Exploring Fit in an mHealth Effectiveness-Implementation Trial: A Qualitative Study

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Abstract

Background: Implementation frameworks like the EPIS model emphasize the importance of the "fit" between an intervention and its context, which includes the needs of its target population, as well as the culture, resources, and capabilities of the implementing organization. Even though lack of fit is a major barrier to implementation, fit has not often been a focus of implementation research.

Objective: This paper uses fit as a lens to examine the implementation of Tula, an mHealth app aimed at reducing risky drinking days among individuals meeting the criteria for mild to moderate alcohol use disorder, in a 3-arm (app alone; app plus peer mentoring; app plus health coaching) RCT.

Methods: Semi-structured interviews with 18 trial participants and 7 Tula implementers were conducted. Trial participants were pulled equally from each arm of the trial, and represented participants who demonstrated both high and low engagement with the application. Implementers consisted of a project manager, 4 peer mentors, and 2 health coaches. Interviews with participants focused on their motivations, opinions, and experiences of the intervention and their perception of their drinking behavior following the intervention, including how their use of the app worked to change that behavior. Interviews with implementers were centered on their roles, theories of change, perceptions of intervention, and areas for improvement. All interviews were analyzed using rapid qualitative analysis with both deductive and inductive components.

Results: We identified areas of both fit and misfit. For example, there was a good fit between implementers' theories of change and participants' description of how change occurred. Fit was improved by the versatility of the app, which allowed participants to customize their experiences. Conversely, misfit was noted in the app's inability to cultivate connection for many participants and a disjunction between the role of peer mentors in the intervention and their broader professional ethos.

Conclusions: Focusing on fit provides a useful guide to enhance future iterations of the Tula app that lead to better sustainment of the intervention. Clinical Trial: NCT04011644 (ClinicalTrials.gov). Registered 08 July 2019. Available at: https://clinicaltrials.gov/study/NCT04011644

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Exploring Fit in an mHealth Hybrid Effectiveness-Implementation Trial: A Qualitative Study

Nora Jacobson, Linda Park, Alice Pulvermacher, Samantha Voelker, Mallory Herzog and Andrew Quanbeck

Introduction

Excessive alcohol use is linked to increased injury risk and poor health outcomes, causing around 140,000 U.S. deaths and 3.6 million years of potential life lost annually.[1,2] Alcohol use disorder (AUD) spans a spectrum of risk, necessitating interventions tailored to an individual's likelihood of developing severe AUD.[3] Improving access to effective interventions is crucial due to AUD's widespread and destructive nature.[1,4] Digital medicine apps show promise in treating and providing ongoing care for AUD patients, offering a widely accessible means for self-management and clinical monitoring.[5] However, research on implementing these technologies for early intervention in AUD is limited.[3] A key research question remains: how can human support, such as health coaches, enhance the effectiveness of digital medicine apps?[6–8]

This paper reports results from the qualitative component of a hybrid effectiveness-implementation trial that systematically varied the degree of "human touch" offered to support use of an evidence-based mHealth intervention for alcohol use disorder [NCT04011644].[9] The implementation component of the trial was guided by the EPIS framework, which delineates four phases in the implementation of evidence-based interventions: *exploration* to consider target population needs, *preparation* to assess barriers and facilitators to implementation, *implementation* to assess progress and determine adjustments, and *sustainment* to assess how to maintain the context structures and supports of the intervention.[9] For successful implementation, there needs to be a high degree of "fit" between the intervention and the contexts of implementation.[10,11] Fit, which has also been described as "appropriateness" and "compatibility",[11–13] has been conceptualized as encompassing multiple domains, including alignment between the intervention and the needs and preferences of the target population, and alignment between the intervention and the culture, resources, and capabilities of the implementing organization.[11] The lack of fit is one of the most often cited barriers to implementing an intervention, but the construct has not often been the focus of implementation research.[11]

In this paper, we use fit as a lens to examine the experiences of the users and implementers of an mHealth intervention called Tula (Sanskrit for "balance") that was tested in a recent 12-month randomized controlled trial.[14,15] Tula used a harm reduction approach to support individuals with mild to moderate alcohol use disorder to decrease the number of heavy drinking days (5 or more standard drink units for males; 4 or more for females). Trial volunteers were randomized to one of three arms: app only; app plus peer support; or app plus health coaching (see Table 1). Participants in each arm received a monetary incentive to fill out periodic study surveys that assessed the number of heavy drinking days and several quality of life measures. A full description of the protocol can be found in Park et al. 2022.[14] The RCT was approved by the Minimal Risk IRB at the University of Wisconsin-Madison.

