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RESEARCH PAPER

Development of the Motivation and Skills Support (MASS) social goal attainment smartphone app for (and with) people with schizophrenia

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Summary   People with schizophrenia and schizoaffective disorder (SZ) often struggle with social impairment, including small social networks and loneliness. Limitations in social skills and reduced social motivation—effort to engage in social connection—are key contributors to social impairment. While evidence-based approaches to improving social outcomes are available, including social skills training and cognitive behavioral therapy for psychosis, ongoing access to these interventions is often limited. Mobile technologies, including smartphone applications (apps), may address some of this need. In this paper, we describe the development of a smartphone app designed to address social skill and motivation deficits in SZ: the Motivation and Skills Support (MASS) app. We discuss the incorporation of stakeholder input into intervention design as well as results from usability pilot testing of the app in a sample of people with SZ. Finally, we describe next steps in the development and testing process of the MASS app.
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Social impairment is a hallmark feature in schizophrenia and schizoaffective disorder (SZ), and it is associated with chronic disability (Addington & Addington, 1999; WHO, 2001). Contributors to social impairment include deficits in social skills and social motivation, among other factors (e.g., social cognitive deficits). Social skill deficits, such as limitations in the ability to initiate conversations, accurately monitor and respond to others, and show appropriate verbal/nonverbal behaviors, are more common and severe in SZ than in other psychiatric groups (Bellack, Morrison, Wixted, & Mueser, 1990; Mueser, Bellack, Douglas, & Morrison, 1991).

Diminished social motivation, including reduced effort at connecting with others and setting goals that are less social in nature, is also common in SZ, despite a reported desire for social affiliation (Fulford, Campellone, & Gard, 2018; Gard et al., 2014a; Gard et al., 2014b). Evidence based on the temporal experience of pleasure model (Edwards, Cella, Tarrier, & Wykes, 2015) suggests that people with SZ have intact hedonic responses to positive situations and stimuli (i.e., consummatory pleasure, or ''liking''), but are impaired in their ability to anticipate future positive experiences (i.e., anticipatory pleasure, or ''wanting'') (Barch & Dowd, 2010; Gard, Kring, Gard, Horan, & Green, 2007; Gold et al., 2013); thus, difficulties with social motivation (e.g., goal setting) may be due to impairments in anticipating future pleasure. Further, these difficulties may emerge from a reduced ability to cognitively integrate previous positive social experiences with current goal states, leading to reduced effort for social connection (Blanchard, Mueser, & Bellack, 1998; Granholm, Ben-Zeev, Fulford, & Swendsen 2013; Herbener, 2008). Taken together, people with SZ exhibit difficulties with both skills that facilitate social connection and the anticipation of experiencing positive emotions in future social experiences, resulting in difficulties in attaining and maintaining meaningful relationships.

Social Skills Training (SST; Kurtz & Mueser, 2008; Lyman et al., 2014) and cognitive behavioral therapy for psychosis (CBTp; Wykes, Steel, Everitt, & Tarrier, 2008) are two psychosocial treatments with an established evidence base for improving social functioning in SZ. SST is a behavioral treatment focused on teaching verbal and nonverbal communication skills through instruction, modeling, behavioral rehearsal (i.e., role plays) with feedback, and skill practice in natural settings (Bellack, Mueser, Gingerich, & Agresta, 2004; Kurtz & Mueser, 2008; Lyman et al., 2014). Whereas SST focuses on social skills, CBTp primarily addresses beliefs and perceptions that shape the interpretation of social interactions and willingness to engage with others (Kingdon & Turkington, 1994). Given their potential synergy, the elements of CBTp and SST have been successfully integrated in the past (Granholm, Holden, Link, & McQuaid, 2014; Roberts, Penn, & Combs, 2016).

Despite the substantial evidence for the effectiveness for SST and CBTp, they are rarely provided in the U.S. due to both limited resources of people with SZ to access these treatments and the lack of clinician training in SST and CBTp (Lehman et al., 1998; Wang, Demler, & Kessler, 2002). Even with access, challenges faced by people with SZ can limit engagement in treatment (Carrion, Swann, Kellert-Cecil & Barber, 1993; Tarrier et al., 1998). Cognitive deficits and diminished motivation can limit the degree to which skills learned in sessions are employed in daily life and may require additional support outside of regular meetings (Wykes & Huddy, 2009). Additionally, people with SZ may feel that particular interventions are not idiographic enough for their individual needs (e.g., learning dating skills in a therapy group when one is married), which would interfere with treatment adherence. Because social situations involve a dynamic interaction with the immediate environment, relatively low intensity, implementable interventions delivered in naturalistic settings have potential for great impact on social functioning (Myin-Germeys, Birchwood, & Kwapil, 2001).

