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Using physical health apps to promote healthy lifestyles in youth mental healthcare: A nationwide perspective-gathering exercise of over 400 service users

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ABSTRACT

Digital technologies have presented a myriad of new solutions for improving cardiometabolic and behavioural health in the general population. However, the ways in which such advances could be applied to address the heightened health-risk behaviours and associated diseases in mental healthcare is unknown. To examine this, 492 young people with mental illness (YPMI) were recruited from 27 Primary Care and NHS mental healthcare sites across the UK, covering various diagnoses (excluding eating disorders). Participants were presented with four types of physical health apps, delivering: 1) Health Tracking; 2) Health Coaching; 3) Health Connections; and 4) Instructional Videos, and completed an online perspective-gathering exercise on the preferred utility, features, behavioural targets of these technologies, and barriers/facilitators to uptake. Results showed a high level of perceived utility across each of the four app types, with physical activity, sleep and diet emerging as preferred behavioural targets. Feedback on ideal app features indicated a need for integrated physical-mental health tracking, and expert-led instructional content/coaching, with less interest expressed towards sharing data with clinical teams. These findings can improve the development, future trials, and clinical implementation of digital lifestyle interventions in mental healthcare, through better accounting for the needs and preferences of YPMI.

1. Introduction

Individuals with a mental health condition have a 1.4- to 2-fold increased risk for obesity, diabetes, and cardiovascular diseases when compared with the general population (Firth et al., 2019). This increased risk is due to a myriad of factors, including metabolic side effects from psychotropic medications, insufficient access to adequate physical healthcare, and increased risk of adverse health behaviours such as smoking, poorer diet, and physical inactivity (Correll et al. 2015; Firth et al. 2019). Over time, the poor physical health associated with long-term mental illness leads to a greatly reduced life expectancy compared to the general population, the extent to which this disparity has been recognized as a human rights issue (Thornicroft 2013).

Despite the increased risk, physical health is frequently neglected in both primary and secondary care services for mental illness (Bailey et al. 2019; Firth et al. 2019; Thornicroft 2013). Significant barriers to

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implementation exist including negative attitudes towards physical health programs, competing work demands, and lack of management support, possibly due to the exorbitant demands already placed on the under-resourced mental health services (Bartels et al. 2015; Stanton et al. 2015). One emerging opportunity for improving physical health monitoring and interventions in mental healthcare is through scalable and affordable solutions that could potentially be provided through digital technologies, which are well-positioned to reduce barriers to access (Sawyer et al. 2023). In particular, the use of smartphone or mobile health (mHealth) technologies for promoting behavioural health have gained increasing attention (Agulleiro et al. 2023; Naslund and Aschbrenner 2021). However, while recent years have seen considerable investment, research and implementation in using mHealth to improve physical healthcare in the general population, the extent to which these developments could be applied in the context of mental healthcare is under-researched.

Furthermore, while youth in general are interested in digital mental health interventions, they also desire new tools that they perceive as a better-fit to their desired uses (Sawrikar and Mote 2022). This finding is buttressed by recent studies showing multimodal digital health interventions have been ineffective for promoting healthier lifestyles in youth (Champion et al. 2023). Therefore, researching how a new generation of digital technology can be used to promote physical health in mental healthcare is important to ensure youth are not overlooked or left behind from continued technological advances and new interventions.

As physical health typically begins to deteriorate during the early stages of mental illness (Launders et al. 2022), mHealth could be utilized to support timely preventative health interventions; aiming to reduce or delay the onset or exacerbation of comorbid physical health conditions in young people treated for mental health conditions (Carney et al. 2016; Sawyer et al. 2024; Stubbs et al. 2016). This population may also be particularly well suited to mHealth interventions, given the higher levels of adoption and usage of smartphone technologies (Berry et al. 2016; Firth et al. 2016; Torous et al. 2021).

We conducted a nationwide online perspective-gathering exercise among Young People currently receiving treatment for Mental Illness (YPMI), seeking to establish the preferred uses of such technologies for service users of youth mental healthcare, and their perspectives on ideal components / features of mHealth interventions for improving their lifestyle and physical well-being. We also sought to examine how key putative clinical and demographic factors influenced the overall desirability of certain types of health apps, and how the preferences for specific features differed across clinical and demographic groups.