Table 1. Study Arms

App Only	App + Peer Support	App + Health Coaching
Unguided use of Tula	Tula use supported by a community-based peer mentor	Tula use supported by the health coach
Study team conducts safety monitoring and technical support	Interpersonal communication and wellness monitoring via the app	Up to three 1:1 health coaching sessions via phone call
No discussion forum	A discussion forum moderated by a peer mentor	A discussion forum moderated by a health coach
No communication feature with private messaging	The private messaging feature in communication routing to a peer mentor	The private messaging feature in communication routing to a health coach
No dashboard access	No dashboard access	Health monitoring by health coaches supported by a dashboard

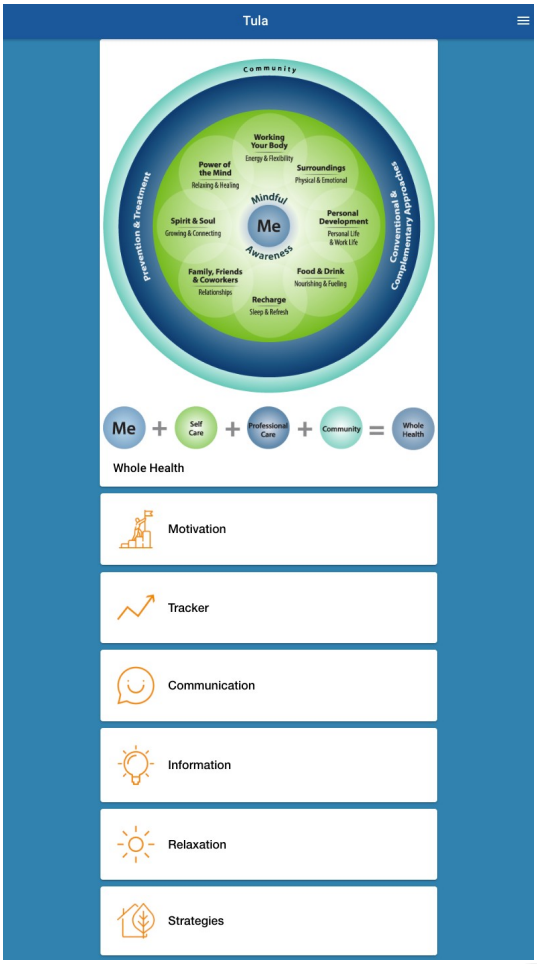
Full trial results are reported in Quanbeck et al. (under review).[15] Across all three groups, a statistically significant time effect was observed, with the percentage of self-reported heavy drinking days dropping from 38.4% at baseline (95%CI [35.8%, 41%]) to 22.5% (19.5%, 25.5%) at 12 months. However, there were no significant differences between groups in alcohol use reduction. Additionally, participants in the health coaching arm showed statistically significant improvements in mental health-related quality of life compared to the other two groups. However, participants in the health coaching arm dropped out of the study at a higher rate than participants in the other two arms, making that result difficult to verify due to risk of bias due to survivorship effects (i.e., patients who had worse mental health may have been more likely to withdraw from the study).

Methods

App design

The app was designed according to the tenets of self-determination theory, which posits that adaptive functioning is optimized when people are able to meet their needs for autonomy, competence, and connection.[14,16] The app content was informed by the Whole Health Model, a VA-developed approach to health promotion that views health as having physical, psychological, spiritual, and social dimensions and seeks to enable people to improve their health by empowering them to identify their own needs and priorities and set their own goals.[17] Thus, the app's embedded theory of change held that people's ability to change their drinking behavior would be promoted by features that were customizable and educational, and that supported relationships with others. Figure 1 shows a visual depiction of the Tula app from the user perspective.

Figure 1. User-facing view of the Tula app.



