

Do Recovery Apps Even Exist?: Why College Women with EDs Use (But Not Recommend) Diet and Fitness Apps over Recovery Apps

Elizabeth V. Eikey¹, Yunan Chen¹, Kai Zheng¹

University of California, Irvine, USA; eikeye@uci.edu, yunanc@ics.uci.edu,
kai.zheng@uci.edu

Abstract. Getting individuals to adopt condition-specific apps over general health apps remains an issue. Using EDs as an example, we explored 1) if users recommend the general diet and fitness apps they repurpose for ED recovery and 2) if they use condition-specific apps intended for recovery. We used semi-structured interviews and four questionnaires to investigate use and perceptions of diet and fitness apps and recovery apps with 24 college women with self-identified and clinically-diagnosed EDs. Using inductive coding, we generated themes to address their lack of use of recovery apps. We found the majority ($n=13$) would not recommend using general diet and fitness apps for recovery (compared to only 3 who would), yet most participants did not seek out a condition-specific app even when their objective was recovery. Four themes emerged around the non-use of recovery apps: lack of awareness, unpopularity or unfamiliarity, unwillingness, and lack of features or poor usability. In order to improve awareness as well as perceived popularity and familiarity of condition-specific apps, we suggest researchers and clinicians develop approved app lists, primary care clinicians become expert recommenders for evidence-based apps, and clinicians and educators leverage social media and college settings to reach these “hard to reach” populations.

Keywords: ED Recovery App, Diet and Fitness App, Mental Health, mHealth, Personal Informatics

1 Introduction

In recent years, there has been a proliferation of condition-specific applications (apps) – especially those for mental health conditions, such as depression and anxiety [1], bipolar disorder [2], and eating disorders [3, 4]. This is no surprise given the high rates of mental illness. The Centers for Disease Control and Prevention estimate that 50% of adults in the U.S. will develop at least one mental illness during their lifetime [1]. With the advancements to and prevalence of mobile devices, condition-specific apps hold significant promise as a supplement or alternative to delivering mental health services [5, 6]. However, one major challenge is getting individuals to adopt these condition-specific apps over more general apps. Using eating disorders (EDs) as an example, we investigate the perceptions of using general and condition-specific apps for recovery.

We focus on college women who experience ED symptoms and investigate why recovery apps are not used when the users themselves do not recommend the diet and fitness apps they repurpose for recovery. This is an important group to study given their high rates of ED symptoms and app use. Research has found that 13.5% of undergraduate women have positive screens for EDs [7], and 40-49% of college women engage in ED behaviors at least once a week [8]. Because ED behaviors are associated with poor dietary quality [9], depression, anxiety, self-injury, and substance use [7, 10], and can lead to malnutrition, amenorrhea, organ failure, depression, suicide, and death [11], treatment is crucial. However, treatment-seeking is low [1].

Although widely available, apps intended to support ED recovery and treatment may be underused. For instance, research has shown that some individuals with EDs repurpose or “appropriate” general diet and fitness apps, such as MyFitnessPal, in an attempt to support ED recovery rather than download and use a recovery-specific app [12, 13]. This is problematic because diet and fitness apps are not made with this population in mind and thus can trigger and exacerbate ED symptoms [12, 14–18]. Additionally, researchers, clinicians, and developers are exerting much effort to design and evaluate condition-specific apps that are better suited for those with EDs. Unfortunately, this means the potential promise of these apps to help with access to care, illness management, and symptom reduction may be at least partially unfulfilled. In order to develop solutions to this issue, there is a need to understand *why* ED recovery apps are not used – particularly from a population who appropriates yet would not recommend general diet and fitness apps. This research is part of a larger study about the use and perceptions of health apps among college women with EDs.

2 Methods

2.1 Research Questions

We sought to understand users’ perceptions of using general diet and fitness apps for ED recovery and their use and non-use of recovery-specific apps. Therefore, we identified two primary research questions:

RQ1: Do users recommend general diet and fitness apps for recovery?

RQ2: Do users utilize condition-specific apps (i.e., recovery apps) when their motivation is recovery? RQ2a: If not, then why not?

2.2 Data Collection

We used two data collection methods: surveys and semi-structured interviews. In total, four questionnaires were administered on Qualtrics: a demographic survey to obtain information about participants’ age, ethnicity, ED status, and type of apps used and three well-established surveys to assess their ED symptoms (similar to [17]): the ED Examination Questionnaire (EDE-Q 6.0) [19], the Eating Attitudes Test (EAT-26) [20], and the Clinical Impairment Assessment questionnaire (CIA 3.0) [21, 22]¹.

¹ For more details about these measures, please see [13].