2. Method

2.1. Study design

This perspective-gathering exercise was conducted cross-sectionally and remotely using REDCap, as part of a broader online study (which also assessed the service users' current uses of digital technologies and online platforms for managing their physical health, as a topic for future examination). Ethical approval was gained from the North West – Preston Research Ethics Committee (21/NW/0198).

2.2. Recruitment and inclusion criteria

Participants were recruited through clinical services advertising the study via flyers, posters, and invitation letters to service users and through their services' social media accounts and webpages, all using standard wording. The inclusion criteria required that participants self-report they: (a) were aged 16 – 30 years old; (b) had received a clinical diagnosis of a mental health condition; and (c) were a current service user of healthcare services for a mental health condition. Individuals who were not able to complete informed consent were excluded from the study, as were those who reported having a current eating disorder (comorbid or primary), as diagnosed by a healthcare professional due to difference in lifestyle/dietary interventions recommended in the treatment of such conditions.

2.3. Participants

Fig. 1 shows the flow of respondents to the online adverts to participants included in this study. A total of 577 individuals completed the eligibility criteria screening successfully and were recruited to the study across 27 sites (including both Primary Care services and NHS Mental Health Trusts) throughout the United Kingdom. Of those, 492 individuals provided sufficient information to be included in the study analyses (defined as any eligible participant providing at least 1 response to any of the questions pertaining to health app usage/preferences).

3. Measures

3.1. Demographic & clinical status

To reduce burden on participants, clinical and demographic questions were optional for completion. Single-item measures used in this study included participant age in years, gender, ethnicity (open text), healthcare provider / recruiting site (open text), mental health diagnoses (including current and historical) and length of time since first receiving mental health treatment.

3.2. Views on digital technologies for physical health promotion

For the perspective gathering, participants were presented with graphical demonstrations on-screen to illustrate individual features commonly used within mHealth apps. This information is presented in Supplementary Information 1. In doing this, participants were shown example screens of four types of app components, which were: 'Health Tracking' (i.e. passive or active recording of relevant data, such as step count, exercise, or sleep patterns); 'Health Coaching' (i.e. apps providing text-based conversational contact with a coach who can provide individualised advice and strategies for improving health/lifestyle); 'Health Connections' (whereby the app is designed to notify individuals with external opportunities for improving their health, through online/offline groups, 'real-life' classes, or events and leisure facilities in the local community); and 'Instructional Training' (providing instructional videos, sound clips or other forms of media, supporting health behaviours such as exercise and cooking). These four components of health and fitness apps were determined through a structured examination of those used within the United Kingdom's National Health Service (NHS), specifically by analysing the contents of relevant apps which are; (i) owned/created by the NHS, provided through their webpages on healthy living and smoking cessation; (ii) presented within the (now defunct) NHS App Library; and (iii) trialled within the NHS Digital Diabetes Prevention Programme (Ross et al. 2023).

Participants were shown each of these four components of health apps individually, and after each were asked questions about their perceived utility, preferred behaviour target, and desirable features; questions designed to be broadly applicable across different types of apps, and selected on the basis of the structured examination mentioned above alongside the feedback of service users and clinicians who had participated in our PPI activities on this topic and reviewed previous versions of the survey tool. Finally, the survey concluded with broader questions on perceived opportunities for implementation and barriers towards uptake of using digital technologies for health promotion in YPMI. See Supplementary Material 1 for details.