Sample selection

We sought to elicit perspectives both from implementers of the intervention and from research participants across a range of engagement levels. The implementer sample (n = 7) included 1 research team member who had project management responsibilities, all 4 individuals who worked as peer mentors, and the 2 individuals who provided health coaching. Participant engagement was determined by total number of app page views over 12 months for participants in all three arms, discussion group views and posts for the participants in the peer support arm, and number of health coaching sessions completed for those in the health coaching arm. A total of 18 participants (6 in each arm) with high and low use were identified and invited to participate in the interviews. Participants who did not engage at all—e.g., those in the health coaching arm who attended zero coaching sessions—were not eligible because they would have no direct experience with the intervention.

Qualitative interviews

Implementers were interviewed by the first author. These interviews focused on roles played in Tula, implementers' theories of change, perceptions of how the intervention did or didn't work, and suggestions for improvement of the intervention. Trial participant interviews were conducted by three research team members (NJ, AP, SV) who had not had previous direct contact with the participants. Participant interviews covered participants' reasons for joining the study and their opinions of and experiences with the different components of the intervention, as well as their perceptions of whether and how Tula had affected their drinking behavior. Interview participants provided verbal informed consent.

All interviews were audio recorded, transcribed verbatim, and analyzed using rapid qualitative analysis, an approach that includes both deductive and inductive elements and is particularly appropriate for implementation research.[18] An initial coding matrix used domains derived from the EPIS framework: innovation, inner context, and outer context. After the first coding pass sorted the data into these *a priori* categories, a second round of coding developed new categories that were specific to the data set. For example, the inner context included participants' motivations for volunteering for the study, while the outer context included the impact of the COVID-19 pandemic (which coincided with the trial). The notion of fit was operationalized by searching for areas of compatibility and incompatibility between the Tula intervention and the implementation contexts. Other analytic activities included memo writing and discussions among the research team about the developing findings.

Results

The findings reported here were based on semi-structured interviews with 18 trial participants and 7 Tula implementers. The demographics and usage data for the 18 interview participants were largely reflective of the overall study population compared to participants in the entire Tula sample (n=558). The subset of participants who were interviewed was primarily white (17/18) female (13/18), and highly educated with 12/18 holding a bachelor's or master's degree. Average age was 47. (See Table 2, which also shows use data for both the interview participants and the overall trial sample).

Table 2. Baseline Characteristics of the Study Population

Characteristic	Low Use (n=9)	High Use (n=9)	Total Interviewed (n=18)	Total (n=558)
Age (M, SD)	(43.8, 13.9)	(50.2, 11.6)	(47, 12.8)	(42.8, 12.9)
Female (N, %)	(6, 66.7%)	(7, 77.8%)	(13, 72.2%)	(366, 65.6%)
Race (N, %)*				
White	(9, 100%)	(8, 88.9%)	(17, 94.4%)	(510, 91.4%)

Black	(0, 0%)	(1, 11.1%)	(1, 5.6%)	(27, 4.8%)
AI/NA	(0, 0%)	(0, 0%)	(0, 0%)	(5, 0.9%)
Asian	(0, 0%)	(0, 0%)	(0, 0%)	(12, 2.2%)
NH/PI	(0, 0%)	(0, 0%)	(0, 0%)	(2, 0.4%)
Other	(0, 0%)	(0, 0%)	(0, 0%)	(6, 1.1%)
Hispanic or Latino (N, %)	(0, 0%)	(0, 0%)	(0, 0%)	(14, 2.5%)
Education (N, %)				
<High School	(0, 0%)	(0, 0%)	(0, 0%)	(3, 0.5%)
HS or GED	(0, 0%)	(1, 5.6%)	(1, 5.6%)	(67, 12%)
Vocation or Associate	(2, 22.2%)	(3, 33.3%)	(5, 27.8%)	(85, 15.2%)
Bachelors	(5, 55.6%)	(5, 55.6%)	(10, 55.6%)	(235, 42.1%)
Masters	(2, 22.2%)	(0, 0%)	(2, 11.1%)	(121, 21.7%)
Doctorate	(0, 0%)	(0, 0%)	(0, 0%)	(47, 8.4%)
Marital status (N, %)				
Married	(6, 66.7%)	(4, 44.4%)	(10, 55.6%)	(301, 53.9%)
Widowed	(1, 11.1%)	(1, 11.1%)	(1, 5.6%)	(10, 1.8%)
Divorced	(0, 0%)	(1, 11.1%)	(1, 5.6%)	(55, 9.9%)
Separated	(0, 0%)	(0, 0%)	(0, 0%)	(6, 1.1%)
Never Married	(0, 0%)	(2, 22.2%)	(3, 16.7%)	(109, 19.5%)
Living with a partner	(2, 22.2%)	(1, 11.1%)	(3, 16.7%)	(73, 13.1%)
Refused	(0, 0%)	(0, 0%)	(0, 0%)	(1, 0.2%)
Don’t know	(0, 0%)	(0, 0%)	(0, 0%)	(3, 0.5%)
Severity-mild (N, %)	(4, 44.4%)	(3, 33.3%)	(7, 38.9%)	(356, 63.8%)
Tula Usage (M, SD)				
Page Views	(385.8, 119.9)	(2587, 1104)	(1487, 1365)	(806.1, 510.5)
DG Read	(21.5, 26.1)	(320.2, 464.2)	(170.8, 349.5)	(76.7, 118.1)
DG Post	(8, 0)	(64, 42.5)	(50, 44.6)	(8.3, 12.1)
Health Coach Visits	(1, 0)	(3, 0)	(2, 1.1)	(1.7, 1.3)

