other statistically significant predictors of EDE-Q global scores were participant BMI (β = 0.13, p = .014), CIA scores (β = 0.52, p < .001), compensatory behaviours (β = 0.16, p = .003), and dichotomous thinking scores (β = 0.24 p < .001).

Table 1
Frequencies of Self-Reported Contribution of My Fitness Pal to Disordered Eating.

Degree of contribution to disordered eating	Frequency	Percentage
Very much contributed (6–5)	7	10.1%
Moderately contributed (4)	10	14.5%
Somewhat contributed (3)	9	13.0%
Did not contribute (2–1)	29	42.0%
Did not answer	14	20.4%

Table 2
Group differences between my fitness pal users and non-users on study variables.

Variable	Users	Non-users			
	M (SD)	*M* (SD)	*t*	*p*	*d*
EDE-Q global	2.61 (1.47)	1.36 (1.28)	4.91	< 0.001	0.91
Eating concerns	1.48 (1.48)	0.61 (1.01)	3.87	< 0.001	0.69
Weight concerns	3.08 (1.99)	1.62 (1.69)	4.26	< 0.001	0.79
Shape concerns	3.39 (2.06)	2.09 (1.94)	3.51	0.001	0.65
Dietary restraint	2.48 (1.32)	1.11 (1.26)	5.78	< 0.001	1.06
CIA scores	12.88 (12.31)	6.02 (9.41)	3.28	0.001	0.63
Dichotomous thinking	2.25 (0.88)	1.88 (0.72)	2.37	0.020	0.48
	Median (range)	Median (range)	Mann-Whitney U	*p*	*r*
Objective binge eating	1.00 (0–26)	0.00 (0 − 10)	1179.50	< 0.001	−0.35
Compensatory behaviours	0.00 (0–18.67)	0.00 (0–11.33)	1656.50	0.298	−0.09

4. Discussion

The aims of this study were to estimate MFP usage and to examine whether MFP usage was associated with eating disorder symptoms and psychosocial impairment in men who were recruited primarily through health and fitness-related websites. Around 56% of male participants reported having used MFP to track calories. We found consistent associations between MFP use and eating disorder symptoms and related impairment. In particular, MFP users consistently reported significantly higher levels of attitudinal (i.e., dichotomous thinking and shape, weight, and eating concerns) and behavioural (i.e., binge-eating, dietary restraint) eating disorder symptoms and psychosocial impairment (i.e., CIA scores) than non-MFP users. However, no group differences in compensatory behaviour frequency emerged, which was likely a result of the restricted variability in scores (i.e., 65% did not report the use of any compensatory behaviour) due to sampling non-clinical men. Importantly, MFP use even predicted a significant and small amount of unique variance in global eating disorder symptoms after controlling for the variance explained by eating disorder behaviours, psychosocial impairment, and demographics. Overall, present findings in a male-only sample are consistent with a small body of literature documenting associations between MFP use and eating disorder symptoms in women with eating disorders (Levinson et al., 2017) and undergraduate students (Simpson & Mazzeo, 2017).

Some important implications emerged from these findings. First, our findings suggest that health professionals screening or assessing males with elevated levels of eating disorder symptomatology may benefit from asking about the use of calorie-tracking apps. Given that over one-

[1] We also ran all the analyses again with these missing data imputed, using the Multiple Imputation Method (with 5 imputations). The results from the imputed dataset were almost identical to the results reported in this manuscript (without any imputation). Readers may refer to Supplementary Tables 1 and 2 for the results from the imputed dataset.

third of participants (38%) self-reported MFP use as a factor contributing to their disordered eating, an enquiry into calorie-tracking use may provide further information around the variables potentially implicated in the maintenance of eating disorder symptoms for some men. If prospective or experimental research demonstrates temporal links between MFP use and disordered eating, such information could have the potential to lead to more personalized or targeted early intervention approaches. A second implication from our findings is that manufacturers building, designing, or refining calorie-tracking apps like MFP should consider incorporating brief psychoeducation on eating disorders (e.g., what they are, what are the risk factors etc.), strategies on safe use (e.g., how to manage appropriately and healthily if one eats over their calorie limit), and GP or specialist referral information. Doing so may be beneficial for men who intend on using MFP.

This study has limitations that need to be addressed. First, this was a cross-sectional design, so no conclusions can be made regarding the direction of the observed relationships. For instance, we cannot ascertain whether MFP usage leads to disordered eating in some men or whether some men exhibiting symptoms of disordered eating seek out calorie-tracking tools like MFP. Future prospective and experimental designs are thus needed to confirm the temporal and possible causal nature of these relationships.

Second, we assessed usage via two single items and thus did not assess other important aspects of MFP use. In particular, it would have been beneficial to assess the self-reported reasons around *why* some men perceived MFP as a factor contributing to their disordered eating. For instance, perhaps some men report feeling like a failure when not meeting their calorie-related goals, and thus engage in disordered eating as a method to regulate such negative feelings. In addition, it would have been beneficial to assess whether participants were using MFP with or without a peer group. Using MFP with a peer group could perhaps be perceived by some men to induce various forms of maladaptive social comparisons (a known correlate of disordered eating; Pennesi & Wade, 2016). Finally, assessing the main reasons for MFP usage would have been valuable for further understanding our sample. For example, perhaps men with confidence in their health and fitness capabilities may not feel the need to resort to calorie-tracking apps, whereas men with existing symptoms seek out MFP in effort to regain control over their eating behaviour. Collectively, enquiring about this information is an important future direction for understanding the possible mechanisms that account for the MFP usage-disordered eating relationship.

Third, we only assessed usage of MFP, so we cannot ascertain whether those who did not report using MFP were not using other calorie-tracking apps instead. Thus, our study cannot determine whether it is MFP specifically that is associated with eating disorder symptoms or whether it was calorie-tracking apps in general.

Fourth, we note that the psychometric properties of many of the (sub)scales (EDE-Q, DTES, CIA) used in the present study have not been established in male-only samples. Although these scales have been used in, and administered to, male-only samples in several previous studies (e.g., Lavender, De Young, & Anderson, 2010), we cannot conclusively state that the same factor structure and reliability estimates (e.g., temporal stability) observed in female-only sample generalizes to male-only samples. This should be taken into account when interpreting the present findings.

Fifth, we did not collect information on the proportion of participants recruited through fitness-related websites versus participants recruited through non-fitness-related sources (e.g., the general community). It is possible that most of our sample was recruited through fitness websites and forums. This could explain why we observed large group differences on the outcomes. It may be that the MFP use-disordered eating relationships are moderated by recruitment source, with these relationships being strongest (or only present) in those interested or invested in health, fitness, and their forums. In that regard, our findings cannot be generalized to the broader male population. Ideally, these findings will prompt future studies to investigate for whom and under what conditions (i.e., moderating variables) these relationships between MFP usage and eating disorder symptoms exist. Finally, that most MFP users may have been recruited from fitness forums compared to non-users (who may have been recruited from other sources) suggests that the group differences observed on the outcomes could have been explained by tendency to visit these fitness websites rather than on MFP use itself. This limitation should be kept in mind, and future experimental research testing the causal relations between MFP usage and disordered eating is needed to build on these preliminary findings.

To conclude, this study adds to a small body of literature by showing that MFP use was consistently associated with eating disorder symptoms and psychosocial impairment in men likely to have an interest in health and fitness. That over one-third of men perceived MFP as a variable contributing to their disordered eating highlights the possible utility of enquiring about the use of calorie-tracking apps when screening and assessing for eating disorder symptoms in men. Further experimental and longitudinal research is needed in this area.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.eatbeh.2019.02.003.

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