3.3. Data analysis

Descriptive statistics are provided for sociodemographic and clinical

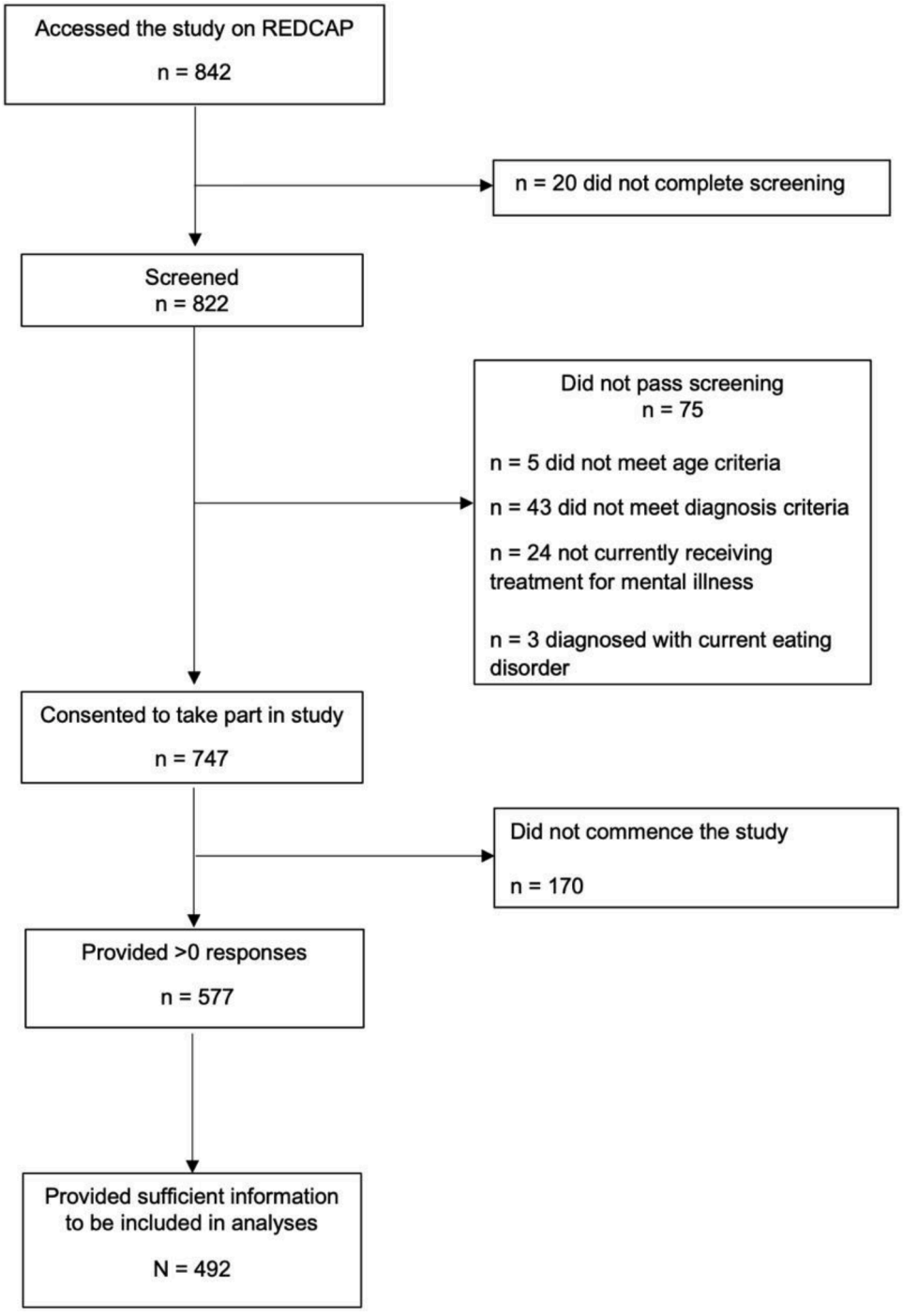

Fig. 1. Participant flow through the study.

information. For the service users' perspectives on the ideal types, features and delivery methods of digital interventions for physical health and fitness, Likert scales were recoded from textual information to numerical scoring on a 1(low) to 5(high) scale (e.g. 'not at all' / 'strongly disagree' = 1; to 'very much' / 'strongly agree' = 5), and quantitative statistics were used to calculate the average responses (and variance around this), using percentage scores, means and standard deviations (SDs). Further comparisons were conducted using Chi-Squared tests to explore how perceived utility of each app type may be influenced by gender (men / women), length of illness ($\leq$2 years vs. $\geq$3 years) and diagnostic status of 'Common Mental Disorders' (CMD; depression and/or anxiety) or 'Severe Mental Illness' (SMI; psychotic and/or bipolar disorders).

4. Results

4.1. Sample characteristics

Of the participants, 73 % were female, and 85.1 % white British, respectively. Ages ranged from 16 to 30 years old, with the mean age being 24.2 years (SD=3.8). Most participants (79.5 %) had a diagnosis of depression and/or anxiety. Full demographics are described in detail in Table 1.

Table 1
Participant characteristics.

