

Why patients diagnosed with bipolar disorder start, continue or discontinue health-related apps supporting their self-management

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Accessible summary

What is Known about the Subject?:

- Self-management is essential in the treatment of those who have bipolar disorder.
- There are many apps to support self-management, but we know that these apps only sometimes cover the users' needs.

What is Added to Existing Knowledge?:

- In our research, we made an inventory of apps that people with bipolar disorder use to cover their needs in self-management. We also have searched for the reasons to start, continue, switch or quit the use of those apps.
- We found that 44% ($n = 18$) of our respondents use health-related apps for self-management purposes. Apps for physical activity, planning and structure and apps for relaxation were most used.
- In the use of apps, the “freedom of choice” and user-friendliness are the most important in continuing the use of apps, while malfunctioning and “not fitting in individual needs” the main reasons were for quitting the use of apps.

Implications for Practice:

- Various apps can be used for self-management purposes as long as these apps meet the individual user's requirements.
- Clinicians and patients should have a broad view when looking for suitable apps and not limit the search to just professional apps.
- In developing new apps, patients, clinicians and developers should collaborate in the development process, requirements and design.

Abstract

Introduction: Self-management is one of the cornerstones in the treatment of bipolar disorder (BD). Complementing interventions by apps are seen as a good opportunity to support self-management. However, there is insufficient knowledge about

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understanding the use of health-related applications by consumers with BD for self-management purposes.

Aim: The study aims to gain insight from patients diagnosed with BD about reasons to use, continue or discontinue health-related apps.

Method: This study employed a mixed-method design in which 41 participants diagnosed with BD participated in a quantitative survey, and 11 participants also participated in an in-depth interview.

Results: The survey showed that 44% ($n = 18$) of the participants use health-related apps, and 26.8% ($n = 11$) use those apps consistently. Interviews revealed that adjustability, usability, trustworthiness and the guarantee of privacy were the main reasons determining whether participants used or terminated the use of a health-related app.

Implications for Practice: Although we found that a substantial number of patients diagnosed with BD use one or more apps to support self-management, their use is often discontinued due to content that needs more robust to address their needs. Besides appropriate content, tailoring and persuasive technologies will likely promote the continued use of an app for self-management purposes. Cooperation between those diagnosed with bipolar disorder and health professionals (like mental health nurses) in developing and designing applications that are aimed to support self-management in BD is necessary for successful implementation and adaptation.

KEYWORDS

bipolar disorder, E-health, self-management

1 | INTRODUCTION

Bipolar disorder (BD) is a severe mental illness characterized by recurrent manic, hypomanic, depressive and/or mixed episodes alternating with euthymic periods. The first episodes of mania or depression often manifest in adolescence and young adulthood (Goodwin & Jamison, 2007). BD types I (with full mania) and II (only hypomania and depression) are estimated to be prevalent in 2% of the world's population, and it is estimated that another 2% has a form of subthreshold BD (Geddes & Miklowitz, 2013). In adults, the prevalence of BD in the Netherlands is 1.3% (de Graaf et al., 2010). Due to early-onset, severity and chronicity, BD poses a significant burden on patients and their relatives and causes an impaired quality of life both during and between mood episodes (Erten et al., 2014; Ferrari et al., 2016; Vieta et al., 2013). Contributing factors are mood symptoms, stigmatization, cognitive dysfunction, comorbid conditions and pharmacotherapy's side effects (Kasper, 2004).

In addition to psychopharmacological treatment, self-management is one of the cornerstones in the treatment of BD to manage and prevent mood episodes and personal functioning in inter-episodic periods. The use of the Life Chart Method for monitoring the course of BD (Denicoff et al., 2002), using a relapse prevention plan (Morriss et al., 2007) and improvement of active coping strategies are examples of self-management interventions (Murray et al., 2011). Learning and applying self-management is a

unique process in which people search for effective tools to support them (van den Heuvel et al., 2015). Nowadays, these tools can also be found in applications for smartphone use. There are more than 10,000 mental health-related apps (Torous & Roberts, 2017) and over 500 apps just for BD (Nicholas et al., 2015a, 2015b). As a result, more and more patients can be informed about and proactive with their mental health care. Many seek technology-oriented and self-directed treatment options (Sandoval et al., 2017). Nicholas et al. (2015a, 2015b) reviewed 82 apps designed for individuals diagnosed with BD. They concluded: "the content of currently available apps for BD is not in line with practice guidelines or established self-management principles. Apps also fail to provide important information to help users assess their quality, with most lacking source citations and a privacy policy (Nicholas et al., 2015)."

