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Authors

Armstrong, Courtney C
Aguilera, Adrian
Hwang, Janet
et al.

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Barriers and Facilitators to Behavior Change for Individuals with Severe Mental Illness who Received the Transdiagnostic Intervention for Sleep and Circadian Dysfunction in a Community Mental Health Setting

Courtney C. Armstrong^a, Adrian Aguilera^b, Janet Hwang^a, Allison G Harvey^{a,*}

^aDepartment of Psychology, University of California, Berkeley, 2121 Berkeley Way # 1650, Berkeley CA 94720-1650, USA

^bDepartment of Social Welfare, University of California, Berkeley, 120 Haviland Hall #204, Berkeley CA 94720-1650, USA

Abstract

The Transdiagnostic Intervention for Sleep and Circadian Dysfunction (TranS-C) was implemented in a community mental health center (CMHC) setting. The goal of TranS-C is to improve sleep and circadian dysfunction among people with severe mental illness. The present study uses the Theoretical Domains Framework (TDF) to uncover barriers and facilitators to changing behaviors learned in TranS-C. Adults with severe mental illness who completed TranS-C ($n = 14$) were given a semi-structured interview based on the TDF. Interview transcripts were independently coded using inductive and deductive coding. The most commonly coded TDF domains were Behavior Regulation, Beliefs about Consequences, Knowledge and Beliefs about Capabilities. Action planning was the most discussed facilitator and compromising sleep health in favor of time spent with loved ones was the most discussed barrier. These findings suggest that TranS-C has promising strengths and raise important barriers that can be addressed in TranS-C to improve its fit within CMHCs.

Keywords

Theoretical Domains Framework; Community Mental Health; Barriers and Facilitators; Sleep Intervention; Behavior Change

1 Introduction

Mental illness is a leading cause of disability globally. Unsurprisingly, severe mental illness (SMI), in which individuals experience symptoms for at least 12 months and contend with substantial interference in at least one area of life,^{1,2} remains common and difficult to

*Corresponding author: Allison G. Harvey. aharvey@berkeley.edu.

Declarations

Conflicts of Interest

The authors of this work declare no conflicts of interest.

treat. In a given year, a mere 15% of individuals diagnosed with SMI will receive what is considered minimally adequate treatment.³ Additionally, fewer than half the treatments available for individuals with SMI have an evidence base, and there is little evidence that such interventions decrease overall disability.⁴ For this dilemma, large-scale implementation of evidence-based psychological treatments stands as a possible remedy.

However, the implementation of evidence-based psychological treatment is not easy to achieve. One reason for this is that evidence-based psychological treatments, often developed in “ideal” university settings, can be a poor fit to a new treatment context or to a new population.^{5–8} This ultimately harms the chances of successful implementation, particularly in community mental health centers (CMHCs),^{9–11} where the present study was conducted. CMHCs are crucial in the US, as they are publicly funded providers of treatment for mental and physical health problems. This allows for the provision of treatment to the most underserved populations, including individuals with SMI who experience high comorbidity,¹² present with complex problems, and are unable to afford private care.¹³ Facilitating the large-scale implementation of evidence-based treatments in CMHCs could be a major step towards increasing access to evidence-based treatments for SMI.^{10,14} However, to do so, it is necessary to develop treatments that “fit” the population that CMHCs serve.

Previous research suggests that transdiagnostic treatments, like the Transdiagnostic Intervention for Sleep and Circadian Dysfunction (TranS-C), are particularly well suited for large-scale implementation in CMHCs. This is because comorbid sleep and circadian disorders are commonly experienced by individuals with SMI.¹² These sleep and circadian dysfunctions contribute to vicious cycles in SMI, including emotional and cognitive dysfunction.^{15–17} Also, they predate and predict the worsening of SMI symptoms.^{18,19} That said, sleep and circadian dysfunction is modifiable in SMI.²⁰ Underpinned by the sleep-health framework²¹ and drawing from frontline insomnia treatments such as Cognitive Behavioral Therapy for Insomnia (CBT-I), TranS-C aims to modify a range of sleep and circadian dysfunctions across a range of SMI diagnoses by delivering 4 core modules that are common in sleep disorders, and 7 optional modules that are occasionally used depending on the case presentation. This typically occurs over the course of eight 50-minute sessions.