	% of sample	Total count
Diagnoses Received		/492
Depression	76.83	378
Anxiety	76.63	377
PTSD	16.46	81
Psychotic disorders	10.97	54
Personality disorder	11.59	57
ADHD	8.54	42
Bipolar disorder	6.71	33
Substance use disorder	3.05	15
E.D. (historical)	2.64	13
Other	12.2	60
Treatment length		/492
2 years or less	49.4	243
3 years or more	50.6	249
Ethnicity		/396
White/British only	85.1	337
Other	14.9	59
Age group		/349
16 - 20	20.46	71
21 - 25	41.79	145
26 - 30	37.75	131
Gender		/404
Female	73.02	295
Male	23.76	96
Other	1.98	8
Prefer not to say	1.24	5
Health Goal		/492
Increase fitness	87.61	417
Be more active	86.23	407
Eat healthier	82.49	391
Improve my sleep	80.99	375
Take up exercise or sports	73.42	337
Lose weight	68.26	314
To spend less time sitting down	62.39	282
Reduce my 'screentime'	54.07	246
Quit or cut down on smoking	28.13	119
Quit or cut down alcohol	23.1	97

4.2. Physical health status

Most participants were dissatisfied/very dissatisfied with their current physical and mental health, with only a minority expressing any satisfaction with current physical or mental health status (Table 1). The health goals most widely prevalent among the sample were to "increase fitness" (87.6 %) and to "be more active" (86.3 %).

4.3. Perceived utility of physical health apps

When asked about the overall usefulness, mean perceived utility scores were highest for Health Tracking (mean=4.0, SD= 0.9), followed by Instructional Videos (mean=3.9, SD=1.0), and Health Coaching (mean=3.8, SD=1.1) and Health Connections (mean=3.6, S.D = 1.0). The majority of respondents either "Agreed" or "Strongly Agreed" that apps which use Health Tracking (77.4 %), Instructional Training (71.3 %), Health Coaching (69.7 %) would be useful for them, although apps for connecting people to real-world health groups were less widely endorsed ('Health Connections' = 58.8 %).

Analyses examining how gender, diagnostic status, and length of illness impact preferred types of health apps presented in Table 2 were negative apart from women reporting a slightly higher degree of perceived overall usefulness for Health Tracking (p = 0.008) and Instructional Videos (p = 0.006) than men.

Data on health behaviours which participants chose to target with health apps are shown in Fig. 2a-c. The most popular behaviour to use Health Tracking and Health Connections apps for was 'physical activity and exercise', whereas for Health Coaching apps, 'healthy eating and diet' was the most preferred. Both alcohol consumption and smoking/tobacco use were the least popular behavioural targets – with ≤10 % of participants showing an interest in using health apps to address these behaviours. No differences were found across diagnostic status for any health behaviour, although higher percentage of women than men expressed interest in using tracking and coaching apps for 'healthy eating and diet' (see Fig. 2a-c).

4.4. Preferred features of physical health apps

Along with enquiring as to perceived overall utility of different types of health apps, participants were also presented with lists of potential features and tools which can be used for each type. The exact descriptions of each feature are shown in Supplement 1, and the full details of entire spread of responses across all participants are shown in Fig. 3a-3d

For Health Tracking apps, the most attractive feature was showing people how their physical health behaviours related to their own daily mental health, which scored 4 out of 5 for how much participants would like this (1 = Not at all, 5 = Very much). Monitoring progress towards personalised health goals was also a highly rated feature of Tracking apps (4.0/5). On the other hand, sharing health data back to clinical teams was the least desirable feature of such apps, scoring only 3/5 on the same scale (See Fig. 3a-3d).

For Health Coaching, the highest scoring features were for apps providing support from certified professionals (4.3/5) and consistently

Table 2
Perceived utility (1–5 scale) of different health apps, compared across participant subgroups.

Diagnosis:	*SMI*			*CMD*				
	Mean	SD	Count	Mean	SD	Count	Chi2 Stat	P value
Health Tracking	3.83	1.05	72	4.04	0.79	363	3.33	0.5
Health Coaching	3.66	1.25	67	3.9	1.05	344	3.76	0.44
Health Connections	3.49	1.25	61	3.59	1	332	8.62	0.07
Instructional Videos	3.63	1.13	62	3.94	0.97	329	6.15	0.19
Illness length:	*2 years or less*			*3 years or more*				
	Mean	**SD**	**Count**	**Mean**	**SD**	**Count**	**Chi2 Stat**	**P value**
Health Tracking	3.96	0.86	228	3.99	0.86	232	5.37	0.25
Health Coaching	3.84	1.08	214	3.83	1.08	222	6.93	0.14
Health Connections	3.51	1.05	212	3.62	1.02	203	1.69	0.79
Instructional Videos	3.84	0.98	210	3.89	1.05	204	3.47	0.48
Sex:	*Male*			*Female*				
	Mean	**SD**	**Count**	**Mean**	**SD**	**Count**	**Chi2 Stat**	**P value**
Health Tracking	3.82	0.91	96	4.11	0.8	294	13.78	0.01
Health Coaching	3.72	1.11	95	3.94	1.03	292	3.74	0.44
Health Connections	3.67	0.95	93	3.54	1.04	289	3.5	0.48
Instructional Videos	3.57	1.07	95	3.99	0.95	291	14.62	0.01