Abbreviations: AI/NA: American Indian/Native American, NH/PI: Native Hawaiian/Pacific Islander, HS: High School, GED: General Educational Development, M: Mean, N: Number, %: Percentage, DG: Discussion Group.

User Motivations

Participants identified two alcohol-specific motivations for wanting to join the study: being curious about their drinking habits and wanting to cut down on their drinking. In discussing these motivations, they alluded to feelings of being at risk for problem drinking, either because of their individual circumstances--for example, a family history of alcoholism or an increase in drinking during the early days of the COVID pandemic--or because they perceived their social context as being oriented toward heavy drinking.

“Why? I guess I was just kind of, I was curious about my own habits. Alcoholism runs in my family…and I just was kind of, it's always kind of lingered in the back of my mind, like how responsible I am with alcohol. So I was just kind of curious to see how often I really did drink…and cravings and, you know, did I need it?” User 04 in the app only arm

"I already have anxiety issues, but during COVID my anxiety really went up a lot, and I found that I was drinking quite a bit, like every day actually. Much more than I had before. So when the study came about…I just thought it would be really good to try to get back on track and to decrease the, how much I was drinking, because it really affects my anxiety." User 06 in health coaching arm

Users also described being motivated to participate by a wish to improve their overall health and by an interest in research.

"Well, for myself, it's, you know, like some people have every year where, you know, they start the new year and they're like, okay, what do I want to try to do to be better? I'm always trying to identify things of, areas work where I can, you know, get better. When I had seen that, I knew that I was probably drinking a little bit more than what I should have, and it just looked at, you know, right time, right place, right opportunity." User 04 in the health coaching arm

"Well I just wanted to cut down on my drinking, and the reason I wanted to do that was because my cholesterol levels were kind of high. Well, I attributed that to late night snacking, and you know, just overeating because that's what alcohol kind of triggers in me. So, yeah. So that's why I wanted to participate, and just to be healthier, you know? " User 06 in peer support arm

"So I found it very interesting. I have a health background, and I've always been, you know, into health and wellness and fitness. So I just thought that it sounded like a very interesting study to be a part of. I'm always kind of interested in research studies in general, but this one in particular I thought was especially interesting just because it had, you know, it related more towards overall, you know, health and wellbeing." User 01 in the health coaching arm

Implementer Theories of Change

Each of the three components of the Tula intervention—the app, the peer support, and the health coaching—had its own theory of change.

The app's theory of change was embedded in its design, which has already been described.

Peer mentors told us that behavior changes, like drinking reduction, depend on an individual's intrinsic motivation. Motivation is prompted and reinforced by increased self-awareness of the pros and cons of the behavior and, ultimately, a decision that the cons of continuing the behavior outweigh the pros. The role of the peer mentor is to use their own experiences of substance use, recovery, and relapse to establish rapport and then to "support and love [people] where they are at" by offering non-judgmental, highly personalized, and often intensive assistance.

