Bridging the Gap of Communicating Health Information to Users: Ethically-Informed Design of App Store Description of Health Apps

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ABSTRACT

Mental health has become a daunting global health challenge in both everyday situations and times of crisis. The Covid-19 pandemic has contributed to an increase in downloads and the use of these apps. Many health apps are available free of charge. As apps are used by people seeking ways to manage or augment the management of their own health conditions, app descriptions should provide clear and thorough information, ensuring that users are not compelled to seek additional sources or infer missing content. Prior research has addressed the lack of necessary information provided to users when choosing health apps in app stores, including evidence-based content on efficacy or feasibility studies, claims, target audience, privacy concerns, and hidden costs. Based on a comprehensive literature review of prior work on health apps and treatment delivery models, in the first phase of our research objectives, we introduced an app store description design to effectively bridge the communication gap in conveying health information to users. This design maximizes the impact and benefits of specific information cues (e.g., evidence-based content) to educate and support people's decisions when selecting health apps, which can be utilized across various health app genres. Improvements in app description design could have a large impact on its use and benefits. In the second phase, we plan to conduct a usability study using a mixed-method design to evaluate the design in terms of its effectiveness, user satisfaction, clarity of information, learnability, feedback, and perceived usefulness. Our proposed design has both simple and detailed versions when needed to mitigate users' burden, hesitancy, skepticism, and to manage their expectations when assessing what the app has to offer upfront in terms of the following aspects: free versus paid features, evidence of benefits and effectiveness, detailed cost of the in-app purchase list, subscriptions and plans, privacy information, clinical and user reviews, and pros and cons of the app. This information structure provides potential users with important details and could reduce the time and effort needed to evaluate the information provided by the app. The knowledge gained from this research could lay the foundation, contribute and shape app store description design moving forward and will help policymakers, health organizations, researchers, healthcare providers, and app developers find suitable solutions to assist users in choosing health apps.

Keywords: Health apps, Evidence-based content, Claims, Effectiveness, Hidden costs, Privacy information, Clinical reviews, Target audience

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INTRODUCTION

Mental health issues have emerged as a major global public health concern, with approximately one in six individuals experiencing common mental health issues every week (Mental Health Foundation, 2016; Darko *et al.*, 2024). The World Health Organization (WHO) predicts that by 2030, mental illness will become the leading global disease burden (Garcia et al., no date). The number of health-related apps currently available for consumers has surpassed 350,000 (IQVIA, 2021) and of these apps, more than 10,000 apps are related to mental health (Torous et al., 2018). Globally, health apps are among the top ten categories in terms of consumer spending on apps (Marshall, Dunstan and Bartik, 2020). The COVID-19 pandemic has greatly accelerated the adoption of health apps, resulting in a significant increase in both downloads and usage (Hudson *et al.*, 2022; George, George and Jenkins, 2024; Kang and Reynolds, 2024). Mental health apps offer a cost-effective way for individuals to manage their mental well-being and enhance access to care (Neary and Schueller, 2018; Lagan *et al.*, 2021; Fan, Jain and Kankanhalli, 2024; George, George and Jenkins, 2024). It could help alleviate some of the barriers associated with traditional services, such as "financial barriers, scheduling and transportation challenges, and stigmas" (Wasil, Patel, *et al.*, 2021, p. 691). Previous research has identified oversaturation in app stores, which complicates navigation and poses challenges to users in finding helpful apps (Song *et al.*, 2014; Peng *et al.*, 2016; Schueller *et al.*, 2018; Lipschitz *et al.*, 2019; Porras-Segovia *et al.*, 2020; Szinay *et al.*, 2021; Kabacińska *et al.*, 2022; Reger *et al.*, 2022). The app stores provide limited information in their app descriptions, often leaving crucial information that users need before downloading, either buried within the text, not immediately visible, or entirely absent or insufficient (Larsen, Nicholas and Christensen, 2016; Kanthawala *et al.*, 2019; Marshall, Dunstan and Bartik, 2020; Jilka *et al.*, 2021; Stafford *et al.*, 2021; Su *et al.*, 2021; Alhejaili and Blustein, 2023a). Although efforts have been made to address this gap, there is still an urgent need to redesign app store descriptions to effectively convey health information to users (Larsen *et al.*, 2019; Szinay *et al.*, 2021; Alhejaili and Blustein, 2023a).