The EDE-Q 6.0 is a self-report questionnaire that measures the frequency of key behavioral features of EDs in terms of number of episodes and in some instances number of days that the behavior occurred in the last 28 days [19]. It is comprised of 4 subscales that assess the severity of aspects of the psychopathology of EDs: restraint, eating concern, shape concern, and weight concern, which make up the global score [19]. A highly reliable and validated tool, EDE-Q is the most commonly used assessment for EDs [17, 23]. While there is no single cut-point, higher scores indicate greater levels of symptomatology. Similar to the EDE-Q, the EAT-26 is a 26-item self-report questionnaire that measures symptoms and concerns characteristic of EDs using quantitative items on a 6-point scale and 5 yes/no behavioral questions [20]. It is particularly useful in assessing ED risk. We included this in addition to the EDE-Q because it has a cut-point. The cut-off score recommendation is 19 and/or one or more of the behavioral questions; however, the EAT-26 score can be used as a continuous measure of disordered eating behaviors. Unlike the other measures, the CIA 3.0 assesses the severity of psychosocial impairment, such as general well-being, due to ED features in the last 28 days across 16 items on a 4-point scale [21, 22]. Because it captures aspects, like mood, self-perception, cognitive functioning, meaningful friendships, and work performance, not captured by the other measures, we chose to include it as a different indicator of ED symptoms. Higher scores indicate greater psychosocial impairment. Studies have found that a score of 16 is the best cut-point for predicting ED case status.

The semi-structured interviews sought to answer users' perceptions of diet and fitness apps and their knowledge and use of ED recovery apps. All data collection procedures took place April-November 2016. We audio recorded all interviews. All participants completed the demographic survey and interview, and 5 declined to participate in the other three surveys. At approximately 14 interviews, we saw repetitive themes in the participant responses, and they converged into the same points (i.e., data saturation) [24]. All 24 participants completed the interviews.

2.3 Data Analysis

The audio recordings consisted of 21 hours and 36 minutes for a total of 436 transcribed pages. We used open, inductive coding to generate themes based on our research questions [25]. After becoming familiar with the data, we generated high-level themes based on our aims. For example, in order to answer RQ2, we first marked each transcript based on if they use recovery apps. Then we iteratively labeled textual data based on participants' answers, which resulted in more specific categories. These codes were then grouped and refined to determine our final categories. For the quantitative data from the questionnaires, we used Excel and SPSS. Body Mass Index (BMI) for those 20 years old and older was computed using the U.S. National Institute of Health calculator². For those under 20 years old, BMI was calculated using the Centers for Disease Control and Prevention (CDC) calculator³ because for teens, BMI has to be interpreted relative to others of the same sex and age and thus is given as a percentile, calculated from CDC growth charts [26].

² https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm

³ <https://nccd.cdc.gov/dnpabmi/calculator.aspx>

2.4 Participants

Participants were recruited using paper flyers as well as digital flyers in some classrooms at a large university in the Northeastern U.S. and compensated \$25 each for approximately 1.5 hours of their time. Institutional Review Board approved all study measures, and informed consent was obtained in person for all but one participant who did a phone interview. Our inclusion criteria focused on college women with disordered eating behaviors (i.e., symptoms related to anorexia and bulimia nervosa [AN, BN]) who use(d) general diet and fitness apps because anorexia nervosa, bulimia nervosa, and related disordered eating behaviors tend to affect college women [7] and diet and fitness apps users tend to be younger [27, 28]. Because many women do not see a professional for their symptoms and thus never receive a diagnosis, we recruited both participants who were self-diagnosed and clinically-diagnosed. ED behaviors in this context may or may not indicate full clinical EDs (e.g., AN or BN) or qualify to be categorized as other specified feeding and eating disorder (OSFED) or unspecified feeding and eating disorder (UFED). We emphasize women's own perspectives and experiences with EDs and the importance of studying EDs even in the absence of a clinical diagnosis. We focus on symptoms and behaviors associated with AN and BN, which could be categorized as OSFED or UFED, because a number of behaviors associated with AN and BN are related, making differentiating AN and BN difficult [11]. Table 1 shows the ranges, means, and standard deviations for each ED measurement.