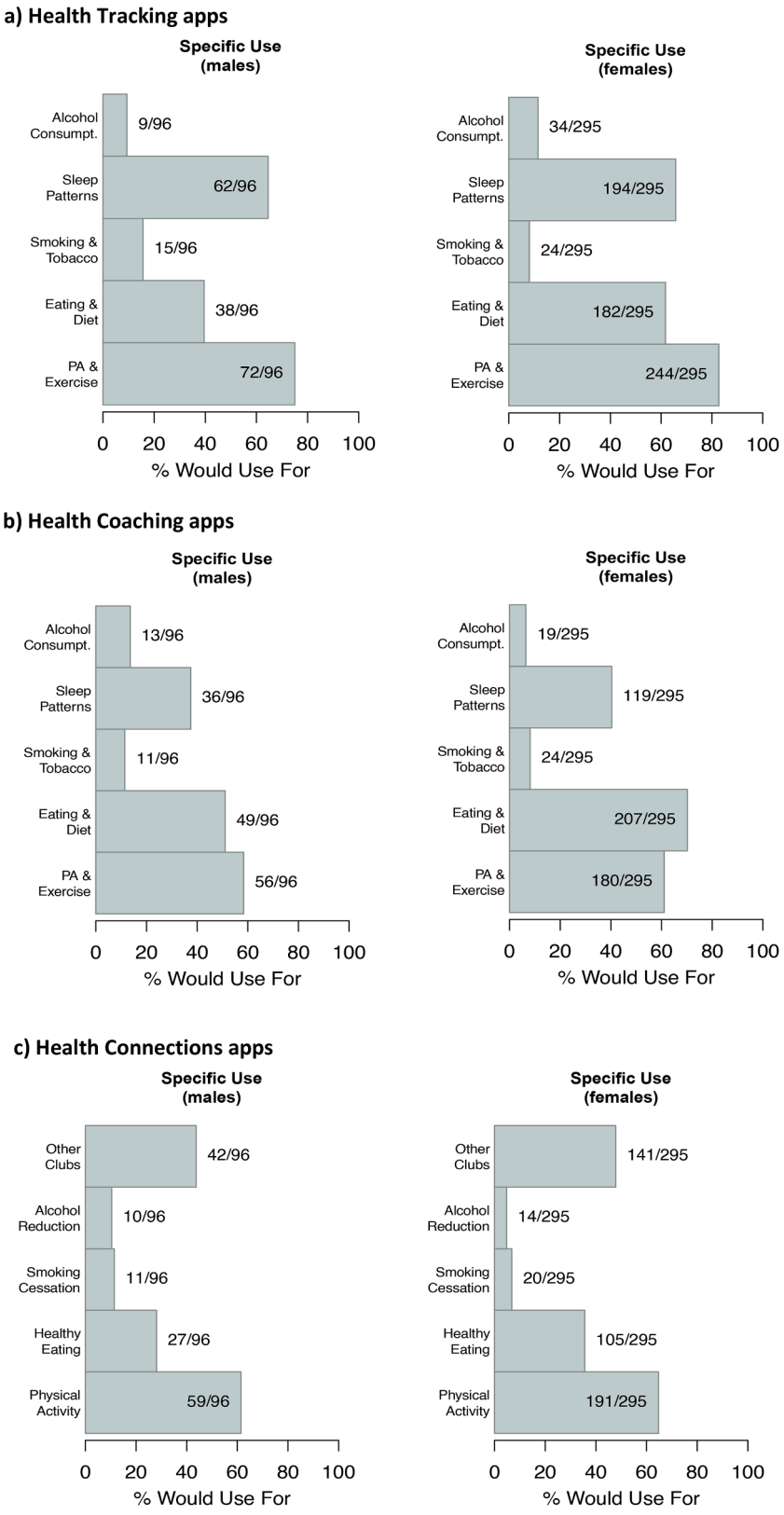

Fig. 2. Participant responses to which health behaviours they would like to target, using specific apps (question omitted for Instructional Training, due to overlap with feature questions displayed in Fig. 3)

working with the same coach (4.3/5). Human, rather than automated, coaches were highly desirable (4.1/5), as was the ability to contact coaches through an in-app chat function (4.2/5); conversely the provision of 'live' video/audio calls was the lowest scoring feature for health coaching apps. (3.3/5).