However, TranS-C is still a relatively new intervention, and so there is a need to understand the barriers and facilitators that influence patient uptake of the various components that comprise TranS-C. Furthermore, the effects of many interventions can be moderated by internal and external factors specific to each patient.²² To examine such factors and how they can impact treatment, a comprehensive and theoretical evaluation of barriers and facilitators is vital.²³ Such studies can help identify ways to increase positive effects, lessen any that are negative, and help us better understand if TranS-C is a good fit for those who receive it.

Given the vast, often overlapping array of behavior change theories, it can be difficult to identify the most appropriate theory to guide such an evaluation. Many theories share central constructs,²⁴ but contain slight variations that could potentially exclude valuable ideas.²⁵ The Theoretical Domains Framework (TDF) addresses this dilemma. Composed by 87 experts on behavior change, the TDF draws from 33 behavior change theories and

128 explanatory constructs to present 14 basic, frequently occurring domains.²⁶ Though it is a framework and not a theory itself, the TDF has been used to identify barriers to behavior change among health care providers and patients alike.^{27–29} Furthermore, the TDF has been useful for developing and refining interventions, and is a well-documented strategy to problem solve when an intervention fails.^{25,27} In the context of a National Institute of Mental Health (NIMH)-funded trial of Trans-C delivered in CMHC's, the TDF was used to guide the current process evaluation. This study had four aims: 1) Identify the most important behavioral change for individual Trans-C recipients, and if those changes have been maintained; 2) Use a deductive qualitative approach to establish which TDF domains influence behavior among Trans-C recipients; 3) Use an inductive qualitative approach to determine facilitators of behavior change maintenance since receiving Trans-C; and 4) Use an inductive qualitative approach to determine barriers of behavior change maintenance since receiving Trans-C.

2 Methods

2.1 Design

This was a qualitative, individual interview study guided by the TDF. For this research, the TDF was used to deductively categorize barriers and facilitators of behavior, and also to explore emergent themes within the textual data, referred to as inductive coding. Fourteen participants who received Trans-C as part of a NIMH randomized control trial³⁰ volunteered to participate. For this study, researchers partnered with a local CMHC, Alameda County Behavioral Healthcare Services (ACBHCS), to provide Trans-C to participants within ACBHCS.

2.2 Inclusion/exclusion criteria

The inclusion criteria for the RCT were—1) Aged 18 years and older; 2) Understand English; 3) Presence of at least one DSM-5 mental disorder for 12 months; 4) One or more sleep or circadian problems for a period of at least 3 months assessed with the Sleep and Circadian Problems Interview; 5) Guaranteed place to sleep for at least 3 months that is not a shelter; 6) Receiving care for SMI at ACBHCS and consent to regular communications between the research team and the patient's mental health providers.

The exclusion criteria for the RCT were—1) Presence of an active and progressive physical illness or neurological degenerative disease and/or substance abuse/dependence making participation in the study infeasible; 2) Current serious suicide risk (assessed by our staff, a case manager, or a psychiatrist) or homicide risk (assessed by our staff, a case manager, or a psychiatrist); 3) Night shift work >2 nights per week in the past 3 months; 4) Pregnancy or breast-feeding; 5) Not able/willing to participate in and/or complete the pretreatment assessments.

For the current study, participants were also required to 1) have completed all eight sessions of Trans-C, 2) be able to attend a face-to-face interview, and 3) have attended their six-month follow-up interview. Having at least six months between their last session of Trans-C

and the interview gave participants time to practice maintaining the behaviors they learned in TranS-C.

2.3 Participants

Across multiple sites within ACBHCS, a total of 48 participants were invited to participate. Eligible participants were initially contacted via phone. Participants who did not respond were contacted twice more by phone over the next two weeks, and then by text message. Of potential participants contacted, one had changed their contact information since participating in the study and could not be reached ($n = 1$). Two participants were initially willing to participate but failed to respond to subsequent scheduling calls ($n = 2$). One participant scheduled an interview but failed to show up and was unable to reschedule their interview ($n = 1$). Twenty-five additional participants did not respond to recruitment attempts, and ultimately eight men and eleven women who met inclusion criteria volunteered to participate ($n = 19$). Among the individuals who volunteered, five participants voiced enthusiasm for the study and were willing to be interviewed but were unable to schedule a time to meet due to work-related time constraints ($n = 3$) or having moved too far away since completing the original RCT ($n = 2$). Thus, a sample of nine women and five men were ultimately able to participate in the interview. The demographic information for 14 participants who attended an interview is shown in Table 1.