Table 1. EAT-26, EDE-Q, and CIA ranges, means, and standard deviations

Measurement	Range	Mean (SD)	Interpretation
EAT-26 Score	2-47	21.32 (10.63)	The mean exceeded cut-point of 19. Fifteen of 19 (78.9%) participants exceeded the cut-point. The mean score on the diet subscale was higher than the mean scores on either the bulimia and food preoccupation subscale or the oral control subscale, indicating higher levels of symptomology associated with diet, such as feeling guilt after eating, awareness of calories, etc.
<i>Diet</i>	2-32	14.37 (7.96)	
<i>Oral Control</i>	0-6	2.42 (2.06)	
<i>Bulimia & Food Preoccupation</i>	0-9	4.53 (2.74)	
EDE-Q Global Score	0.38-4.35	2.70 (1.04)	The global score is significantly higher than the norms reported in [29], $t(1550) = 3.5064$ $p = 0.0005$. The restraint, eating concern, shape concern, and weight concern subscales were all significantly higher than the norms, $t(1550) = 2.7932$ $p = 0.0053$, $t(1550) = 4.6036$ $p = 0.0001$, $t(1550) = 2.6623$ $p = 0.0078$, and $t(1550) = 2.9262$ $p = 0.0035$, respectively. This indicates high levels of symptomology.
<i>Restraint</i>	0.40-3.80	2.27 (1.13)	
<i>Eating Concern</i>	0.20-5.00	2.05 (1.22)	
<i>Shape Concern</i>	0.50-6.00	3.39 (1.37)	
<i>Weight Concern</i>	0.40-5.80	3.06 (1.50)	
CIA Score	3-36	14.84 (10.39)	The mean did not exceed the cut-point of 16. However, 9 of 19 (47.4%) participants reached this threshold, meaning they exhibit psychosocial impairment characteristic of EDs.

Participants were ages 18 to 23 with the mean being 20.63 years. The majority of participants identified as White (non-Hispanic) ($n=18$, 75%) with one from Israel. Three (12.5%) identified as Asian, Asian American, or Pacific Islander, 2 (8.3%) identified as multi-racial, and 1 (4.2%) identified as Native American or American Indian. All participants were current university students. Most participants had not been professionally diagnosed with an ED ($n=17$, 70.8%), and most reported being in recovery or recovered ($n=20$, 83.3%). Participants estimated they had an ED anywhere from 2 months to 7 years (mean=34.93 months; $SD=26.78$). Reported current BMI ranged from 18.7 to 32 (mean=22.90; $SD=3.58$).

3 Findings

3.1 Diet and Fitness Apps for ED Recovery (RQ1)

In our past publications, we reported that college women often appropriate diet and fitness apps for ED recovery (see [13]). However, this publication did not report whether or not user recommend these apps. When asked if they would recommend general diet and fitness apps to be used by others with EDs, the majority of participants ($n=13$, 59.1%) said no (7 [31.8%] said maybe and 2 [9.1%] said yes)⁴. Many felt very strongly that general diet and fitness apps were not appropriate for anyone with an ED let alone when trying to recovery from one. For example, one participant said *“I feel like, I feel like it's probably not the best app to like recover from an ED.”* [U07]. In response to recommending diet and fitness apps for those recovering from EDs, one participant simply said: *“No. Not at all.”* [U13]. Another felt so adamantly against them that she believes individuals with EDs should never use the app: *“I'd probably just ban them [someone with an ED] from the app, like completely ban them from the app. I definitely would probably take [it] away... just to prevent them entirely [from using the app].”* [U06]. Participants who were on the fence about recommending general diet and fitness apps believed the apps could be harmful or helpful depending on the type of ED a person has as well as their commitment and stage of recovery. Even many of those who believed the effects of general diet and fitness apps were dependent on these factors expressed concern about those with anorexia nervosa or individuals at risk of becoming too obsessive using these apps at any point, including recovery.

Most participants felt general diet and fitness apps trigger, fuel, or worsen ED symptoms (see [12] for more details). For instance, one participant said she would not recommend diet and fitness apps for ED recovery *“because obviously it's [the app is] just worsening it [ED] at this point.”* [U02]. Similarly, another participant explained that these apps can be harmful by feeding into the nature of EDs: *“I think EDs, it's a control mechanism. And I think the more control you have over things like that, the more you can do harm.”* [U19]. These general apps could have adverse consequences on users, thus making them unsuitable for recovery. The fact that diet and fitness apps are not recommended is unsurprising given the reported negative effects of diet and fitness apps, such as encouraging restriction and compensatory behaviors and making users feel extreme negative emotions [12].

3.2 ED Recovery App Use (RQ2)

Although most participants would not recommend diet and fitness apps for individuals with an ED or those trying to recover from an ED, they do not turn to condition-specific apps even when their objective is recovery. Despite many of them ($n=20$, 83.3%) reporting being in recovery and many attempting to use diet and fitness apps to help with their recovery process [12], most participants⁵ had never used ED

⁴ 2 participants did not provide an answer for this question.