In particular, mobile technology may be the key to increase the scalability of evidence-based interventions for SZ such as SST and CBTp. Ecological momentary interventions (EMIs) involve the use of mobile devices (e.g., smartphones, tablets) to support real-time self-management and support (Ben-Zeev, Davis, Kaiser, Krzsos, & Drake, 2013; Kazdin & Rabbitt, 2013). Given the ubiquity of mobile devices, EMIs can enhance the accessibility and effectiveness of evidence-based interventions in day-to-day situations (Hotopf, Churchill, & Lewis, 1999; Birchwood & Trower, 2006). EMIs can facilitate the use of skills related to in situ social goals, providing real and practical opportunities for behavioral rehearsal and practice in a way that traditional skills training approaches cannot. In addition, given the lack of support for the effectiveness of evidence-based interventions in improving psychosocial functioning outcomes in SZ beyond treatment termination (Laws, Darlington, Kondel, McKenna, & Jauhar, 2018), the use of scalable technologies could improve the sustainability of effects of these interventions over longer periods of time (Fulford & Mote, 2019).

To explore the feasibility of using mobile technology to improve social functioning for people with SZ, we developed a novel smartphone application-based EMI to target social skills and social motivation in peoples' day-to-day lives. The four key aims of our approach included:

- integrating evidence-based psychosocial treatment approaches with the temporal experience of pleasure model to target key contributors to social functioning impairment in SZ;
- translating elements of SST and CBTp into a mobile platform, allowing for real-time support of social skills in peoples' daily lives;
- developing an app that systematically enhances social motivation through the feeding back of information about prior affective social experiences related to individuals' social goals;
- prioritizing stakeholder input (people with SZ and expert clinicians) in the design of the intervention to assess attitudes regarding mobile technology and to include content relevant for the everyday social functioning needs of people with SZ.

In the current report, we describe the development of the Motivation and Skills Support (MASS) app, including the incorporation of stakeholder input into app design as well as results from pilot usability testing of the app with people with SZ. From the usability testing, we present both quantitative and qualitative analyses, including a brief

case study describing one participant's experience with the app. Finally, we highlight the refinement process based on usability testing for the next iteration of the MASS app.

Method

We used an iterative process for app development centered on stakeholder input at various stages of the project. The first stage involved conducting focus groups with people with SZ and individual interviews with clinicians. Content from these discussions informed initial planning of pertinent app features, such as which social goals were most meaningful and relevant, and what were common barriers to social goal pursuit. The next stage involved development of app content, followed by usability testing of an app prototype built from the initial planning stage. Feedback from individual users then guided modification of the app for future pilot testing (not addressed in the current report).

Participant recruitment

People with SZ were recruited from community fliers and local community rehabilitation centers that serve people with serious mental illness. Eligibility criteria included having a chart diagnosis of either schizophrenia or schizoaffective disorder and being between the ages of 18 and 70. Clinicians were contacted based on their expertise of working with people with SZ.

Stakeholder input

We invited an expert panel of people with SZ and clinicians to provide input on social needs and views regarding mobile technology. Eleven people with SZ participated in one of three focus groups, consisting of two to six people each. These groups were racially/ethnically diverse, of approximately equal sex distribution and spanned a broad age range. Focus groups were led by the study investigators (DF, DG, and KM) and were approved by the Institutional Review Board. People with SZ provided informed written and verbal consent and were compensated for their participation. Additionally, one of the study investigators (DF) conducted individual interviews with two clinicians with at least 20 years' experience working with people with SZ. Clinicians were not compensated for the interviews. Focus groups and individual interviews lasted 60 to 90 minutes and were semi-structured, with questions aimed at identifying common social scenarios and goals for people with SZ (e.g., "What comes to mind for you when you think of friends?"). Questions were identified by study investigators (DF, DG, and KM), and three other researchers and clinicians with expertise in SZ provided feedback as paid consultants for the study. Both interviews and focus groups included similar questions (a full list of focus group and interview questions are available upon request).