2.4 Materials

The Behavior Change Interview—An interview guide was developed based on the 14 domains included in the TDF.²⁶ Though at least one question was asked for each domain, additional questions were developed for domains that embodied a wider range of constructs and required more questions in order to be covered effectively. Questions that covered separate domains, but were redundant in their wording, were combined. In these cases, the interviewer used prompts to allow both domains to be differentiated. Questions were designed based on past research and similar studies utilizing the TDF.^{23,25,27,28} Additional prompts were prepared in case participants needed a question explained to them, or to probe in case further clarification or explanation was needed. Each of the questions in the interview guide were focused on a behavior of interest selected for each individual participant based on their experience with TranS-C. The behavior of interest was identified using the Warm Handoff Letter and The Use and Utilization Questionnaire, which are explained below.

In addition to the open-ended questions intended to gather qualitative data, four additional questions were included asking participants to make ratings on a scale from 0–100. Participants were asked to rate how difficult it was to perform skills learned in treatment, how strongly external factors (such as environmental and social influences) affected their ability to use skills, their confidence in their ability to use skills they learned, and how necessary they felt their behavior of interest was. Higher numbers indicated higher difficulty, higher influence, higher confidence, and higher importance. Participants were also asked how frequently they forgot or decided not to perform their behavior of interest.

Warm Handoff Letter—Upon a participant’s completion of TranS-C, their TranS-C sleep coach composed a letter for the participant’s caseworker. The letter explained the goals of TranS-C and identified the important behaviors the participant planned to continue to maintain even after treatment had concluded. These letters were reviewed and approved by the last author. In the present study, these letters were used by the interviewer to identify the most important behavioral change the participant was working to maintain, referred to hereon as the behavior of interest.

Usefulness Scale & Utilization Questionnaire—Conducted during the 6-month follow up interview, these scales both list each of the 14 treatment elements from TranS-C. Each element is rated on a 5-point Likert scale (0 = not at all useful; 1 = somewhat useful; 2 = moderately useful; 3 = very useful; 4 = extremely useful). Cronbach’s alpha for these scales is .84 and .91, respectively,³¹ which is considered excellent.³² In the present study, this measure was reviewed to check that the behavior of interest identified from the warm handoff letter was considered useful by the participant. Further detail on how this measure was combined with the Warm Handoff Letter to select a behavior of interest is given below.

2.5 Procedure

The 14 participants met with the interviewer in person. Eleven participants met with the interviewer in the CMHC where they received treatment (n = 11). Two participants met with the interviewer at her research institution (n = 2), and one participant was interviewed at the board and care where they resided (n = 1).

After scheduling an interview, the research team reviewed the Warm Handoff Letter and the Usefulness Scale & Utilization Questionnaire. This information was used to determine the most important behavior learned during TranS-C for each individual participant, and this behavior, called the behavior of interest, became the focus of the Behavior Change Interview. Consensus on the behavior of interest was reached among the study’s PI, two research assistants, and the PI for the main study.

Participants were asked to sign a consent form prior to being interviewed and were offered a \$30 gift card for their participation. Recordings of interviews were transcribed after their completion. All interviews were carried out by one interviewer and lasted for approximately 24 minutes (Median = 23.53, IQR = 10.33). This research was approved by the appropriate Institutional Review Board.

2.6 Data extraction and analysis

Digital recordings were transcribed verbatim upon completion of the in-person interview. Transcripts were checked for accuracy by the interviewer. Factors that either facilitated or acted as a barrier to the behavior of interest were identified and extracted from the transcripts. To analyze the data, a two-stage process was used that combined both deductive and inductive coding techniques. In the first stage, deductive coding was used to assign each facilitator or barrier to at least one domain from the TDF based on the constructs which define the domains according to previous research.^{25,26} They were then assigned secondary inductive codes based on emergent themes within the data.

2.7 Data coding

The two-stage design, that uses both theory-based deductive codes from the TDF and inductive codes based on emergent themes, is commonly used in analyses for qualitative studies that use the Theoretical Domains Framework.^{23,27,28}

Deductive coding—During the first stage of data analysis, extracted facilitators and barriers were categorized by TDF domain. This approach to qualitative data analysis uses deductive codes, which are operationalized from a pre-existing theory, to categorize data.³³ During this stage of data analysis, each TDF domain served as an individual code to which facilitators and barriers were assigned. This process was overseen by one head coder (first author), and two independent coders. The reviewers met after coding each interview to compare results. Coding differences were resolved via discussion. If consensus could not be reached between the two original coders, the head coder would make an informed decision to either pick one option or code the data as belonging to two domains.