This research aims to address some challenges found in the description of health apps in app stores. Then, it discusses and introduces a new ethically informed design of app store description that would effectively bridge the gap of conveying health information to users.

Background and Related Work

The information presented in this section provides an overview of the issues found in the app stores regarding inadequate or missing information on the app description of health apps. It also describes the design of the app store and the importance of the description of apps. Lastly, it shed some light on design considerations and some theoretical aspects through multiple domains.

Overview of the App Store Design

App stores are the primary site for "accessing, downloading and distributing apps. "They are considered to be the gatekeepers that set up the rules of "app

creation, sorting, and distribution" (Dieter *et al.*, 2019, p. 2). App providers have a considerable influence on users with respect to the way their apps are presented (Helf and Hlavacs, 2016). In terms of delivery models, previous research has shown that some users found the information in app stores to be disorganized and confusing, creating a barrier to using health applications (Fairburn and Patel, 2017; Szinay *et al.*, 2020, 2021; Alhejaili and Blustein, 2023a). These stores are fundamentally poorly designed, hindering users from effectively identifying and utilizing these apps without using external resources (Aungst *et al.*, 2022). Consequently, there is a need to enhance the app store environment. Helf and Hlavacs emphasized the need to explore and evaluate a new format in the app store (Helf and Hlavacs, 2016).

The Importance of App Descriptions

App descriptions serve as essential channels for developers to convey app information to users (Feng *et al.*, 2019; Larsen *et al.*, 2019; Alhejaili and Blustein, 2022). The description of the functionalities of apps is crucial as users rely on that to understand what the app has to offer, and based on that they make their install decision (Lin and Chen, 2019). Kowalczyk et al. report that "developers are inconsistent in where and how they provide descriptions" (Kowalczyk, Memon and Cohen, 2015, p. 438). The lack of information on the description page of apps could potentially affect the expectations of users (Kowalczyk, Memon and Cohen, 2015). When reliable information on health apps is lacking, people often turn to app stores to find them. However, even experienced professionals are more likely to encounter misinformation, which can lead to decisions based on misleading indicators (de Chantal *et al.*, 2022). Wang et al. state that app developers are considered "the cornerstone of the mobile app ecosystem" (Wang and Li, 2017, p. 163). More importantly, previous work reported several transparency issues found in the app description, such as evidence-based content on efficacy or feasibility studies, benefits and effectiveness claims, hidden costs, privacy concerns, and clinical and user reviews (Wykes, Schueller and others, 2019; Kanthawala *et al.*, 2019; Gordon *et al.*, 2020; Porras-Segovia *et al.*, 2020; Marshall, Dunstan and Bartik, 2020; Nurgalieva, O'Callaghan and Doherty, 2020; Szinay *et al.*, 2021; Wasil, Palermo, *et al.*, 2021; Jiang, 2021; Hendriks *et al.*, 2022; Hudson *et al.*, 2022; New Zealand Ministry of Health, 2022; One Mind PsyberGuide, 2022; Alhejaili and Blustein, 2023a; Power, Boivin and Perreault, 2024).

Design Considerations and Theoretical Aspects

The information of most products on the on-line platforms is displayed through a combination of visual and textual content (Kim *et al.*, 2021). Previous research showed that visual representation improves the decision-making process by providing "contextual and/or detailed information (i.e., the depth of field and the context of information)" (Lurie and Mason, 2007, p. 161). Earlier studies showed that the depth of available information influences the time and cognitive effort spent searching for information (Lurie and Mason, 2007; Alhejaili and Blustein, 2023b). The "amount

of information", "time pressure", "information attributes", "completeness of information" and "information format" may affect consumer decision-making (Haugtvedt, Herr and Kardes, 2007, pp. 595–597). "Decisions become more difficult as the amount of information increases, time pressure increases, conflict among attributes increases, missing information increases, and the information display format becomes less organized or more complex" (Haugtvedt, Herr and Kardes, 2007, p. 595). In terms of the amount of information, the number of attributes added is important. Regarding the format of information, several researchers debated that the displayed information can influence consumers' choices if it is easy to process. With respect to the completeness of the information, in the case of missing information, the consumer's responses vary in many ways, including inferring what is missing based on other attributes available in the set of options (Haugtvedt, Herr and Kardes, 2007). On the other hand, information overload occurs when the information received becomes a hindrance rather than a help, even though the information is potentially useful (Bawden and Robinson, 2009, p. 4). We can reduce information overload and improve the quality of decision making by balancing how information is presented (Varshney, 2014).