The health coaches described grounding their practice in the Whole Health model and the Stages of Change model of health behavior change. Like peers, they saw health behavior change as originating in an individual's intrinsic motivation and the coaches' role as "support[ing] people in making health change that they were ready and wanting to make." Health coaches "[get] to the heart of what really matters to people" in order to provide tools that facilitate an individual's "mindful awareness" of their health habits and the ways in which these habits are or are not consonant with what the individual values.

Health coaching consists of fairly structured conversations in which coaches "help [people] go from knowing to doing," or move from contemplation to action in the stages of change, by working with the individual to identify what they value, figure out how their current habits do or do not serve these values, set goals for change, review their progress toward meeting these goals, and fine tune their goals as needed.

Change Mechanisms as Experienced by Users

Users described four main mechanisms through which the Tula intervention worked to support change: accountability, encouragement, information, and connection.

Accountability came in both weak and strong forms. In its weak form, the Tula intervention raised users' awareness of their drinking behavior by providing visibility onto the number of drinks taken each week. In its strong form, accountability consisted of cycles of pattern analysis and goal setting and either positive or negative reinforcement for behavior change.

(Weak version) "[The app asks you] 'How much did you drink last week?' And that, for me, was enough to just kind of keep me in check. You know, like, 'Ooh, I had a lot last week'…if you have three or four drinks, then you want to have a fifth drink. You're like, 'Ooh, but I gotta enter that in that app.'" User 02 in health coaching arm

(Weak version)"Well, as you know, the application itself makes you more mindful of how much alcohol you're consuming because on a weekly basis, it asks you to tally up how much you've had, and when you actually physically do that, when at the time might seem like I just had a few beers, you know, just had a few drinks, you can see where it really starts to add up. [Laughs] And so I used it, I guess on a weekly basis and then because I was doing that on a weekly basis and seeing how much I was drinking a night… it made me more mindful day-to-day as to how much I was consuming. And so it was, it became more like, "Oh, you know, you already had a couple, you know, maybe that third one is not a good idea."" User 04 in peer support arm

(Strong version) "I also liked that it had the like, mood and sleep like trackers along with the alcohol consumption trackers. Just because it was interesting to kind of see the correlation between all three of those factors and not just looking only at alcohol consumption. It's kind of interesting to see. I noticed that like alcohol consumption tend to be a little higher, like in weeks where I rated mood or lower sleep." User 02 in app only arm

(Strong version) "[The combination of the tracker and the surveys] made me reflect on my goals…. If the question was, how connected do you feel to people outside of work, or, you know, to your family. If I noticed that I connected low there, and then had like three or four drinks above my goal for that week… then that was like a pretty clear, oh, you know, things are out of balance here." User 02 in peer support arm

Both high and low engagement users described accountability as having had the most impact on their drinking behavior.

Encouragement worked by promoting positive thinking, changes in perspective, mood elevation, and hope, which in turn helped to provide motivation to change behavior.

"Oh, just you know, [the thought of the day] was always something positive and it just launches your day in a great manner and, you know, inspiring quotes or, you know, you've got this, you can do it. You know,

tough times don't last, tough people do kind of things and just very inspiring, you know, and it wasn't preachy or anything like that. It was always just kind of nice little encouraging snippets." User 04 in the peer support arm

"I dug into the gratitude list. So it was more of a reminder. If I was having a bad day that I could really point out, remember, positives of my day to go back and reflect upon." User 05 in health coaching arm

"[The peer mentor] kind of opened up and told us about her experiences as well. I thought she was very down to earth, and very encouraging." User 06 in peer support arm

"There was challenges and stuff like that and it wasn't always easy, that there was always being progress made. So that, it was breaking that stuff down when it's like, oh, well, you know, and [the health coach]'d be like, no, well, you know, look what you've already done and, you know, and then come with some other tools or things where I was having difficulties that I wasn't able to utilize, showing me the way to, you know. Just different ideas and things like that. So it was like, I just felt like I was going in the right direction, and that would be probably the biggest, it was very motivating, I guess." User 04 in the health coaching arm

Information supported change by offering new strategies for adaptive behaviors, as well as substitutions for other, maladaptive behaviors.

"[The app contained] just different ideas of things to do to occupy yourself other ways and meditation ideas, like this all kinds of different ideas. Things to keep you busy." User 05 in the peer support arm

Connection allowed users to exchange practical knowledge and to gain insight into other's experiences.