Development of the Motivation and Skills Support (MASS) mobile intervention

Framework

Various researchers and organizations have proposed guidelines for the development and evaluation of mobile health applications for mental health. While specific guidelines vary across groups, most have several common themes around usability and patient safety/confidentiality. The design of the present study was structured so as to adhere to the Principles for Digital Development as endorsed by UNICEF, USAID, WHO, and other organizations (Waugaman, 2016). For one, user involvement was solicited at multiple stages, including initial focus groups and during usability testing. Two, while mental health care occurs in myriad individual systems, we developed an app that could operate independent of specific clinic structures and client status (i.e., as a standalone intervention). Three, our approach is data driven, with a focus on maximizing usability (allowing usage data to guide app refinement). That is, the MASS app is informed by the evidence base for improving social functioning in SZ, and we evaluate impact based on outcomes meaningful to the population. In addition, we incorporated evidence from the literature suggesting certain features of user-centered design, such as focus, architecture, navigation, and comprehension, are critical for increasing usability among people with SZ (see Rotondi, Eack, Hanusa, Spring, & Haas, 2013; Rotondi, Spring, Hanusa, Eack, & Haas, 2017).

Intervention content

The MASS mobile intervention was designed using the Ethica Data web-based platform. Ethica provides assurances of privacy (participants can stop data collection, and delete collected data) and security (data is encrypted). The app was tailored to 11 different social goals that fit into broad categories related to friend, family, and romantic relationships (see Table 1). These social goals were based on both traditional SST content (Bellack et al., 2004) and specific feedback from stakeholders. Video demonstrations of specific social skills that were relevant for these goals were also available through the app to support social goal completion (see Social Skills Training (SST) content and administration). Within the app, participants were provided reminders of their social goal as well as information to help with goal planning. Specifically, each of the 11 goals were broken down into distinct steps that varied in difficulty. Push notifications administered three times per day (morning, mid-day, and evening) directed users to app content focused on their identified social goal and steps. Within the app, a user could select from an array of specific steps (e.g., "practice finding common interests to identify something you both have in common") related to their overarching social goal (e.g., "make a new friend by attending events you're interested in") to attempt or complete before the next push notification. In addition to these goal steps, the app administered ecological momentary assessment (EMA) surveys to assess affect and motivation in response to working towards their social goal, as well as anticipated progress towards achieving their goal. These EMA items were administered to assess and support social goal completion and provide feedback on

Table 1 Goal categories and specific social goals.

Goal category	Specific goal
Make a new friend	Make a new friend by going to events you're interested in
	Make a new friend in school
	Make a new friend at work
	Make a new friend on social media
Improve your relationship with an existing friend	Practice conversation skills to improve your relationship with an existing friend
	Reconnect with an old friend
Get involved in activities with others	Find a regular activity to do with an existing friend
Maintain or improve your relationship with a family member	Improve your relationship with a family member who lives either close by or far away
	Improve your relationship with a family member you live with or see regularly
Develop a romantic/intimate relationship with someone	Develop a romantic/intimate relationship with someone you already know
	Develop a romantic/intimate relationship with someone by joining a dating website/app

social goal progress (see Social goal support: feedback and encouragement).

Social Skills Training (SST) content and administration
We created video demonstrations of social skills to support social functioning. The goal of the SST feature was to reinforce and sustain continued efforts to practice skills in the context of daily life. Two of the investigators (DF and DG) wrote a script for two actors (Maria and Gabriel are old friends reconnecting with one another) to guide acted demonstration of social skills, informed by the SST manual (Bellack et al., 2004) and stakeholder input. We identified key features, such as modeling, behavioral rehearsal, feedback, and in vivo practice, to inform SST video creation. Two actors (one male and one female) and a film crew were hired to create the app-based SST content. The actors demonstrated eight interpersonal skills in a variety of situations related to the social goal of reconnecting with an old friend (see Table 2). The video clips together told a cohesive narrative story that could be viewed sequentially, while each individual clip demonstrated one of the eight social skills. We filmed one to two clips for each social skill (30 seconds to two minutes in duration), for a total of 13 individual clips.

Video clips were made accessible on the home screen of the study phone and participants were instructed to view the videos in their entirety within the first three days of usability testing. The videos were available for participants to watch at any time during usability testing. Further, participants were provided a visual reminder that they could watch these videos after they answered EMA questions related to their social goal (see Fig. 1). Some video content (e.g., clips demonstrating the skill ''finding common interests'') was directly related to specific goal steps (e.g., ''practice finding common interests to identify something you both have in common''), while other video content was related to potential obstacles or difficulties participants might encounter in pursuing their social goal (e.g., clips focused on sharing one's mental health diagnosis with a friend).