The Current Design of App Description

Under the heading "About this App" in the Google Play Store, the app description is lengthy, and users have to scroll down, four full pages, in order to see what the app has to offer. More importantly, it is difficult to find information about evidence-based content, and whether the app does what it claims to do is difficult, and a direct mention of that information is absent. Furthermore, finding the hidden costs in advance does not exist. In terms of privacy concerns, Cory et al. analyzed 152 leading Android mHealth apps and found significant disparities between declared and actual data practices, with many apps failing to accurately declare their collection and sharing of personal and health information (Cory, Rieder and Huynh, 2024). According to a recent new study, researchers found that data brokers resell mental health data collected through health apps. They found that 11 companies were willing to sell a huge amount of data that included critical information about the type of medication users take and the kind of struggle they are dealing with, such as insomnia and attention issues. Surprisingly, the offered data may show a rough estimate of how many people struggle with depression in a particular area (e.g., zip code). Also, some data brokers even offered personally identifiable information such as names, addresses, and income. Even worse, one data broker labelled the collected data as "anxiety sufferers" (Drew Harwell, 2023).

Research Gap and Objectives

Consumers must be able to easily access and view complete information about an app (Chakraborty *et al.*, 2022; Power, Boivin and Perreault, 2024). We briefly addressed some design considerations and theoretical aspects in multiple domains to create our proposed design to bridge the

gap in the communication of health information of apps to users at the point of download. In addition, we considered the transparency aspect found in the transparency framework of app description and adopted the design guidelines created by Alhejaili and Blustein (Alhejaili and Blustein, 2023a) in terms of the following aspects: being upfront with important information, providing clear content, layout, and presentation, balancing between the length and details of information, salient information attributes, completeness of information, simplified and detailed versions when needed.
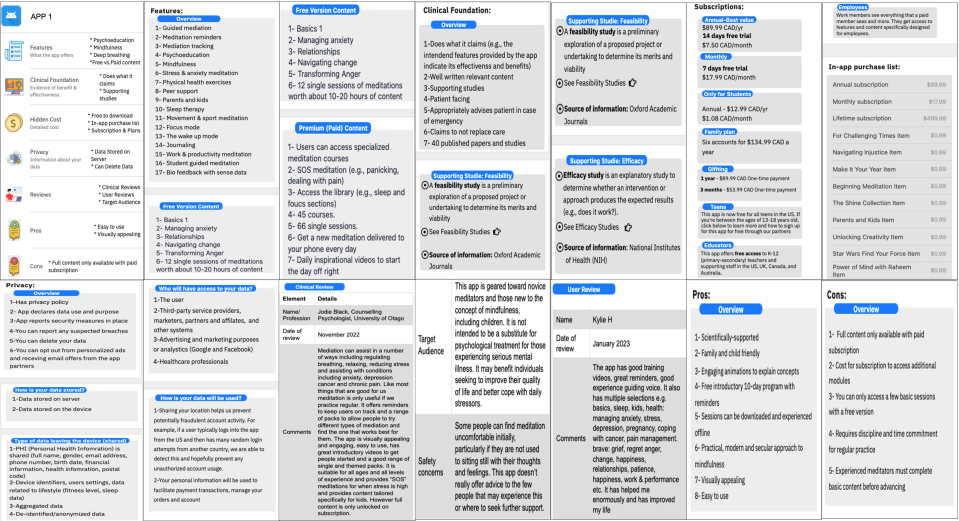

Figure 1: A detailed description of the proposed design.

The Proposed Design

Clearly describing an app is crucial, especially in rapidly evolving fields where even minor changes or improvements can significantly impact its usage and benefits (Ribaut *et al.*, 2024).

Our design aims to maximize the impact and benefits of specific information cues found in previous studies and curated health tools to support people's decisions when searching for health apps (Haugtvedt, Herr and Kardes, 2007; Schueller *et al.*, 2018; Lagan *et al.*, 2020; Alhejaili and Blustein, 2022, 2023a, 2023b; New Zealand Ministry of Health, 2022; One Mind PsyberGuide, 2022).