⁵ 23 of 24 participants answered questions related to ED recovery apps.

recovery apps. In fact, 22 (95.7%) participants had never used recovery apps, and of those, 17 (73.9%) were unaware of their existence. Although 6 (26.1%) participants were aware of ED recovery apps, only 1 (4.3%) had every used a recovery app. Some who had heard of recovery apps became aware through college courses ($n=2$, 8.7%) and 1 (4.3%) through a nutritionist. Because the majority of participants did not use recovery apps, we focus on reported reasons why they *do not* use these ED-specific apps, including lack of awareness, unpopularity or unfamiliarity, unwillingness, and lack of features or poor usability, which is shown in Table 2.

Table 2. Reasons for not using ED recovery apps

Reason	# of Participants ⁶
Lack of awareness	17
Unpopularity or unfamiliarity	4
Unwillingness	2
Lack of features or poor usability	1

Lack of awareness. When asked if they had ever heard of or used ED recovery apps, many did not know of their existence. In these cases, participants had never been exposed to idea of recovery apps at all. For instance, one participant replied: “*No. Do they exist?*” [U07] Some participants talked about how they never thought about searching for recovery apps. For example, one participant stated: “*Huh! No. I don't know about that [ED recovery apps] actually. I've never thought about looking it up. I probably should do that.*” [U11] Similarly, another participant said: “*No. I didn't even know that they existed. I know about support groups. I didn't know about apps.*” [U12] This lack of awareness of ED recovery apps was prevalent and contributes to their lack of use.

Unpopularity and unfamiliarity. Users’ perceptions of the apps’ popularity and their familiarity with them were cited as reasons not to use recovery apps. Unlike the lack of awareness theme, in these cases, participants had heard about ED recovery apps but chose not to explore them. Two participants had heard of ED recovery apps in technology courses but did not use them. Not hearing about these types of apps outside of class led to the perception that these apps are unpopular, and in some cases, although participants had heard of these apps, they lacked a sense of familiarity about what they are and what they do. For example, one participant said she assumed ED recovery apps were not commonly used, which partially explained why she did not use one herself: “*My [technology] class, I think we did go over something about apps like that. But since I never really heard of them, I probably assumed that they're not that popular and like don't really, I never really explored them.*” [U04] She had some level of awareness of their existence but never looked into them due to perceptions about how commonly used they are. Another participant said she was not familiar with the features and functions of recovery apps, so she never bothered to use one: “*They mentioned something like them in my class, but I don't really know what they look like or like kind of what they do honestly.*” [U05]

⁶ 1 participant mentioned more than one reason for not using recovery apps.

Along those same lines, a couple of participants who were aware of recovery apps explained that they were not motivated to use them. For instance, one participant discussed how ED recovery apps were not at the forefront of her thoughts about apps. When asked if she ever used recovery apps, she said: *“No. I’m sure they exist, I just never thought to look for one.”* [U10] Another participant stated how recovery apps were not commonly discussed because of society’s lack of understanding of ED recovery. She said she had not heard much about recovery-specific apps *“because people don’t really think you have to recover from things like that too much.”* [U16]

Unwillingness. Participants expressed an unwillingness to use ED specific apps despite knowing about them. For example, one participant described a conversation with her nutritionist about using a recovery app but she refused: *“My nutritionist mentioned an app... mentioned getting one for people with EDs. I was like, ‘Listen, [nutritionist’s name], that’s not gonna work. Sorry.’ [laughs] I respect that they have that for people and I’m sure it works for people, but that’s not gonna fly. She was like, ‘Don’t worry...’ I mean, she’s like, ‘Just putting it out there, just letting you know.’ I was like, ‘Yeah, not gonna fly.’”* [U17] Another participant did not want to use a recovery app because it was an admittance of a very real yet self-diagnosed issue: *“I never really explored them just because I never really wanted to self-diagnose myself as having one even though I know like I did.”* [U04] This suggests that some users are not necessarily ready to commit to recovery, and therefore, they are not ready to give up general apps for condition-specific ones.

Lack of features or poor usability. Of those who were aware of ED recovery apps, only one participant had ever used any. The recovery apps she used focused mainly on positive messages: *“I think the one had positive quotes all the time, which was nice but I don’t think they were super, super helpful... I didn’t have it for that long. So, I don’t think they were very... I don’t know. It [was] more of a positive thing, so. I don’t think you could track food or anything on them.”* [U13] Although she thought the content of the app was appropriate, its lack of features made it unhelpful in supporting her recovery needs.

4 Discussion

Our findings show that while users repurpose diet and fitness apps for recovery, the majority would not recommend them to others for the same purposes. Recovery apps may be more appropriate, but users are not always aware of them.