Social goal support: feedback and encouragement
Participants were provided encouragement to work on their social goal, as well as summaries of prior experiences to

help support engagement and motivation within the app (see Fig. 2). Each time a participant elected to work on a step toward their social goal, they were asked ''How much progress do you think you'll make in the next few hours?'' and ''How motivated are you to work on this step?'' When participants responded with low expectations ('little' to 'no' anticipated progress) or low motivation ('little' to 'not at all' motivated) regarding their social goal, they were provided an encouraging statement to help improve affect and future motivation. Additionally, when available, summaries of prior experiences based on EMA reports of affect, motivation, and effort were deployed based on a chain of logic statements within the app. When participants reported low expectations or low motivation for their social goal, the app provided summaries of prior experiences of positive affect in the context of social goal progress during recent social goal striving based on the user's previous EMA responses (e.g., ''you recently made some progress on your social goal and reported feeling moderately happy about it''). The purpose of these summaries was to facilitate linkage of prior positive social experiences with current goal states to make social pleasure more salient for individuals and improve motivation, consistent with the temporal experience of pleasure model (Edwards et al., 2015). All participants, regardless of level of intention or motivation, were also provided opportunities to watch the SST videos within the app.

Usability testing of the MASS application procedure

After initial app development, we examined the acceptability and feasibility of the MASS app through usability testing. Usability testing was approved by the Institutional Review Board. We recruited eight community dwelling participants with SZ to use the app over 14 days (including three participants from the original focus groups). Participants provided informed written and verbal consent to study procedures and were compensated for their time during the in-person interviews (at the beginning and end of usability testing). Participants were introduced to the app and provided an Android smartphone during the first study visit with a research assistant. During this visit, the research assistant and participant collaboratively selected one of the 11 avail-

Table 2 Social skill video descriptions.

Social skill	Description	Number of video clips per skill
Active listening	This is a general skill that can be helpful when you would like to improve your conversation skills with someone you are either meeting for the first time or trying to get to know better	2
Expressing pleasant feelings	This is a skill that is useful when you are getting to know someone better, or would like to improve your relationship with someone you already know	1
Making positive requests	This is a skill that will help you get what you want and need from someone else	2
Expressing unpleasant feelings	This skill will help you share something you are unhappy about and would like to change	1
Giving and accepting compliments	These skills are useful when you are both getting know someone or trying to improve a current relationship	2
Finding common interests	This is a useful skill for getting to know someone better by finding things to do together	1
Compromising and negotiating	This is a skill that is useful for solving problems with someone you are getting to know better	2
Disclosing mental health needs	This is a skill that could be used once you feel comfortable sharing your mental health needs with someone you want to develop a stronger relationship with	2

able social goals. Participants were instructed to select a goal that was meaningful, realistic (given context and life circumstances), and that they believed they would exert at least moderate effort toward over the next two weeks. The smartphones provided to participants included a data plan (i.e., participants did not incur any costs associated with the phone) and participants were provided verbal instructions on how to use the phone (e.g., how to turn phone on/off, how to access the app, etc.).

The day after the initial interview, a research assistant called the participant to address any barriers to using the app. Throughout the two-week testing period, research assistants monitored use of the app using the Ethica researcher online dashboard (e.g., access to SST videos, EMA entries). Researchers called participants one additional scheduled time to address remaining questions or concerns prior to the post-testing follow-up meeting.

After the two-week testing period, participants returned to the lab and provided quantitative and qualitative feedback to inform subsequent revision of the app. On an online survey, participants rated on a scale from one (''not at all'') to five (''extremely'') the following questions regarding their experience with the app: ''how difficult was it to use the program on the phone?'', ''how difficult was it to understand the questions?'', ''how much did you enjoy using the program on the phone?'', ''how much did the program on the phone help you with your social goal?'' Participants were asked to elaborate on their responses to the online questions during a brief interview with a research assistant, including discussing barriers and facilitators to using the app and any additional feedback to be implemented in a future iteration of the app. Participants returned the smartphone during this last session. There was no attrition during usability testing; all participants completed both interview sessions and returned the phones.

Data synthesis and analysis

Transcriptions from stakeholder focus groups and clinician interviews were reviewed by study investigators (DF, DG, and KM) for common themes. Across multiple meetings with the research team, consensus was achieved as to the actionable items to incorporate into the design of the MASS app. Notes from the usability testing interviews were categorized by one of the authors (KG) by intervention component (e.g., SST videos; frequency of push notifications; EMA content) and summarized. The case study presented below was formulated based on these notes by two study authors (KG and JM). Means were calculated for qualitative data collected during usability testing (survey responses).