Therefore, existing apps do not sufficiently fulfil users' needs for disease management (Sandoval et al., 2017). Because of this "maze of apps," clinicians are advised to discuss the availability and use of apps with their patients (Torous et al., 2018) to avoid using apps that can harm patients. Furthermore, there is a clear call to develop good quality, evidence-based mobile interventions to support patients in managing their illness (Nicholas et al., 2015a, 2015b). Although apps are frequently used, it remains unknown which demands or needs patients diagnosed with BD have in using these apps. To "open the window" to these demands and needs, this study aims to gain insight from patients diagnosed with BD about reasons to start using,

continue use or discontinue the use of health-related apps and how frequently health-related apps are used by patients diagnosed with BD for self-management purposes.

2 | METHOD

2.1 | Design

We used a mixed-method study with an explorative design. For the study's quantitative component, a questionnaire was developed to collect data about the types of apps used and the frequency of use. In the qualitative part of the study, semi-structured interviews were conducted to gain insight into why people diagnosed with BD begin to use, continue or discontinue the use of health-related apps. Health-related applications were defined as "apps aimed at, or are used for, improving and managing personal health."

2.2 | Participants

Participants were recruited in a specialized outpatient clinic for BD. All patients were diagnosed with BD I or II and received specialist care according to the Dutch BD guidelines (Kupka et al., 2015). Patients were euthymic when entering the study. The exclusion criteria were a major depressive or manic episode, psychotic episode, suicidal, or did not possess a smartphone.

2.3 | Procedure

Ethical approval for the study was obtained from the Dimence Mental Health Institute Scientific Research Committee. All patients that met the inclusion criteria were potential participants. The clinicians in the outpatient clinic selected potential participants for the study and asked them if the research may approach them. The researchers approached patients who agreed and received an information letter with an informed consent form. After signing the form and completing the questionnaires, patients were asked to participate in the interviews. The selection was a-selective and was based on voluntary participation in the qualitative part of the study. The face-to-face semi-structured interviews, lasting 20–30 min, were based on a topic list and were conducted and recorded in the outpatient clinic. Data collection was continued until data saturation had been achieved.

2.4 | Materials

Two questionnaires were used: the Revised Personal Involvement Inventory (RPII) (Zaichkowsky, 1994) and the "Use of health applications in mental health." The RPII was developed to establish involvement with products, adverts and purchase situations as a context-free measurement. Involvement is defined as "A person's perceived

relevance of the object based on inherent needs, values and needs." (Zaichkowsky, 1985). The RPII was used to deepen information about patients' involvement with the apps (Zaichkowsky, 2012). The RPII has 10 items on a seven-point Likert scale from positive to negative (e.g. important-not important, meaningful-meaningless). The total score (10–70) is divided into three levels of involvement (low: 10–29; average: 30–50; and high: 51–70). The RPII has two sub-scales (cognitive and affective involvement). For both scales, the total score lies between 5 and 35, with also can be divided into three levels (low: 5–14, average: 15–25 and high: 26–35). The participants filled in the inventory when they used health-related apps. The questionnaire covered all apps used. Participants were asked to give information about the three most-used apps when they used more than three.

For the semi-structured qualitative interviews, the following topics were addressed:

- Features that are important in using the apps
- Aspects of starting with applications
- Aspects of maintaining the use of applications
- Aspects in discontinuation of use

The latter inventory (Appendix S1) was specifically developed for this study to gather information on health-related applications by patients diagnosed with BD. The questions focus on the number of apps used, the specification of the type of apps and information about the duration, frequency, and purpose of the used apps.