"It was insightful to get some tips from other people and it kind of led me to something new I found out, too, which has really helped me. I, well I started making mocktails, and I'd have them at home. I rarely drink at home, but every once in a while, I get really stressed out, beat up, and just, ugh, you know? I want a cocktail, but I found that mocktails were really good for me because they kind of gave me that ritual. They really helped. So, somebody suggested trying them and, you know, try some different recipes, and yeah. So I got some good information from other members that way." User 06 in the peer support arm

"So it was useful in the fact that…challenges that I would run into, I could see others that were challenged in the same manner, and some, on some occasions you could get feedback of what they were able to use or what they did that that made that difficulty something that was easier to deal with. Then there was also ones that would have comments where you like, okay, I don't want to do that. So on the positive there was there was good things, and on the negative there was good things. It was just nice to have that different perspective." User 04 in the health coaching arm

Fit and Misfit

We found areas of fit and misfit across the three components of the Tula intervention and the contexts of implementation.

Tula was a good fit with users' motivations for joining the trial. All interview participants described the intervention as having been successful in giving them some insight into their drinking. Many, though not all, reported that they had reduced their drinking or otherwise changed their drinking behavior. Several noticed improvements in their overall health—for example, weight loss or improved sleep.

There was also a good fit between users' motivations, the change processes they described, and the app's features. The feature most often associated with both forms of accountability was the weekly drink tracker, which was universally popular with both low and high engagement users. Users who experienced the stronger form of accountability also cited the study surveys. All the interview participants described using the tracker to become more aware of their drinking behavior, and several attributed their ability to reduce or change their drinking behavior to the tracker. The features described as being the most encouraging were the thought of the day, the modules devoted to motivation and gratitude, and the interactions with the peer mentors and health coaches. The features that seemed most closely linked to information were the modules focused on relaxation and drinking reduction strategies, and the discussion groups, particularly the group associated with the peer support component of the intervention. The Tula components mentioned as important to fostering connection were the peer support and the health coaching.

There was compatibility between implementers' theories and users' reports of how Tula worked to effect changes in their drinking behavior. Accountability, encouragement, information, and connection as described by the users were consistent with the theories of change embedded in the three components of Tula. That is, when it worked, Tula appears to have worked in ways it was theorized it would.

All of the peers and health coaches indicated that the harm reduction philosophy underlying Tula was compatible with their own beliefs and approaches. The health coaches described their Tula work as very similar in approach to their non-Tula coaching and as personally fulfilling.

A significant misfit was the dissonance between the peer mentors' conceptualization of the peer role and the role as conceived in the Tula intervention. Specifically, the peer mentors contrasted the highly personal nature of their services as offered in the non-Tula context with the distanced and anonymous quality of the Tula work, which one peer mentor described as "dry." All the peers noted this difference and suggested that it hindered their effectiveness.

"I didn't have enough in-depth dialogue with each participant where I could understand where they're coming from…in a more in-depth way. And…I couldn't really share my experiences as deeply as I would if it was face-to-face." Peer mentor 01

"There was no face-to-face contact.…there was not much of a connection made there. Whereas, you know, with peer support, we meet in person, face-to-face. You know, we can, you know, we can see the, the body language…that's how you build a rapport, connection and trust. And so through an app there just wasn't anything like that…. It's just not enough. It was, it was just really almost non-human interaction in a way." Peer mentor 03

One peer mentor experienced this misfit so acutely that they provided their contact information to trial participants and held one-on-one telephone conversations.

The discussion feature, included in the app for those trial participants randomized to the

peer support or the health coaching arms, was successful for some users, especially to the extent that it was a source of information and encouragement. However, it appeared to be largely a misfit when it came to providing deeper feelings of connection. Both the health coaches and the peer mentors said they felt poorly equipped to facilitate meaningful discussions. Even the highest engagement users in the peer support component, those who spent the most time on the discussion pages, were lukewarm about the discussions. Several interview participants said they had other outlets, such as AA, that met their needs for connection. Others noted that they felt they had little in common with users who posted in the discussions.