Results

Stakeholder feedback

Clinician interviews

Both clinicians noted the wide variety of social goals people with SZ often have, as well as the variety of social skill challenges they face. They noted that a history of unsuccessful social interactions (e.g., saying something inappropriate, a friendship that ended) was a major factor in reduced social motivation for people with SZ. They reported that facilitators towards social goal achievement included reminding people why they are interested in social relationships in the first place (e.g., happiness, ''fun'') and breaking larger social goals into small, manageable steps. The clinicians also referenced SST as being beneficial for their clients. Based on this feedback, we provided a variety of social goals that participants could choose from (11 in total) and broke each goal down into multiple, discrete steps. We also included a
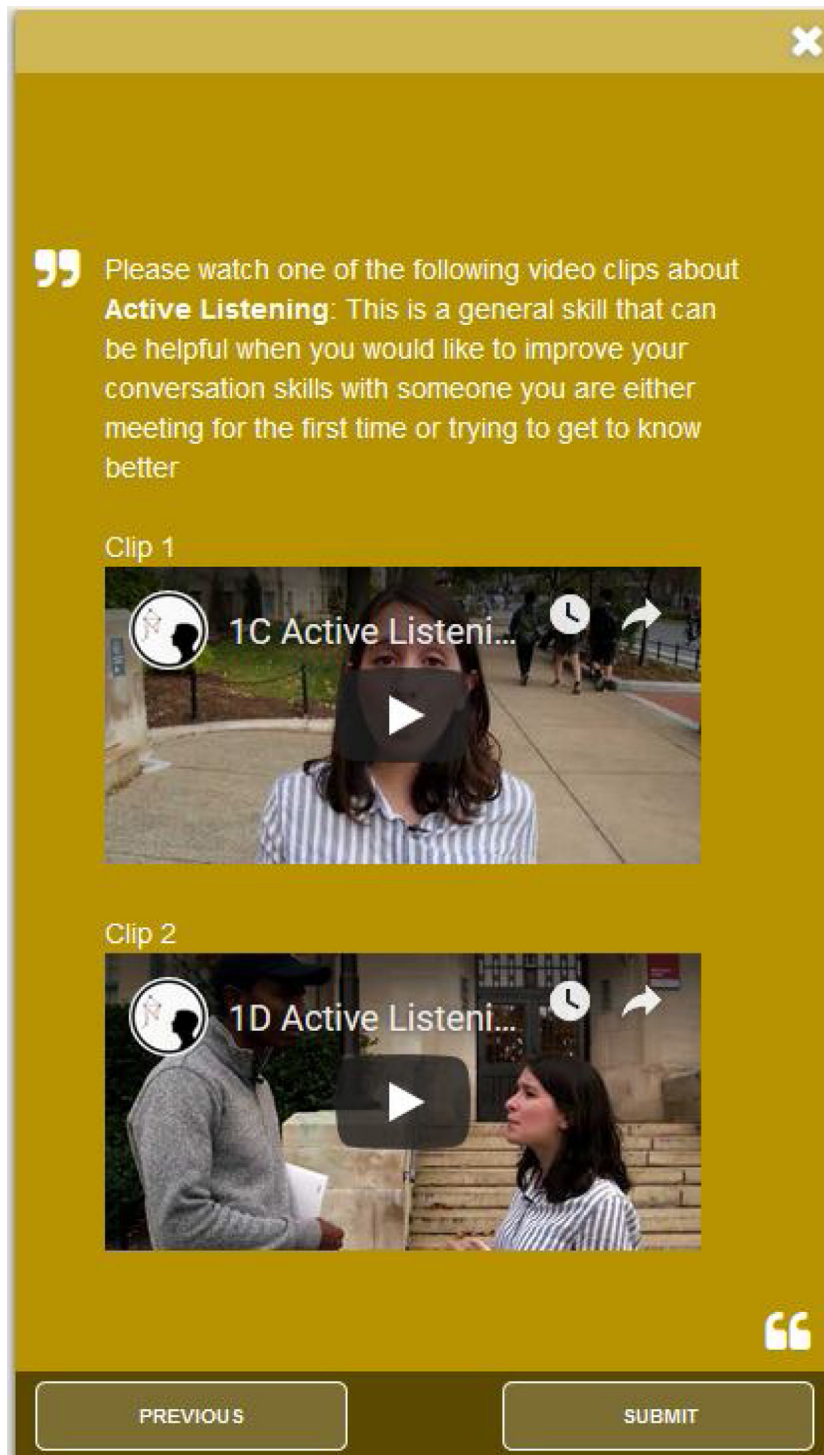
Figure 1   Screen shot of Motivation and Skills Support (MASS) app social skill training video content.