As seen in Figure 1, the proposed design is illustrated in a block of information that displays a combination of visual and textual information. The first part is a simplified version that lists information on the following elements: app features, clinical foundation, hidden costs, privacy, reviews, pros, and cons. Users can view more content using the detailed version. The feature element shows an overview of the available features and lists the content available in the free and paid versions. Under the clinical foundation element, users can see an overview of the app in terms of evidence of benefits and effectiveness (e.g., does what it claims, well-written relevant content). More importantly, it shows that the app supports studies in terms

of feasibility and efficacy. In addition, it shows the source of information and links to the designated study itself. The hidden cost element shows the detailed plan, subscription, and associated fees. Moreover, it shows a list of in-app purchase items, such as unlocking creativity items. The privacy element provides an overview of some privacy aspects, such as privacy policy, and whether the app declares its data use and purpose. In addition, it shows the location of data storage, the type of data that leaves the device, who will access the data, and how the data will be used. The review element shows a detailed clinical review written by a Counselling Psychologist with comments regarding the benefit of using such an app, as well as the target audience of the app, and if the app has some safety concerns. Furthermore, it shows a user review of their experiences using the app. Finally, under the pros and cons element, it provides an overview of the advantages and disadvantages of using such an app. Overall, our proposed design provides a new means to display an app's information on app stores where we ethically, accurately, and explicitly explain every aspect of the app in advance, which will assist many users who look for appropriate apps to cope with their health condition.

DISCUSSION

It is imperative for app stores to provide users with an effective informational environment that encompasses what the app has to offer (Lin, 2021). As a result, users will not only have accurate information on hand but can also find accurate information regardless of what app store they use (Aungst *et al.*, 2022, p. 4).

Regrading our proposed design, we did not consider user ratings because they were found to be a poor indication by clinical reviewers(Singh *et al.*, 2016). Many apps are removed from the app store due to ranking fraud, fake descriptions, and in-app purchase fraud (Lin, 2021). In addition, some of the ways in which app developers use leave ratings on their apps or pay others to do so make it harder for users to distinguish real ratings from fraudulent ones (Neary *et al.*, 2021). Previous work shows that online user app ratings and the number of app downloads are inadequate predictors of the quality of health apps in terms of user experience, professional/clinical assurance, and data privacy (Hyzy *et al.*, 2024). More importantly, we did not include app images because we wanted users to be able to judge app content itself and since "some developers opt to use alternative assets such as images, videos, or What's New field to reveal additional behaviour, which was not presented in the app description (Kowalczyk, Memon and Cohen, 2015, p. 443). In terms of hidden costs, the Google Play Store does not provide a list of in-app purchase items. They only show a range of expected costs (e.g. $8.49-$159.99 per item). However, Apple has a slight advantage in that it lists the type of subscription, such as yearly or monthly plans. However, it is only a few clicks away and is buried in the app description. Another important aspect is that, for example, the Headspace website (Headspace, 2025) stated that their app is the "most science-backed meditation app" and that, over 70 published papers and studies on product-specific outcomes. However, the current app description does not mention that information.

Power et al. found that information on the evidence base for most highly visible applications is not available (Power, Boivin and Perreault, 2024). Lastly, in addition to our proposed design, the app stores should provide a mechanism to the app developers in which they would be able to add all of the previous details in the app description or make a newly designated section, which will eventually help users deal upfront with the uncertainties of the app contents. App stores should facilitate a standardized reporting format for app information that developers can use (Bowie-DaBreo *et al.*, 2020).

CONCLUSION AND FUTURE WORK

Although some would say that we are to some extent addressing many aspects, our work is needed, and starting somewhere is very important. The health app stores have a duty, and health app developers must adopt these changes to help users (Wykes, Schueller and others, 2019). In terms of the proposed design, we believe that it would fill this gap and act as a gateway to effectively communicate the information of health apps, which could help educate consumers (Hwang, Ha and Kim, 2021). In the second phase, we will conduct a usability study using a mixed-method approach to assess the effectiveness, user satisfaction, clarity of information, ease of learning, feedback, and perceived usefulness of the proposed design. In conclusion, the insights derived from this study could establish a basis, contribute to, and influence the design of app store descriptions, helping policymakers, health organizations, researchers, healthcare providers, and app developers identify effective solutions to help users select health apps, which can be generalized and expanded to other domains.

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