In terms of using Health Connection apps, to connect individuals with health groups/clubs in the 'real world', the most desirable feature was a direct chat function to group organisers, scoring 3.9/5. On the

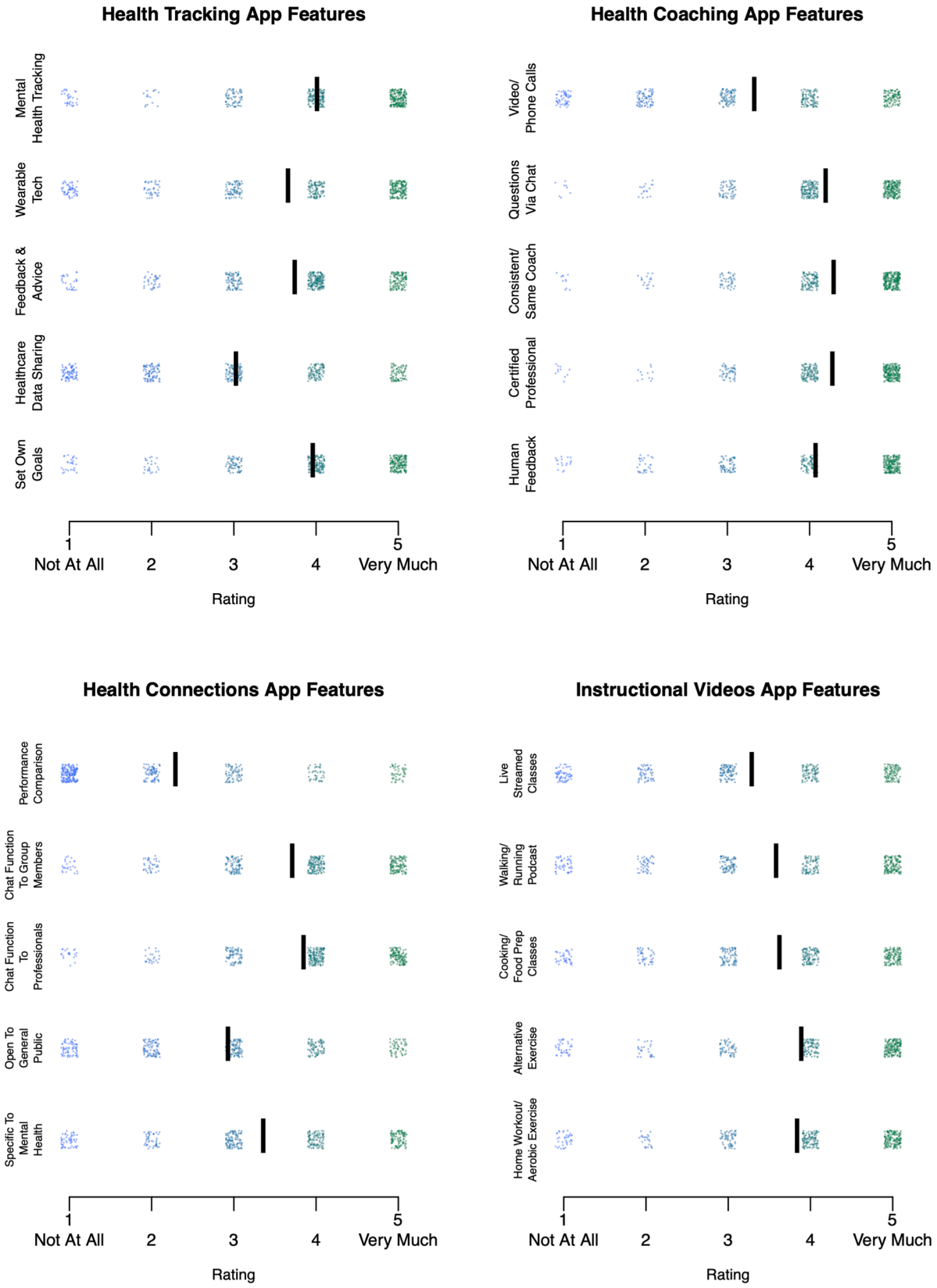

Fig. 3. Desirability of specific features available for each of the four app types. Full wording for the description of features is shown in Supplement 1.