Inductive coding—When the initial round of coding was completed, a general inductive approach was used to identify important emergent themes within each domain. The inductive coding process is intended to create meaning from open-ended, qualitative data and involves studying qualitative data deeply to identify key themes and patterns.^{33–35} During this process, emergent themes and patterns are identified by repeatedly studying transcripts and considering how pieces of data relate to one another across interviews.³⁵ The process of identifying emergent themes, which are then used as inductive codes, is guided by theoretical knowledge and the research aims.³⁴ Using the general inductive approach, the PI for the study derived a list of inductive codes taken from themes that surfaced from the interviews. This list was confirmed by a second coder. This coder and the head coder then revisited the deductively coded transcripts and worked together to assign the themes to the textual data as secondary, inductive codes.

3 Results

3.1 Behaviors of interest

Across the 14 interviews conducted, four different behaviors of interest were identified. These behaviors of interest were maintaining a consistent sleep schedule (n = 8), establishing a wind-down routine (n = 3), reducing exposure to light before bed (n = 2) and eliminating napping (n = 1).

During the interview, participants made four ratings on a scale from 0–100 regarding their behavior of interest. These ratings are summarized in Table 2. Higher numbers indicated higher difficulty, higher influence, higher confidence, and higher necessity. The reported standard deviations are of notable size, indicating that responses were diverse amongst participants. However, as evident in Table 2, participants were mostly confident in their ability to perform their behaviors of interest and believed that their behaviors of interest were necessary.

Additionally, participants were asked to report how often they performed the behavior of interest. Two participants reported that they no longer track whether or not they perform

their behavior of interest (n = 2). Of the remaining 12 participants, four (n = 4) did not perform their behavior of interest three or more times a week. Five participants (n = 5) reported not performing their behavior of interest 1–2 times a week. Three participants (n = 3) reported that they consistently performed their behavior of interest and missed opportunities to perform it no more than once a month.

3.2 Data coding

A total of 598 facilitators and barriers were coded across the 14 interviews. All facilitators and barriers were coded into at least one of the 14 TDF domains, and all 14 domains were discussed at least once across all 14 interviews. Two codes were assigned in 12 instances because consensus could not be reached amongst coders due to overlapping definitions between TDF domains.

Deductive codes—Following standards for using the TDF in research, qualitative data from the Behavior Change Interview is summarized in Table 3, as recommended by previous works.²⁵ Table 3 includes the TDF domains, inductive codes, and illustrative quotes. Additional information, including the frequency that a domain was discussed, what percent of the time domains were discussed as barriers, and whether inductive codes facilitated (F; in Table 3) or acted as a barrier (B; in Table 3) to the behavior of interest, is also provided. Domains are presented hierarchically, by the frequency of the TDF Domain for all participants.

As evident in Table 3, the most commonly discussed TDF domains overall, as operationalized by the number of facilitators or barriers assigned to the domain, were behavior regulation (n = 72) and beliefs about consequences (n = 68). Knowledge (n = 67) and beliefs about capabilities (n = 67) were tied for third place. The three least commonly discussed domains overall were optimism (n = 3), social/professional role and identity (n = 6), and goals (n = 18).

All domains were discussed as both facilitators and barriers over the course of the 14 interviews. The three domains most frequently discussed as barriers were emotions, memory, attention and decision making, and environmental context and resources. In the 38 instances that emotions were discussed across all interviews, 35 (92.1%) of those instances were coded as barriers. This is reflected in the %barrier column of Table 3. For memory, attention and decision making, the %barrier was 73.3% and for environmental context and resources it was 66.7%. The domains least frequently discussed as barriers were skills (4.5%), goals (5.5%), and knowledge (7.4%).

Inductive codes—Inductive codes were derived from themes that were identified via iterative review of the data, as instructed in Thomas et al., (2006), and used to identify common facilitators and barriers that participants experienced. Taking facilitators first, the four most commonly discussed facilitators of the behavior of interest were action planning (n = 44), ability to identify a skill (n = 37), understanding the skill's rationale (n = 32), and noticing negative outcomes whenever the behavior of interest was not performed (n = 27). For coding purposes, action planning was defined as the preemptive outlining of actions to be taken in a specific context to pursue of a goal.³⁶ These facilitators fall under the

TDF domains of behavioral regulation, skills, knowledge and beliefs about consequences, respectively.