2.5 | Data analysis

2.5.1 | Quantitative analysis

SPSS (IBM, version 22) was used for the quantitative data. Descriptive analysis of the different types of apps, duration and frequency of the use of apps. Spearman's rank correlation was used for the relation between the categories of apps and the frequency of use.

We classified the apps according to self-management purposes in BD:

- Physical health and fitness
- Planning and activity structure
- Social media
- Meditation and relaxation
- Sleep
- Treatment
- Medical information

2.5.2 | Qualitative analysis

For the qualitative data, ATLAS.ti7 was used for the analysis. A descriptive phenomenological method was used (Colaizzi method as described by Shosha, 2012). The interviews were ad verbatim

transcribed; next, successively open and axial and selective coding was applied. The first interview was coded by two researchers (ELA and BGG) independently from each other. Then, the codes were discussed until consensus was achieved. A code-tree was made after four interviews. Triangulation was used to increase the objectivity of the data analysis. To avoid personal bias, the process of bracketing was carried out. The interviewer performed member checks after each interview to establish whether the content represented the participants' perspectives. After 10 interviews, data saturation was achieved an eleventh interview was carried out to verify the data saturation.

3 | RESULTS

3.1 | Participants

Of the 98 outpatients, 15 patients were excluded by the clinicians due to mood instability (5), no diagnosis of BD (9) or not being a native speaker (1). Eighty-three patients were approached to participate in the study. However, nine potential participants did not start because they did not own a smartphone, and 33 patients refused to participate in the study. Forty-one patients were included in the study and completed the questionnaire. Eleven of these participants also participated in the qualitative interview.

3.2 | Quantitative data

Twenty-three participants (56%) indicated that they did not use health-related apps at all. The remaining 18 participants (44%) used 41 health-related apps. These apps are divided into seven categories (see Table 1). Twenty apps were used to improve self-management in BD. Eleven participants (26.8%) used one or more apps as a self-management tool for BD. These apps were mainly used for improving physical health ($n = 16$), day planning/structure ($n = 8$) or relaxation purposes ($n = 7$). The remaining seven participants did use health-related apps but not specifically for BD self-management purposes. The average number of health-related apps used by the 18 participants was two; 50% used one app, 22% used two apps, and 28% used three or more apps. Table 1 shows the results of the number and categories of the apps they used. Appendix S2 presents a list of the apps they used. Interestingly, none of the participants used mood-monitoring apps for BD.

The duration of app use varied from 2 weeks to 4 years; 12 participants (31.6%) had been using the apps between 1 and 3 years. A majority of the apps (75%) were used at least weekly. We found no correlation between the categories and the frequency of application use (Spearman: $r_s = .19$, $p = .265$). Table 2 shows the duration and frequency of the use of health-related apps.

In order to deepen information about the level of involvement with the apps, the Revised Personal Involvement Inventory (RPII)

TABLE 1 Number and categories of apps

	N = 41 (100%)
Use of apps	
Yes	18 (44%)
No	23 (56%)
Number of apps	
1	9 (50%)
2	4 (22%)
3	2 (11%)
4	2 (11%)
Five or more	1 (6%)
Categories	
Physical health and fitness	16 (39%)
Planning and activity structure	8 (19%)
Relaxation/meditation	7 (17%)
Sleep	3 (7.5%)
Social media	3 (7.5%)
Medical information	2 (5%)
Treatment	2 (5%)

Abbreviation: N, number of participants.

was assessed. The participants had an average to high level of involvement ($M = 52.33$, $SD 8.46$). The levels of involvement on sub-categories cognitive and affective involvement are average to high ($M = 27.85$ vs. $M = 24.48$). The results regarding the three most frequently used categories of apps are shown in Table 3.

3.3 | Qualitative data

Eleven participants that used health-related apps participated in the qualitative interview. Four codes were identified for each of the four topic areas: (1) features that are important in using apps; (2) aspects in starting the use of apps; (3) continuing use of apps; or (4) discontinuation or quitting the use of apps, as outlined in Table 4.