other hand, the idea of using such apps to compare ones' own progress/performance to other group members was not well received, scoring only 2.3/5. Interestingly, the desirability of joining groups specifically for mental health populations (3.4/5) was rated similarly to groups which are open to general public (2.9/5), indicating no strong preference for any particular composition of clubs/groups.

Regarding the ideal content of Instructional Training apps, the strongest interest was for home workout and aerobic training videos

(3.8/5) along with alternative exercise videos for yoga, pilates, or strength training (3.9/5). Of note, the least requested feature was for instructional training to be delivered through 'live stream' (rather than pre-recorded sessions), scoring only 3.3/5 for desirability. The options for Instructional Training apps to deliver home cooking classes and walking/running podcasts were both rated equally (3.6/5).

4.5. Preferred methods of mHealth implementation

The most popular source of recommendation for selecting a health app was the GP, with 62.6 % agreeing that their GPs advice on this would be useful. Around half of participants felt that their friends, peers with mental health conditions, and psychologists/therapists could all provide useful recommendations. Psychiatrists and care-coordinators were the least popular sources of advice for health apps. Finally, 49 % of participants selected that they would also be happy to find health apps themselves, online.

The strongest barrier to adoption was uncertainty about the effectiveness of such apps, scoring 3.3/5. This was followed by the difficulty of finding apps that align with personal goals, scoring 3.1/5. Accessibility and usability were rated lower, with lack of regular access to a smartphone/data (1.6/5) and difficulty in using these kinds of apps (1.7/5) being the least significant barriers. Finally, the need for healthcare professionals' advice on what apps to use was scored at 2.5/5 as a possible barrier toward health app usage.

Participants' answers to open-ended questions also raised some further barriers to consider around features and content of digital interventions, mentioning that such apps can be perceived as boring, unengaging, or culturally irrelevant/insensitive. Furthermore, the potential for monitoring/tracking apps to promote obsessive or harmful behavioural patterns was raised, particularly for those which focused on content around weight-loss or calorie intake. Additionally, frustrations around the frequent need for downloading updates and inappropriate data sharing were also raised.

Open-ended suggestions on app design features alluded to various aspects of gamification, such as providing in-app achievements/certificates for users, and progressing through different levels. Along with this, creating the potential for connecting with friends, family and other users through the apps were also mentioned as motivating factors. Other suggestions for increasing engagement pertained mostly to meeting user's individual needs in the context of physical activity/exercise interventions, putting forth that providing personalised fitness challenges, regularly updated workout routines, and different intensities/versions of workouts for users to select from would be beneficial.

5. Discussion

As health and fitness becomes increasingly relevant with accessible digital technologies, this study examined how tools like apps may promote healthy lifestyles in young people with mental illness. Results showed a high degree of perceived utility across various types of physical health apps, with those providing Health Tracking and Instructional Videos ranked particularly favourably. Apps for Health Coaching were also quite well received, as were those providing Health Connections (i.e. through linking people with health groups/opportunities in their local communities), albeit to a lesser extent. Additionally, participants detailed feedback on the ideal content and design for each of these app types provided a broad range of novel insights into optimal app design/selection for this population, while also indicating how clinical and demographic factors may influence such preferences.

While much of the research on the use of digital technologies in treatment of mental illness has focused on designing and evaluating mental health apps (Torous et al. 2021), our study provides new, in-depth insights into how smartphone technology could also be harnessed to provide physical health interventions for this population. The high perceived utility of Health Tracking and Instructional Training apps aligns broadly with general trends seen in the general population, where there is a growing use of passive data collection, and widespread adoption of using online platforms to gain access to instant health advice (Onyeaka et al. 2021). Beyond this, the more detailed analysis of service user feedback on ideal features of such apps suggests their interest in such approaches may stem from a desire for increasing their personal understanding of their mental and physical health. For instance, the most appealing feature of health tracking apps among participants was the capability to correlate physical health behaviours (such as exercise, eating patterns, sleep etc.) with their daily mental well-being; emphasising young people's inclination towards using such technological innovations to learn how their behaviour and lifestyle can be used in personalised self-management strategies. The least popular feature for tracking apps was sharing information back to clinical teams, perhaps due to the current lack of clarity around the uses of such data (Stefancic et al. 2022). Given that a substantial amount of academic research is now exploring methods for using passively-collected data smartphone data in psychiatry (Barnett et al. 2018; Torous et al. 2016), it is essential to ensure that such advances in capability are applied in ways which directly improve clinical care and are readily understood by service users and clinicians alike (Stefancic et al. 2022).