4.1 Condition-Specific Goal Does Not Mean Condition-Specific App

Research has shown that some users with EDs initially select a diet and fitness app with weight loss or awareness in mind [12, 13]. However, when individuals’ motivations change from weight loss to ED recovery, some users continue to use general diet and fitness apps rather than search for and select a condition-specific app tailored to their needs (i.e., recovery) [13]. These prior works do not explore why this happens. Thus, our findings extend this research by shedding light onto why recovery apps are not used when diet and fitness apps are not recommended. Part of this may be

explained by their lack of awareness and perceived popularity of apps specifically for ED recovery. Because some had not heard of these apps at all, they did not think to search for them. Even if they thought there may be ED recovery apps or had heard of condition-specific apps, some assumed these types of apps were unpopular. This lack of name recognition and popularity contributed to why some users did not search for recovery apps. Compared to diet and fitness apps, recovery apps receive much less attention and have a smaller user base. Further, there may be stigma and privacy concerns associated with using recovery apps, which may falsely reinforce a perception that they are unused and unpopular. Research has shown women with disordered eating do not want to share information associated with diet and fitness when using an app [30]. This tendency to self-conceal is common among those with EDs, and some studies show that self-concealment predicts psychological distress in individuals with perfectionistic tendencies [31] (common with EDs) and disordered dieting [32]. Additionally, stigma predicts attitudes toward counseling for people with disordered eating [33], so it may also affect attitudes towards using recovery apps.

This may also be related to some users' unwillingness to use these apps; choosing to use a recovery app requires users acknowledge their ED in a more visible way, which some may be reluctant to do. Further, some may be in denial about their ED. Because recovery apps are not as well-known, they are not discussed in day-to-day life like more general, popular apps such as MyFitnessPal, which may further contribute to the potential stigma of using one. There is little opportunity for recovery apps to be viewed as typical (in contrast to diet and fitness apps which are normalized) and recommended by friends, which has been shown to influence the use of health apps [34]. For the few that had looked for apps more appropriate for ED recovery, they mentioned poor usability of these apps, which is consistent with prior analyses of some ED recovery apps [3]. This suggests that for some users, first impressions of one app may lead to a negative impression of entire app genre - meaning the design of one app influences users' willingness to even consider any similar apps in the future.

4.2 Improving Awareness of Condition Specific Apps

While we do not claim that apps will “solve” EDs nor should they be used in the absence of professional treatment, there is promise for apps in the mental health domain [5, 6]. Thus, investigating why these apps may not be used is important. While there may be numerous reasons (e.g., stigma) why recovery apps may not be selected, part of the issue may be cyclical: because ED recovery apps are not as popular, they are not as recommended, yet because they are not recommended, they are less popular. The question is how do we not only improve individuals' awareness of condition-specific apps that are appropriate (usable, safe, effective), especially for less common or stigmatized health conditions, but also promote these apps so individuals become more likely to search for and use them? We offer three suggestions, including expert-approved app lists, clinician involvement, and leveraging education and other settings (e.g., social media).

One important step in increasing awareness of condition-specific apps is to involve clinicians and other experts in deciding which apps are suitable and developing ways to “get the word out” to recommend appropriate apps. Although there is research that aims to evaluate apps on their adherence to evidence-based

principles [3, 35], there is no standard list of approved apps based on condition, and app stores do not evaluate apps for content. Through cross-disciplinary panels and workshops, a collaborative discussion among researchers in fields like Information Science, Medical Informatics, Human Computer Interaction, and Psychology could yield lists of approved apps for specific conditions. This could be a first step at creating and disseminating app information that can then be used and distributed.

In addition to developing a list of appropriate apps, creating an open dialogue about condition-specific apps is essential to increasing awareness of them, which is critical because our findings suggest perceived popularity and familiarity with apps helps determine whether or not they are used. As research has also shown, recommendations play a key role in users' awareness and willingness to search for and select certain apps [13, 34]. Perhaps primary care clinicians and other experts can act as advocates of certain apps and become a trusted recommender even for individuals not seeking mental health services, especially in university settings, where we know individuals are at an increased risk of developing EDs. For instance, one participant discussed how her nutritionist recommended an eating disorder recovery app, which led her to search for and use it. This approach can be used by other experts to help individuals learn about different tools to support their illness management. University health services, for example, could discuss or circulate approved recovery apps as part of all patients' visits (not just mental health visits). Healthcare providers could incorporate this practice when weight is measured at the beginning of appointments.