3.3.1 | Features that are important in using apps

The first topic in the interview was related to the use of health-related apps. Features important in using the apps are "freedom of choice" and "user-friendliness." The code Freedom of choice was the most often mentioned aspect (6/11). Participants liked to have freedom of choice in the setup of applications, such as being able to turn off notifications and sound, to choose which voice they want to hear, or to set personal data, all to adjust the application to their individual needs:

TABLE 2 Duration and frequency of the use of health-related apps

	N = 41 (100%)
Duration of use	
1–2 weeks	1 (2.4%)
2–4 weeks	2 (4.8%)
1–3 month	9 (22%)
3–6 month	5 (12%)
0.5–1 year	6 (15%)
1–3 years	13 (31.8%)
4 or more years	5 (12%)
Frequency of use^a	
<1 day/2 weeks	6 (15%)
1 day/2 weeks	4 (10%)
1 day/week	4 (10%)
2 days/week	3 (7%)
3 days/week	7 (17%)
4 days/week	0 (0%)
5 days/week	2 (4.8%)
6 days/week	3 (7%)
7 days/week	12 (29.2%)

Abbreviation: N, number of used apps.

^aFrequency, x times weekly.**TABLE 3** Level of involvement measured with the revisited personal involvement inventory (RPII)

	RPII score (SD) (range)^a
Outcomes on the RPII	
Total score	52.33 (SD = 8.46) (10–70)
Cognitive subscale	27.85 (SD = 5.16) (5–35)
Affective subscale	24.48 (SD = 4.59) (5–35)
Subgroups cognitive involvement	
Physical health and fitness	25.37 (SD = 4.02)
Planning and activity structure	32 (SD = 4.76)
Relaxation/meditation	27.86 (SD = 5.9)
Subgroups affective involvement	
Physical health and fitness	23.82 (SD = 4.96)
Planning and activity structure	25.75 (SD = 3.95)
Relaxation/meditation	24.14 (SD = 3.72)

^aBased on the outcome of the RPII involvement total score (low: 10–29; average: 30–50; and high: 51–70) and the scores on the subcategories (low: 5–14; average: 15–25; and high: 26–35).

That you can say, for example, I am so old, that is how much I weigh, that is how much I want to do sports. Something that he can then make a kind of picture for you. That's great, that's really great

(participant 1)

The code User-friendliness was mentioned five times as an essential feature of an app. User-friendliness consists of various elements such as clarity in structure and design, facilitating and carrying out specific daily actions more quickly and efficiently, applying categories, or distinguishing the importance of components within the application. Also mentioned was the easy use of the application (four):

Yes, that you can easily be referred, but you can easily go back. Then sometimes, you also have an app that you throw something in a shopping cart, and then you press the back button, and then you return to your home screen. While I think, yes, you know, I just wanted to go back to the previous page

(participant 4)

Also, clarity and survivability are important factors in using apps for the participants. This code refers to intuitive use and a clear display of functionalities. The last code, trustworthiness, refers to clear privacy statements and acknowledgement. This gives participants the feeling that they can safely use the application.

I want a app to have a clear design without features that hinder the way you use the app, and I find it important that I can easily find my way throughout the app.

(participant 1)

For example, that you know with company is behind the app, so that I can trust the app and know that my personal data are save and in good hands.

(participant 2)

Six participants found that the assumed purpose of an application was a reason to start with the app. Specific factors were goalsetting, collecting knowledge and insight, and exercises for relaxation.

The determining factor is that I have in advance the feeling that I am really going to do something with it, just to say.

(participant 4)

3.3.2 | Aspects in starting of use

The second topic refers to factors that influence starting the use of health-related apps. The most important codes that affect the starting of applications were awareness of the app and the purposes of the app. Six participants mentioned awareness of the app, for example that the different ways to become acquainted with an application's existence were important. These include hearing about apps from other users or professionals and through recommendations from others, both verbally and via other (social) media. Also, getting a notification from an application that is standard on the phone can be helpful in this:

TABLE 4 Overview codes using apps

Topic	Code	X mentioned (max. 11)
Features that are important in using apps	Freedom of choice	6
	User friendliness	5
	Clarity and surveyability	4
	Trustworthiness	3
Aspects of starting of use	Awareness of the app	6
	Purpose of the app	6
	Possibility of support	4
	Support of purpose of use	3
Aspects of maintaining using applications	Freedom of choice	6
	User-friendliness	4
	Informativeness	4
	Completeness	3
Aspects in discontinuation of use	Not fitting the individual needs	9
	Disruptions and malfunctioning	5
	Adverts	4
	Lack of use	3

And my health app ... It was just standard. (i.e. participant wasn't aware of the existence of the app) In one go, I received a message, "you have reached your goal". That was funny because I think I would not have downloaded it because I am not very concerned about that, but I think it is very funny, and in the meantime, I use it very often.

(participant 2)

Four participants cited the **possibility of support** as a reason to start with an app, meaning that they were searching which support an app can offer before starting with that app. The support entailed both support in the use of the app (e.g. a manual or help-desk) (2) and the knowledge that the participant could receive supportive messages during the app's use that encouraged the use of the app (2).

For me, I'm not that technical, a kind of support is important, so to say that when I didn't succeed in the installation, there is a kind of help to solve the problem.

(participant 10)

The last code refers to the coherence between the app's purpose and the user's personal goals, defined as support of the purpose of use. If these are in line with each other, the participants are more willing to start using an app.

For example, that it's a bit of a gloomy day, and they recommend a scent that's very refreshing, uplifting, kind of Citrus, that sort of thing. That it makes you think oh, how nice I am supported and I am offered knowledge and help that I don't have myself.

(participant 10)

3.3.3 | Aspects of maintaining using applications

The third topic relates to aspects that influence the continuation of the use of health-related apps. Freedom of choice and user-friendliness were dominant codes in continuing the use of apps. Freedom of choice is the most often mentioned code to continue using an app (6). For some participants, autonomy was important.

You decide when you switch it on

(participant 3)

That you don't necessarily have to use everything on the app. But just if you can indeed choose, this suits me, and this is useful to me, that is indeed nice

(participant 5)

Four participants mentioned excellent user-friendliness. For them, the app needed to be well-arranged and easy to use. In addition, four participants mentioned that an app had to provide valuable information for them.

It is also just fun—all kinds of information. I like information, so to say, and there is all sorts of things, like it equals to so many stairs, okay! So it kind of makes you feel good too. Maybe that is also important, that you can get a bit of a good feeling ... that it could be stimulating or something

(participant 2)

In line with the above-mentioned codes are the following two codes that refer to the degree of informativeness (does the app

provides me with accurate information that I can use for my purposes) and to the degree of completeness, with refers to the thorough content of the app. If participants start with an app and during the use, they find out that the content is not exhaustive enough, they find this disappointing.

For me it has to be complete, for example, I like to share with others, like, that you can say to fellow sufferers like, oh, if this bothers you, I always do this when I feel a little depressed, then I listen to someone on YouTube who says inspiring things can tell.

(participant 10)

3.4 | Aspects in discontinuation of use

The last topic inquired about the aspects that are important in discontinuation of the use of an app. Experiencing that the purpose of the app did not fit the individual need was, besides disruptions and malfunctioning, the most important reason to quit using an app. Nine participants mentioned not fitting their individual needs as the most important reason to discontinue using an app.

Well, it just annoys me when it doesn't work, so when an app doesn't run or is very difficult, that you really have to take 20 or 30 steps before you get what you're looking for. Then I think, yes, I do mind that.

(participant 2)

In addition, disruptions and malfunctioning, such as broken links, incorrect information and the inability to turn off notifications or sound, were reasons to quit using an app.

If he gets stuck every time and doesn't work properly, no, then it won't help me either if you have to start it ten times each time

(participant 5)

The other codes that lead to discontinuation are adverts and the lack of use. Returning adverts lead to aversion and distraction and, therefore, can lead to quitting an app.

I found it irritating when I use an app, and unwanted adverts interrupt the use of the app. For me, it could be a reason to quit.