reminder for participants when they reported a social inter-action made them feel happy in the past within the app as well as encouraging statements to reduce defeatist attitudes and improve motivation (see Social goal support: feedback and encouragement). Finally, as planned, we developed the SST-informed video content to help facilitate social goal progress in the intervention (see Social Skills Training (SST) content and administration).

Focus groups

Across three groups (total $N = 11$), participants noted both structural challenges (e.g., being unemployed) and per-sonal difficulties (e.g., skill deficits) with social goal pursuit. Despite these challenges, group members noted the impor-tance of social relationships, their desire to improve their social lives, and their preference for social connection over isolation. They also noted multiple benefits to improving
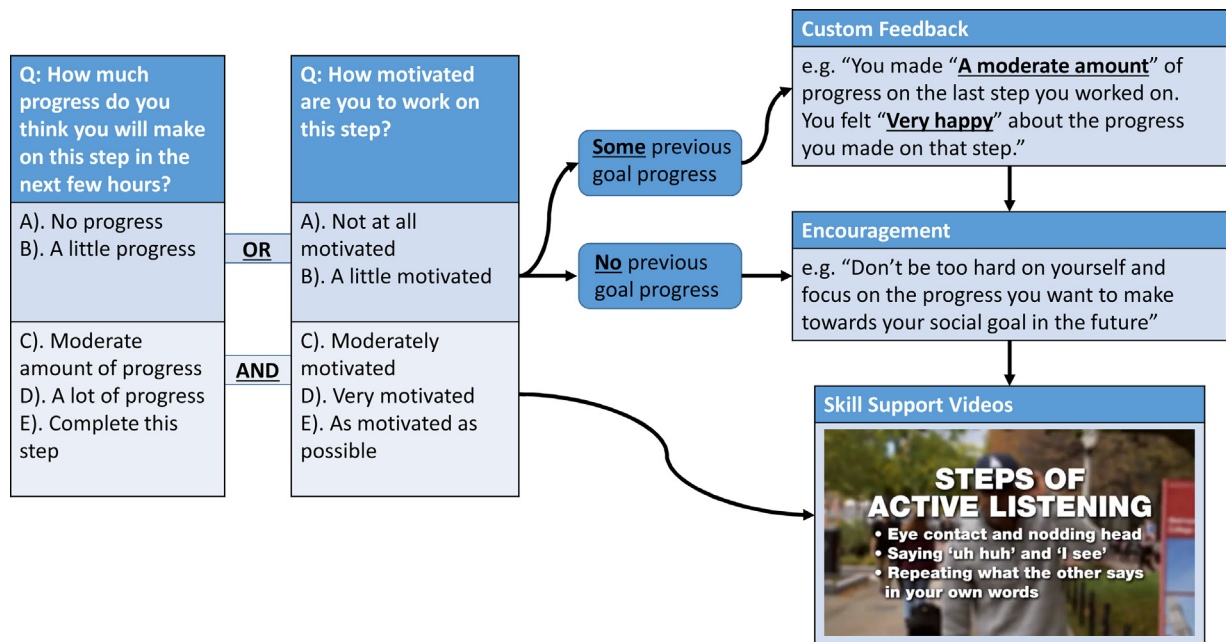
Figure 2   Social goal progress and affect feedback logic example.

their social lives, including a reduction in symptoms when they are with others. One group in particular focused on the difficulty with disclosing their mental illness to others as a main barrier for improving social relationships with those without mental illness. Based on this feedback, we opted not to include psychoeducation about the benefits of social relationships as part of the intervention as this did not seem necessary. As planned, we incorporated SST content related to disclosing one's mental illness to others, and included this as a possible step towards certain social goals we thought would be appropriate (e.g., ''reconnect with an old friend''). Finally, we included general social goals centered on friends and family that were nonspecific as to whether they involved other people with SZ.