However, clinicians and other experts acting as trusted recommenders requires individuals have access to nutritionists or other healthcare professionals. How then can we bridge these pathways for those who do not seek formal help? We may be able to access these individuals by identifying other places and means to reach them, such as through social media and education settings. For instance, research has shown that most young adults and adolescents use social media [36, 37]. We may be able to partner with community organizations, universities, and national ED entities to have them "spread the word" about approved recovery apps via social media channels, like Twitter, Instagram, Facebook, and Snapchat, in order to increase awareness and popularity of these apps. Further, primary care clinicians may be able to reach individuals through social media and act as expert recommenders of recovery apps. Studies have shown young people are receptive to this. In fact, in a study of adolescents and young adults with psychotic disorders and non-psychotic mood disorders, Birnbaum et al. [36] found 63.6% were willing to have clinicians approach them on social media when they were experiencing symptoms. Therefore, this could be a space where otherwise "difficult to reach" individuals could be reached and the potential for alternative or supplemental healthcare services, such as apps, could be discussed and promoted. This is promising; however, more research is needed to understand clinicians' shifting roles as technology evolves.

Another hopeful avenue is education settings. Given the high rates of mental health issues among college students [38] and the fact that college may be the only time where one setting encompasses most aspects of an individual's life (e.g., career-related, social, health, and support services) in an integrated way [39], higher education settings may be ripe with opportunity to reach individuals dealing with mental health issues. It may be possible to run campaigns across campus (e.g., dining halls, gyms, classes, student resource centers, web-based resources,) about evidence-

based condition-specific apps, such as ED recovery apps like Recovery Record [40]. Creating an open culture around mental health could help improve the knowledge and identification of mental health issues [41] and reduce stigma [39] (which may make condition-specific app adoption more normalized), and developing intervention approaches around trusted resources, such as “approved” apps, could improve the awareness and perceived popularity and familiarity of those apps. Although interventions and campaigns may be successful in reducing stigma for mental health conditions (e.g., depression [42, 43]), more research is needed to test the effectiveness of these approaches for improving mental health app *adoption* for specific conditions.

4.3 Limitations and Future Research

It is important to note that these findings are not meant to generalize to all users, but rather provide a case in which we can look into users’ perceptions of general health apps for recovery and why users may not use condition-specific (i.e., recovery-focused) apps. It is possible that there is some sampling bias as all participants were recruited from one university. These findings may not represent an exhaustive list of all reasons users do not use recovery apps. Also, this research does not evaluate the role of app stores in promoting and contributing to the popularity of certain apps through proprietary algorithms as well as possible false-ratings. Thus, more industry—academic collaboration is needed. This research does not intend to claim that all participants have clinical eating disorders, but rather draw attention to the need to consider subclinical or underdiagnosed populations. This is important in order to improve individuals’ well-being if they are not ready to or cannot access professional services or are deemed “not severe enough” to qualify for a clinical diagnosis. Participants in this study did not use recovery apps, despite them being designed specifically to aid in the recovery process. Future research should explore who is using these recovery apps, how do they find out about them, and how do their outcomes compare to those who are using diet and fitness apps. Additionally, researchers should consider why users with other health conditions may use general apps rather than condition-specific ones and the benefits and drawbacks of doing so.

5 Conclusion

We examined users’ perceptions of using diet and fitness apps for ED recovery and found that while they do not recommend using diet and fitness apps for recovery, they do not utilize recovery or treatment apps. Through our qualitative investigation, we provide explanations as to why these condition-specific apps may be underutilized – most notably a lack of awareness of recovery apps. This study is a promising first step and provides a foundation to begin to address this issue.

Acknowledgements. We would like to thank our participants for sharing their experiences. This work was supported by the National Center for Research Resources, the National Center for Advancing Translational Sciences, National Institutes of Health (NIH) under grant UL1 TR001414. It is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