(participant 11)

If I, for instance, don't want to use the app for a few weeks, and I know that I don't think the first trigger is cool or fascinating, then it won't happen after that

(participant 6)

4 | DISCUSSION

There is a lack of knowledge about the patterns of use of these apps in individuals diagnosed with BD. This study aims to gain insight into how frequently patients with BD use health-related apps for self-management purposes for BD and their general health. We found that 44% ($n = 18$) of the participants use health-related apps, and 26.8% ($n = 11$) use those apps consistently. A second aim was to gain insight from patients diagnosed with BD about their reasons for beginning use, continuing use or discontinuing the use of health-related apps. Interviews revealed that adjustability, usability, trustworthiness and the guarantee of privacy were the main reasons determining whether participants used or terminated the use of a health-related app.

We found that almost half of the participants used health-related apps. This is a higher rate than generally found in the general population. Carroll et al. (2017) found that more than one-third of the general population with smartphones had health-related apps, but only 20% of the participants used those apps (Carroll et al., 2017). Furthermore, in a study about the factors that aimed to predict e-health use, only 3.2% of the participants (adult Internet users; $n = 2358$) used an online diary or blog about any health topic (Kontos et al., 2014). Krebs and Duncan (2015) found a higher percentage of health app users in a nationwide survey (58%), but almost half of them had stopped the use for various reasons such as loss of interest, a high entry data burden or hidden costs. (Krebs & Duncan, 2015). Our findings suggest that having a significant health problem (like BD) can lead to higher usage of health-related apps. The awareness of the necessity of self-management interventions by people diagnosed with BD can also increase use. The type of apps that the participants in our study used were mainly focused on the use for physical activity, planning and relaxation purposes goals; these functionalities can be related to the definition of self-management by Barlow et al. (2002). Physical activity is linked to a healthy lifestyle and remaining physically active while in a (mild) depressed episode. Apps that offer planning and structure day activities or apps that stimulate or improve relaxation and sleep are linked to interventions that will enhance the social rhythm. Ehlers et al. (1988) defined social rhythm as the social relationships, social demands or tasks that serve to entrain biological rhythms (Ehlers et al., 1988). For people diagnosed with BD, disturbance of social rhythm can be emergence mood episodes; therefore, interventions that enhance the stabilization of social rhythms are important (Crowe et al., 2016). The apps mentioned above activities are not directly (BD) illness-related; we hypothesize that this may be more acceptable for people diagnosed with BD. Previous research has shown that people diagnosed with BD need apps that support work, social relations, finances and leisure management (Morton et al., 2017, 2021; Murnane et al., 2016; Nicholas et al., 2017; Todd et al., 2013). Another explanation could be that the Netherlands has a higher possession rate of smartphone users than other countries (91%) (Huizer et al., 2018). Finally, we defined health-related

apps as an application aimed at, or used for, improving and dealing with health (Kamel Boulos et al., 2014). Compared to the studies mentioned above.

In BD, it is recommended that patients monitor their mood and use self-management approaches; apps can support this. There are specific apps for mood monitoring and self-management of mood. Surprisingly, we found that none of the participants used any mood-monitoring apps. One explanation is the apparent reliance in the Netherlands on the freely available paper and pencil (P&P) Life Chart Method (LCM) (Denicoff et al., 2000). This P&P LCM is often used within the treatment to monitor mood. An app might not be seen as an addition to this standard approach. A second explanation could be a lack of awareness of existing apps both among patients and clinicians (Morton et al., 2021). Several studies have shown that the uptake of e-health in mental health, in general, is a complicated process (e.g. adapting, continuation and techniques) with relatively low participant rates (e.g. Beentjes et al., 2018; Christensen et al., 2014).