"I only really read. I never really posted, to be honest…. It's easier just to kind of read other peoples'.'" User 03 in peer support arm

"To be honest, I did not play on the social side of it at all….it was people who weren't going to quit, and they didn't really want to. They were looking for someone to talk them into it. That's kind of the way I looked at those comments…in my opinion, if you want to do something, you just got to do it. It's not like somebody should be talking to you or anything like that. It's got to come from inside." User 01 in peer support arm

Implementers identified a misfit attributable to the research context. They perceived that some trial participants were motivated not by an authentic wish to change their behavior, but by the monetary compensation offered by the study. Thus, they lacked "skin in the game" and, while these participants completed the surveys that were the basis for receiving compensation, they did not really engage with any of the Tula components.

The app's technology and the volume of its content showed fit and misfit. While most implementers and users praised how well the app functioned—"everything you click on, it works," others described it as clunky and unintuitive or reported technical glitches that interfered with use. Two users expressed a lack of enthusiasm for any app: one because their life during COVID was taking place almost entirely online and they wanted a break from screens; another because they were trying to reduce their phone usage.

Many users liked how much information the app contained; others felt overwhelmed or wanted a more curated experience.

"And so for me it was frustrating because there was so much in abundance. And I felt like you had to do it all. It wasn't like I could do a subset and be successful. So then I found myself not being as successful. That's a terrible thing to say, but I did…it became overwhelming and I felt more guilty and worse off." User 03 in health coaching arm

Other domains that mixed fit and misfit were preferences related to privacy and intervention intensity. Many users stated that they did not care to reveal themselves, or make themselves "vulnerable" to strangers online, and thus they appreciated having the ability to remain anonymous.

"Wanting to kind of self-improve on your own terms was really helpful for me in just having it be private, but knowing that, you know, there were strategies in there I could look at and I didn't have to, like reach

out to somebody. For that, personally, for me, it was helpful." User 01 in app only arm

"And that way when you use the app, it's private, you know? No matter what you enter into it, it's just you and your entering info, you know? No one else around and it can, as bad as it may seem, who cares? Because no one sees it but you, you know what I mean? It goes to data for whatever you guys are doing, but at the time when you're entering stuff it don't matter, because it's just you." User 05 in app only arm

The fact that health coaching required some self-revelation during one-on-one conversations with the coaches was uncomfortable for some users.

"The other most difficult thing is talking to the coach on the phone whom I didn't have a relationship with, didn't know. And for me, it was already an embarrassing topic…I felt very probed and very kind of like a scientific experiment…I know it was anxiety producing for me." User 03 in health coaching arm

Notably, the research team member who informed participants of which arm they had been assigned to reported that many trial participants randomized to the coaching arm expressed disappointment with their assignments. As noted earlier, the health coaching arm had a higher rate of attrition than the other two arms.

While most users seemed to appreciate that the Tula experience was fairly relaxed, others felt that they would have gotten greater benefit from a more intensive intervention.

"I probably would have benefited from it all. You know, having the group, having the counselor and the app, all three of those, would be a pretty high success rate I think, for myself personally." User 03 in the app only arm

"I felt [the health coaching sessions] weren't memorable. I felt they were short, weren't in-depth. It was like, 'what do you want your goals to be? Here are your problems. OK, that's a good goal.' I just fell off the map. It really wasn't, I thought it would be more invasive at that level with the coach, and it was 15 minutes maybe each…. I felt the coach didn't coach…. You want someone who is skilled but is also going to provide you with expertise and solutions and ideas. I didn't feel that was done." User 05 in health coaching arm

Discussion

While most of the literature on alcohol reduction mHealth interventions has been inconclusive, there is some evidence of promise, particularly for the general population —who tend to have better outcomes with mHealth interventions.[19–22] Our examination of fit suggests some explanations for that promise.