References

1. (2011) CDC Mental Illness Surveillance Fact Sheet. In: Centers Dis. Control Prev. https://www.cdc.gov/mentalhealthsurveillance/fact_sheet.html
2. Nicholas J, Larsen ME, Proudfoot J, Christensen H (2015) Mobile apps for bipolar disorder: A systematic review of features and content quality. *J Med Internet Res* 17: . doi: 10.2196/jmir.4581
3. Juarascio AS, Manasse SM, Goldstein SP, Forman EM, Butryn ML (2015) Review of smartphone applications for the treatment of eating disorders. *Eur Eat Disord Rev* 23:1–11 . doi: 10.1002/erv.2327
4. Fairburn CG, Rothwell ER (2015) Apps and eating disorders: A systematic clinical appraisal. *Int J Eat Disord* 48:1038–1046 . doi: 10.1002/eat.22398
5. Bakker D, Kazantzis N, Rickwood D, Rickard N (2016) Mental Health Smartphone Apps: Review and Evidence-Based Recommendations for Future Developments. *JMIR Ment Heal* 3:e7 . doi: 10.2196/mental.4984
6. Leigh S, Flatt S (2015) App-based psychological interventions: friend or foe? 12–14
7. Eisenberg D, Nicklett EJ, Roeder K, Kirz NE (2011) Eating Disorder Symptoms Among College Students: Prevalence, Persistence, Correlates, and Treatment-Seeking. *J Am Coll Heal* 59:70–707 . doi: 10.1038/nature13314.A
8. Berg KC, Frazier P, Sherr L (2009) Change in eating disorder attitudes and behavior in college women: Prevalence and predictors. *Eat Behav* 10:137–142 . doi: 10.1016/j.eatbeh.2009.03.003
9. Woodruff SJ, Hanning RM, Lambraki I, Storey KE, McCargar L (2008) Healthy Eating Index-C is compromised among adolescents with body weight concerns, weight loss dieting, and meal skipping. *Body Image* 5:404–408 . doi: 10.1016/j.bodyim.2008.04.006
10. Gillen MM, Markey CN, Markey PM (2012) An examination of dieting behaviors among adults: Links with depression. *Eat Behav* 13:88–93 . doi: 10.1016/j.eatbeh.2011.11.014
11. American Psychiatric Association (2013) Diagnostic and Statistical Manual of Mental Disorders (DSM-5), 5th Editio. American Psychiatric Publishing, Washington, D.C. and London, England
12. Eikey E V., Reddy MC (2017) “It’s Definitely Been a Journey”: A Qualitative Study on How Women with Eating Disorders Use Weight Loss Apps. In: ACM CHI Conference on Human Factors in Computing Systems (CHI ’17). ACM, Denver, CO, pp 1–13
13. Eikey E V, Booth KM, Chen Y, Zheng K (2018) The Use of General Health Apps Among Users with Specific Conditions: Why College Women with Disordered Eating Adopt Food Diary Apps. In: AMIA. San Francisco, CA
14. Levinson CA, Fewell L, Brosol LC (2017) My Fitness Pal calorie tracker usage in the eating disorders. *Eat Behav* 27:14–16 . doi: 10.1016/j.eatbeh.2017.08.003
15. Simpson CC, Mazzeo SE (2017) Calorie counting and fitness tracking technology: Associations with eating disorder symptomatology. *Eat Behav* 26:89–92 . doi: 10.1016/j.eatbeh.2017.02.002

16. Eikey E V (2016) Providers' Perceptions of the Impact of Weight Loss Apps on Users with Eating Disorders. In: Proceedings of the 2016 ACM SIGMIS Conference on Computers and People Research. ACM, New York, NY, USA, pp 19–20
17. Tan T, Kuek A, Goh SE, Lee EL, Kwok V (2016) Internet and smartphone application usage in eating disorders: A descriptive study in Singapore. *Asian J Psychiatr* 19:50–55 . doi: 10.1016/j.ajp.2015.11.007
18. Eikey EV, Reddy MC, Booth KM, Kvasny L, Blair L, Li V, Poole ES (2017) Desire to Be Underweight: An Exploratory Study on a Weight Loss App Community and User Perceptions of the Impact on Disordered Eating Behaviors. *JMIR mHealth uHealth* 5: . doi: 10.2196/mhealth.6683
19. Fairburn CG, Beglin S (2008) EDE-Q. In: *Cognitive Behavior Therapy and Eating Disorders*. Guilford Press, New York, USA, pp 1–5
20. Garner DM, Olmsted MP, Bohr Y, Garfinkel PE (1982) The Eating Attitudes Test: Psychometric Features and Clinical Correlates. *Psychol. Med.* 12:871–878
21. Bohn K, Fairburn CG (2008) The Clinical Impairment Assessment Questionnaire (CIA 3.0). *Cogn Behav Ther Eat Disord* 2–3
22. Bohn K, Doll HA, Cooper Z, O'Connor M, Palmer RL, Fairburn CG (2008) The measurement of impairment due to eating disorder psychopathology. *Behav Res Ther* 46:1105–1110 . doi: 10.1016/j.brat.2008.06.012
23. Berg KC, Peterson CB, Frazier P, Crow SJ (2012) Psychometric evaluation of the eating disorder examination and eating disorder examination-questionnaire: A systematic review of the literature. *Int J Eat Disord* 45:428–438 . doi: 10.1002/eat.20931
24. Marshall MN (1996) Sampling for qualitative research. *Fam Pract* 13:522–526
25. Thomas DR (2006) A General Inductive Approach for Analyzing Qualitative Evaluation Data. *Am J Eval* 27:237–246 . doi: 10.1177/1098214005283748
26. CDC Centers for Disease Control and Prevention About Child & Teen BMI. In: *Heal. Weight CDC*. https://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_child_rens_bmi.html
27. Fox S, Duggan M (2012) *Mobile Health 2012*. Pew Internet Am Life Proj
28. Smith A (2015) “The Smartphone Difference.” *Pew Res. Cent.* 1–60
29. Quick VM, Byrd-Bredbenner C (2013) Eating Disorders Examination Questionnaire (EDE-Q): Norms for US college students. *Eat Weight Disord* 18:29–35 . doi: 10.1007/s40519-013-0015-1
30. Eikey E V (2016) Privacy and weight loss Apps: A first look at how women with eating disorders use social features. In: *Proceedings of the International Conference on Supporting Group Work (GROUP)*. pp 413–415
31. Kawamura KY, Frost RO (2004) Self-concealment as a mediator in the relationship between perfectionism and psychological distress. *Cognit Ther Res* 28:183–191 . doi: 10.1023/B:COTR.0000021539.48926.c1
32. Masuda A, Latzman RD (2012) Psychological flexibility and self-concealment as predictors of disordered eating symptoms. *Sch Words Georg State Univ*