The second aim of this study was to gain information about the considerations for starting, continuing and discontinuing using health-related apps by people diagnosed with BD. Our findings show that most participants had a clear self-management purpose when using a health-related app, such as goal setting, collecting knowledge and insight about the illness, and finding exercises for planning and relaxation. However, we found that freedom of choice, user-friendliness and trustworthiness are important factors determining (dis)continuation of use of apps. The fact that these factors appear in different topics of the interviews means that they could be of decisive importance when developing new apps. Also, a lack of content fitting with personal needs, technical problems and adverts were important reasons for quitting an app. All these factors can be considered important facilitators of engagement. O'Brien (2008) developed a "model of engagement" to define engagement and establish critical components that lead to engagement (O'Brien & Toms, 2008). This engagement model can be a crucial part of the successful implementation of applications. O'Brien stated, "Successful technologies are not just usable; they engage users." The model consists of three phases of engagement: the point of engagement, the engagement phase and the disengagement phase. If we look at our findings and compare them with phases of engagement, we see at the "point of engagement" partial similarities, like interest, motivation and the use for a specific goal. In the engagement phase, there are fewer distinctive similarities. Topics like completeness, adjustability and usability cannot satisfy the model's engagement attributes, while our participants did not mention graphics, rich interface, enjoyment and fun. It could be argued that our participants are seeking a practical self-management tool rather than a gamification application, which requires possibly more engagement elements.

Finally, in the disengagement phase, we found that disruptions and malfunctioning, not fitting the individual needs, adverts, and lack of use are the most dominant reasons to stop using apps. O'Brien mentioned usability, negative affect and interruptions that

can be linked to our findings, disruptions, malfunctioning and lack of interest. Studies among chronic psychiatric disorders report topics partly cover our results like motivation, customization, interconnectivity, data inaccuracy, convenience and competitiveness (Anderson et al., 2016). Our findings of technical dysfunction and loss of interest (or when content is too familiar) are reasons to quit in other studies (Anderson et al., 2016; Peng et al., 2016). To overcome disengagement, persuasive technologies can be used. A review conducted by Hamari et al. (2014) shows that persuasive technologies are one of the main (psychological) goals to increase engagement and motivation (Hamari et al., 2014). Applying persuasive technologies, such as reduction, tunnelling, tailoring, personalization, self-monitoring, simulation and rehearsal (Oinas-Kukkonen & Harjumaa, 2008), can improve adherence. But only when the appropriate principles of persuasive technologies are deployed at the critical moments when non-adherence begins (Kelders & Van Gemert-Pijnen, 2013). Still, this did not improve the intervention outcome measured by effect size (Wildeboer et al., 2016). It can thus be suggested that in any newly developed application, careful integration of persuasive technology is needed to avoid non-adherence.

4.1 | Limitations

Some important limitations apply to the current study. Participants were recruited in one outpatient clinic, and the number of participants was relatively small. Therefore, our results may not be fully generalizable for all individuals diagnosed with BD. Moreover, surprisingly, the participants in our study did not have any experience with mood-monitoring apps. Since mood monitoring can be considered one specific type of self-regulation in the context of health and therefore fits the definition of health-related apps we used for this study, our results will also apply to mood-monitoring apps. Still, we must consider that mood-monitoring apps have additional specific requirements.

5 | CONCLUSION

Patients diagnosed with BD have enormous challenges in terms of self-management related to their mood disorder and health in general. Apps can play a prominent role in supporting people in meeting these challenges. Although we found that a substantial number of patients diagnosed with BD are using one or more apps to support self-management, their use is often discontinued due to content that is insufficiently addressing their needs. Besides appropriate content, tailoring and persuasive technologies will likely promote the continued use of an app for self-management purposes. This study revealed some vital and minimal requirements, such as freedom of choice, user-friendliness and clear objectives. It is important that future apps, apart from appropriate content, must be accompanied by tailoring and persuasive technologies to promote continued use for self-management purposes.

6 | RELEVANCE STATEMENT

In the treatment of bipolar disorder, self-management is one of the cornerstones in the treatment of BD to manage and prevent mood episodes and personal functioning in inter-episodic periods. Acquirement and applying self-management is the main task of nursing and connected with one of the main principles of nursing; coping with the consequences of the illness. Our study adds information on self-management support by using apps in with nursing can assist patients.

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CONFLICT OF INTEREST

None of the authors has a conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICAL APPROVAL

Ethical approval for the study was obtained from the Scientific Research Committee of the Dimence Mental Health Institute.

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SUPPORTING INFORMATION

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