Youth showed interest towards Instructional Training videos, for both aerobic home workouts and alternative forms of exercise like yoga, pilates and strength training. Coupled with the desire shown for professional support in Health Coaching, this suggests young adults are interested in expert input for lifestyle modification (beyond just self-tracking/management), albeit from non-psychiatric professionals. This finding aligns well with the empirical evidence already from non-digital (i.e. in-person) trials in people with mental illness, which have shown that lifestyle programs delivered by physical health experts—rather than mental health professionals—yield better engagement and outcomes (Fibbins et al. 2019; Stanton 2018). Furthermore, recent pilot studies have found high acceptability and adherence for online lifestyle programs delivered via videoconferencing applications (Koomen et al. 2021).

It is also noteworthy that the most popular behavioural targets for these digital interventions were exercise, diet and sleep, with relatively little interest in smoking cessation or alcohol reduction. Similar interests are reflected in recent large-scale survey studies, showing that samples with severe and enduring mental illness also have a strong desire for addressing their physical activity and improving their diet (Peckham et al. 2023). However, this contrasts with the current clinical focus on lifestyle aspects in mental healthcare, which primarily focuses on assessing smoking/substance use rather than exercise or dietary interventions (Bailey et al. 2019). Nonetheless, recently emergent data from trials of digital lifestyle interventions among SMI populations have produced encouraging data for the acceptability and usability of apps focusing on physical activity, weight management or smoking cessation in this patient group (Agulleiro et al., 2023; Sawyer et al., 2023).

6. Strengths and limitations

The large, geographically diverse sample, collecting data from almost 500 young people across 27 mental healthcare services across England, lends robustness to our findings and increases generalisability, particularly with regards to healthcare systems such as the NHS which are already implementing smartphone apps as prescribed means for physical health management (Ross et al. 2023). A further strength of this study was the inclusion of a broad spectrum of psychiatric diagnoses, allowing for a comprehensive analysis of how digital lifestyle interventions can be applied across varied mental health settings. While the complete anonymity afforded to participants in this study precluded any method for validating their diagnoses/identity, the absence of financial or other incentives reduces the likelihood of participants providing intentionally misleading data, as there was no reason to do this, and indeed the only motivation join the study was participants own

altruism / interest to do so. To clarify this further, we have added this information to the limitations section.

Through showing only minor differences in app preferences between CMDs and SMI populations, this data was able to shed light on a potentially transdiagnostic utility of such interventions, at a level of detail that could be used to inform the selection of most suitable existing apps (or development of new apps) for delivering much-needed lifestyle interventions across youth mental healthcare (Firth et al. 2020). However, limitations in the study are also evident, particularly with regards to the sample being predominantly White British, such that the opinions expressed here may not fully represent the ethnic diversity of the UK generally, or mental healthcare populations within. Additionally, the recruitment issues inherent to online studies will create some selection bias, such that the views of individuals who have no access or interest in digital technologies are excluded. Overall, study results not only reinforce the importance of examining service users' own priorities to align research and healthcare with these, but also provides novel, actionable insights into how digital technologies could feasibly be used to address currently neglected lifestyle aspects in mental healthcare, in ways that would be well-received by the target population.

CRediT authorship contribution statement

Joseph Firth: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Chelsea Sawyer:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Data curation, Conceptualization. **John Sainsbury:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Rachel Morell:** Writing – review & editing, Writing – original draft, Methodology, Data curation, Conceptualization. **Hamish Fibbins:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Sandra Bucci:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Lamiece Hassan:** Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Josh A. Firth:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Data curation, Conceptualization. **Henry Onyweaka:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **John Torous:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Karina Lovell:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization.

Declaration of competing interest

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Data availability statement

The data that support the findings of this study will become available online, following an embargo period to allow for publication by the research team.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2024.116187.

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