We found good fit between the Tula intervention, inclusive of the app, peer support, and health coaching, and many aspects of the contexts of use. There was a compatibility between the implementers' theories of change and users' descriptions of how change occurred and between these change processes and the app's features. The best fit was between the change process users called accountability and the app's tracking feature. This is consistent with findings from other studies, which have demonstrated positive behavior change from logging alcohol consumption as participants see real time

progress via the tracking function.[20] Giroux et al (2014) conducted a study of a location-based monitoring and intervention system for alcohol use disorders, and Osth et al (2023) compared 2 different smartphone apps to complement alcohol treatment. Both reported that participants found the accountability function and tracking feature increased their awareness of drinking consumption and increased their motivation for behavior change.[23,24]

We also uncovered several misfits. There was discordance between the peer mentor role in the Tula intervention and key features of the role in the non-Tula environment. The app itself was not entirely successful at fostering connection; the discussion feature, in particular, seems to have been only minimally effective. In addition, we observed several domains of mixed fit and misfit, specifically pertaining to the app's technology and content, and to users' preferences related to privacy and intervention intensity.

That the app offered an array of options—"something for everyone"--was cited by both users and implementers as an important strength of the Tula intervention. Having choices meant that users could customize their experiences; including, for the low engagement users, the choice to ignore parts of the intervention that they did not find helpful or interesting. A narrative review of 71 articles on barriers and facilitators to digital health adoption found that patient empowerment, self-management, and personalization were the key drivers in adoption of digital health tools.[25] Patient concerns over data privacy and security are also important when it comes to issues of choice in digital health. Patients expect clear guidance on how their data will be used and value the ability to control data sharing.[26]

Another key finding was the ways in which the research context affected both users' and implementers' experiences. For some users, random assignment constrained choice, pushing them into interventions they had no interest in exploring. From the implementers' perspective, the incentives offered to trial participants satisfied motivations that had nothing to do with drinking or health. In both cases, the misfit between the intervention and the research context appears to have threatened Tula's effectiveness. Conversely, the surveys participants were asked to fill out as part of the research seemed to have functioned as an effective part of the intervention for some users, particularly those who found a strong version of accountability helpful to making change.

This qualitative examination helps provide an explanation for the main results of the Tula trial. The dominant mechanism of change described by the interview participants was accountability, which was closely tied to the app's tracker, a feature that trial participants in all three arms were able to access. The fact that the peer support component was not more effective than the app alone may be because what happened in Tula bore little resemblance to the highly personalized practices of outreach and response that are part of the ethos of peer support as it has developed as a profession.[27,28] The higher rate of attrition in the health coaching group compared to the other study arms may be at least in part explained by a misfit between the privacy

preferences of a subset of users and the demands of the health coaching intervention. However, it should be kept in mind that related research on digital health apps for alcohol reduction have shown very high attrition rates; Attwood et al.'s (2017) examination of the Drinkaware app for alcohol use reduction observed high attrition, with only 42.6% of using the app after the first week and only 5% retained after 12 weeks.[29] The improvement in mental health-related quality of life among participants who stuck with health coaching seems to reinforce the idea that allowing Tula users to customize their own intervention experiences may garner the best outcomes.

Limitations

The design of this study did not allow us to determine the exact nature of the relationship between fit and engagement for individuals, but the data do suggest that the two are related. Users for whom the Tula components were a good fit were enthusiastic about them and appear to have been more engaged. Lower engagement users seem to have experienced more misfit. Future quantitative analysis will examine the relationship between engagement and outcomes and explore potential mechanisms of action.

Although the demographics of the interview sample were largely consistent with the overall Tula sample, individuals who agreed to participate in interviews might have differed from the larger sample in ways we did not measure. Our decision not to recruit participants who chose not to use the Tula components means that the sample does not represent the group of participants with the lowest levels of engagement. However, the consistency of responses suggests that we did achieve informational redundancy and thus are able to represent the experience of users who met our inclusion criteria.

Conclusion

The results reported in this paper suggest that the concept of fit can go some way toward explaining the outcomes of the Tula mHealth trial and may provide insights into user experiences of mHealth interventions in general. Using fit as a lens through which to examine the experiences of intervention users and implementers provides insights that can be applied to iterative intervention improvement, which in turn will increase effectiveness and promote sustainment.

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Conflicts of Interest

AQ has a shareholder interest in CHESS Health, a company that disseminates software technology to the addiction treatment field (CHESS Health did not develop the app tested in the manuscript) and consults on implementation of evidence-based healthcare interventions for the non-profit NIATx Foundation. These relationships are managed by the University of Wisconsin–Madison's Conflict of Interest Committee. All other authors have no conflicts of interest to disclose.

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Supplementary Files

Figures

Patient-facing view of the Tula app.