33. Hackler AH, Vogel DL, Wade NG (2010) Attitudes Toward Seeking Professional Help for an Eating Disorder: The Role of Stigma and Anticipated Outcomes. *J Couns Dev* 88:424–431 . doi: 10.1002/j.1556-6678.2010.tb00042.x
34. Peng W, Kanthawala S, Yuan S, Hussain SA (2016) A qualitative study of user perceptions of mobile health apps. *BMC Public Health* 16:1158 . doi: 10.1186/s12889-016-3808-0
35. Breton ER, Fuemmeler BF, Abrams LC (2011) Weight loss-there is an app for that! But does it adhere to evidence-informed practices? *Transl Behav Med* 1:523–529 . doi: 10.1007/s13142-011-0076-5
36. Birnbaum ML, Rizvi AF, Correll CU, Kane JM, Confino J (2017) Role of social media and the Internet in pathways to care for adolescents and young adults with psychotic disorders and non-psychotic mood disorders. *Early Interv Psychiatry* 11:290–295 . doi: 10.1111/eip.12237
37. Smith A, Anderson M (2018) Social Media Use in 2018. *Pew Res Cent* 4
38. Auerbach RP, Alonso J, Axinn WG, Cuijpers P, Ebert DD, Green JG, Hwang I, Kessler RC, Liu H, Mortier P, Nock MK, Pinder-Amaker S, Sampson NA, Aguilar-Gaxiola S, Al-Hamzawi A, Andrade LH, Benjet C, Caldas-De-Almeida JM, Demyttenaere K, Florescu S, De Girolamo G, Gureje O, Haro JM, Karam EG, Kiejna A, Kovess-Masfety V, Lee S, McGrath JJ, O'Neill S, Pennell BE, Scott K, Ten Have M, Torres Y, Zaslavsky AM, Zarkov Z, Bruffaerts R (2016) Mental disorders among college students in the World Health Organization World Mental Health Surveys. *Psychol Med* 46:2955–2970 . doi: 10.1017/S0033291716001665
39. Hunt J, Eisenberg D (2010) Mental Health Problems and Help-Seeking Behavior Among College Students. *J Adolesc Heal* 46:3–10 . doi: 10.1016/j.jadohealth.2009.08.008
40. Tregarthen JP, Lock J, Darcy AM (2015) Development of a smartphone application for eating disorder self-monitoring. *Int J Eat Disord* 48:972–982 . doi: 10.1002/eat.22386
41. Jorm AF (2012) Mental health literacy; empowering the community to take action for better mental health. *Am Psychol* 67:231–243 . doi: 10.1037/a0025957
42. Hammer JH, Vogel DL (2010) Men's Help Seeking for Depression: The Efficacy of a Male-Sensitive Brochure About Counseling. *Couns Psychol* 38:296–313 . doi: 10.1177/0011000009351937
43. Finkelstein J, Lapshin O (2007) Reducing depression stigma using a web-based program. *Int J Med Inform* 76:726–734 . doi: 10.1016/j.ijmedinf.2006.07.004
44. Murnane EL, Cosley D, Chang P, Guha S, Frank E, Gay G, Matthews M (2016) Self-monitoring practices, attitudes, and needs of individuals with bipolar disorder: Implications for the design of technologies to manage mental health. *J Am Med Informatics Assoc* 23:477–484 . doi: 10.1093/jamia/ocv165