Usability testing

Participants ($N = 8$) selected one of the 11 available social goals (see Table 3 for goals selected and app adherence). Here, we describe quantitative results from user feedback and viewing the SST videos, summaries of qualitative feedback from all participants, and a case study of one participant's experiences and feedback.

Quantitative user feedback
Completion of the EMA surveys (social goal support and feedback assessment) ranged from low (less than one survey per day) to high (all three surveys per day) across the users. At the conclusion of usability testing, average ratings of ''how difficult was it to use the program on the phone?'' and ''how difficult was it to understand the questions?'' were low ($Ms = 1.1$ and 1.6, respectively, on a scale from 1—5). Average ratings of enjoyment (''how much did you enjoy using the program on the phone?'') and helpfulness (''how much did the program on the phone help you with your social goal?'') were moderate ($Ms = 3.5$ and 3.1, respectively, on a

scale from 1—5). Therefore, participants rated the app as easy to use and helpful in supporting their social goal attainment. Finally, all but one participant viewed all of the SST videos during the first three days of usability testing. Due to the way that viewing data was collected, we were unable to assess total number of times each participant viewed the videos throughout the entire duration of usability testing.

Summative qualitative user feedback
See Table 4 for summaries of user feedback. Overall, several users described the SST video content as engaging and entertaining, and that the videos helped them be mindful of the impact of basic social skills (e.g., maintaining eye contact) on improving interactions. Users also shared that they felt the structure of the social goal support helped them organize the steps needed to engage in goal pursuit. However, multiple participants noted that they would have appreciated additional in-person support throughout usability testing, including more opportunities to problem-solve specific obstacles, as well as more support for technical problems with the phone/app. Specific modifications based on usability testing feedback will be incorporated into a future iteration of the MASS app (see Table 4).

Case study
''Elizabeth'' was a middle-aged woman with SZ. The goal she chose was to ''improve relationship with a family member you live with or see regularly.'' She completed 58% of the EMA surveys. During the post-testing interview, she said that the instructions on the app were clear and the app itself was easy to use. She reported enjoying the SST videos and mentioned multiple skills (e.g., maintaining eye contact, active listening) that she practiced throughout the study. She noted that the app was helpful and that the SST content was useful in helping her improve her relationship with her family member.

Table 3   Usability testing: goals selected and app adherence.

User	Social goal	EMA survey completion (mean surveys per day)
1	Practice conversation skills to improve your relationship with an existing friend	High (2.9/3)
2	Improve relationship with a family member you live with or see regularly	Medium (1.6/3)
3	Make a new friend on social media	Medium (1.1/3)
4	Develop a romantic/intimate relationship with someone you already know	Low (0.6/3)
5	Make a new friend by going to events you're interested in	Low (0.9/3)
6	Make a new friend at work	High (3/3)
7	Reconnect with an old friend	High (2.13/3)
8	Practice conversation skills to improve your relationship with an existing friend	Low (0.93/3)
Average:	Medium (1.63/3)	

Note. EMA: ecological momentary assessment.

Table 4   User feedback from usability testing and modifications made for future open pilot trial.

User feedback on challenges of app	Modifications made for open pilot trial
Felt bad when reminded of limited progress made on social goal	Wording around social goal progress softened; added variety of encouragement quotes for limited success/engagement
EMA surveys too frequent	Surveys reduced from 3× to 2×/day
Would have benefited from more SST video content	Added additional social story narrative (making a new friend) and examples of each social skill
Wanted additional structure and guidance on social goals	Social goal steps added and arranged sequentially based on difficulty/complexity
''Make a new friend on social media'' goal was difficult; SST video content not applicable to this goal	''Make a new friend on social media'' was removed as a potential goal for open pilot; future plan to develop SST content specific to this goal
Wanted a visual marker of progress through study	Added progress bar to show participants how much longer they had in the study
More in-person check-ins during app use	Implemented brief, weekly phone calls with research assistants to provide technical support and check in about social goal progress

Notes. EMA: ecological momentary assessment; SST: Social Skills Training.

The challenges Elizabeth noted included feeling ''sad'' when she did not accomplish her goal for the day. However, she also stated that the reminders regarding her goal were helpful in ''pushing'' her to continue to make progress. She also reported that the layout for the steps related to completing her social goal was ''confusing'' and that there were ''too many'' steps to choose from. Based on this feedback, we modified the app to make the steps towards a goal sequential, clearer, and more succinct (i.e., steps were given names, where participants could ''click'' on the step to get more information about what the step entailed, to reduce the amount of text on the screen at a given time). We also developed more encouraging/validating statements for users when they reported they had not worked on their social goals for the future iteration of the intervention.

Discussion

In the current report, we described the development of the Motivation and Skills Support (MASS) smartphone app to address social motivation and skill deficits in SZ. Based on prior research and stakeholder input, we designed a mobile intervention that could be individualized to a participant based on the specific social goal they wanted to work on, included SST content to facilitate social goal completion, and provided personalized feedback by gathering prior reports of social pleasure and motivation to enhance future social goal progress. The MASS app demonstrated evidence of acceptability to people with SZ, including engagement with app-based content and high reported satisfaction (i.e., low ratings of difficulty and moderate ratings of enjoyment and helpfulness of the app). Participants also provided valuable feedback on improving the app for a future open pilot with a larger sample of people with SZ.

Qualitative information gathered from participants following usability testing indicated several notable strengths of the app, as well as some areas for improvement for a larger trial. Key features that were identified by participants as helpful included the SST video content, the reminders of steps necessary to complete their goal, and the ease of using the app. Some notable suggestions for improving the app experience included decreasing the number of daily notifications, adding more SST video content, providing more

specific structure/guidance on social goals, and increasing in-person check-ins during app use. Further, based on feedback from participants like ''Elizabeth,'' we developed a more varied series of validating statements for common barriers to social goal progress when participants reported that their motivation or expectations for goal progress were low. In response to requests for more live support in using the app, we included regular, brief phone check-ins with participants. These check-ins serve to provide both technical support and problem-solving for specific barriers to social goal attainment, allowing for personal contact that is critical to the success of mobile interventions (Fulford & Mote, 2019). We are currently piloting this updated version of the MASS app with a group of people with SZ in two U.S. cities (National Clinical Trial #03404219).

Preliminary evidence of acceptability and feasibility of the MASS app is promising given the limited available mobile apps focused on addressing social skills and motivation specifically through a standalone app. Existing digital interventions often target the reduction of symptoms of psychosis (Ben-Zeev, Brenner, Begale, Duffecy, Mohr, & Mueser, 2014), or focus on improving broader recovery outcomes (Macias et al., 2015). Recent digital interventions have also been designed to improve social cognition (e.g., Biagianti, Schlosser, Nahum, Woolley, & Vinogradov, 2016) or general motivation/goal striving (e.g., Schlosser et al., 2018). While these are all necessary and important mobile treatment foci, our aim was to create a smartphone app that addressed both social skills and motivation using evidence-based approaches (i.e., SST and CBTp) and stakeholder input to improving social functioning in SZ.

Specifically, we aimed to develop a mobile platform that was customizable for each individual's social goal needs. The ability to select from a library of common social goals, and to receive tailored social skill training content unique to those goals, has the potential to increase engagement and application of the intervention. Future iterations of this intervention could easily complement traditional therapeutic care (e.g., a client and therapist deciding on a social goal collaboratively for the client to work on through the app). Importantly, the provided social goals were chosen based on integral stakeholder input from clinicians as well as those with lived experience of SZ, a necessary component for designing an intervention that attempts to address such an idiographic concern as social motivation and social functioning. In addition, through reminding participants of their actual reports of past social pleasure/motivation when they are reporting low pleasure or motivation, the app provides a tailored, just-in-time intervention to address deficits in anticipatory pleasure and low expectations for future social goal progress. This targeted feedback provided by the MASS app logic is a unique feature that we hope can address some of the ongoing challenges people with SZ experience—informed by neuroscience findings—in translating the ''liking'' into ''wanting'' of social activities.

This study is not without limitations. Our sample sizes for both stakeholder feedback and usability testing were small, making it difficult for these results to be broadly generalizable across people with SZ. Further, we did not include other potentially relevant stakeholders, such as family members of those with SZ, in study design. Finally, the duration of our usability testing was relatively short to make meaningful progress toward a social goal (two weeks). For the current open pilot, the intervention takes place over two months.

Conclusion

The MASS app shows promise as a scalable digital intervention tool for supporting people with SZ in the pursuit of social goals by addressing motivation and skills. The translation of evidence-based psychosocial interventions for improving social functioning in SZ into a mobile platform has the potential to increase access to such care for a population in high need. Findings from an ongoing open pilot trial will speak to the preliminary efficacy of the app in improving our key targets: social motivation (proximal) and functioning (distal).

Disclosure of interest

The authors declare that they have no competing interest.

Acknowledgements

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