Moving on to barriers, the most commonly discussed emergent barriers to the behavior of interest were compromising sleep health in favor of time spent with loved ones (n = 20), low perceived control over behavior of interest (n = 16), cognitive overload (n = 15), feeling emotionally dysregulated (n = 13) and poor sleep environment (n = 13). These barriers fell under the TDF domains of social influence, beliefs about capabilities, memory, attention and decision making, emotions, and environmental context and resources respectively.

4 Discussion

The first aim of this study was to identify the most important behavioral changes made by individual participants while receiving TranS-C and determine if those changes had been maintained. The identified behaviors of interest were maintaining a consistent sleep schedule (n = 8), establishing a wind-down routine (n = 3), reducing exposure to light before bed (n = 2) and eliminating napping (n = 1). In their ratings of these behaviors, participants reported that they understood the necessity of these behaviors, and generally had confidence in their ability to perform them. However, of the participants interviewed (n = 14), few (n = 3) reported consistently performing behaviors learned in treatment, only missing opportunities to do so once a month or less. This finding is consistent with prior research documenting that long-term maintenance of behavior change is difficult to achieve and may be driven by different mechanisms than those that motivated initial change.^{37–39} Further, this result highlights the need for future research that differentiates between these mechanisms.

Aim 2 was to use a deductive qualitative approach to establish which TDF domains influence behavior among the TranS-C recipients. This was supplemented by Aims 3 and 4, which were to use an inductive qualitative approach to determine facilitators and barriers of the behavior of interest. In our study, TranS-C recipients frequently discussed being influenced by the following TDF domains: Behavior regulation (n = 72), beliefs about the consequences (n = 68), knowledge (n = 67), and beliefs about capabilities (n = 67). Within the TDF framework, these terms are defined by Cane et al. (2012) as “anything aimed at managing or changing objectively observed actions,”^{26(p14)} “acceptance of the truth, reality or validity about outcomes of a behavior in a given situation,”^{26(p13)} “the awareness of something’s existence,”^{26(p13)} and “acceptance of the truth, reality or validity about an ability, talent or facility that a person can put to constructive use,”^{26(p14)} respectively. The emergent themes indicate the importance of action planning, recalling and understanding the rationale for skills, and the recognition of negative outcomes when the behavior of interest is not performed as facilitators of behavior change in TranS-C recipients. These are exemplified in a quote from one particular participant, who commented on the result of her inconsistent sleep schedule:

“I was up till 3 in the morning, and I had to get up at seven – no six, to get on an airplane to Arizona so I was like completely off kilter... and what I did when got back from Arizona, I was so burnt from my whole schedule being off,

I just cancelled like two weeks' worth of, errands – well not errands, but doctors' appointments.” (participant (p) 66)

Together, these findings are consistent with prior research on behavior change generally and behavior change specifically in the context of sleep. Indeed, self-regulation skills (such as action planning) play a key role in maintaining good health behaviors,⁴⁰ and there is substantial literature on the impact of dysfunctional beliefs about sleep on sleep quality.⁴¹

Examining the barriers to behavior change that TranS-C recipients encounter can also be used to identify where the intervention can be strengthened and where the fit with the context can be improved.²⁵ The three domains most frequently discussed as barriers were emotions (% barrier = 92.1%), memory, attention, and decision making (% barrier = 73.3%), and environmental context and resources (% barrier = 66.7%). Within the TDF framework, these terms are defined as “a complex reaction pattern involving experiential, behavioral and physiological elements, by which the individual attempts to deal with a personally significant matter or event,”^{26(p14)} “the ability to retain information, focus selectively on aspects of the environment, and choose between two or more alternatives,”^{26(p13)} and “any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence and adaptive behavior,”^{26(p14)} respectively. The emergent themes show that TranS-C participants frequently discussed compromising sleep health in favor of time spent with loved ones, low perceived control, cognitive overload, feelings of emotional dysregulation, and poor sleep environment impeding their ability to perform behaviors learned over the course of TranS-C. Such ideas are reflected in the following quote from one participant who struggled with reducing light exposure before bed:

“Sometimes I'm in the board and care, and people just get to me... It gets me so mad that I just go to bed sometimes, and I just get so angry. I don't bother turning off the lights. I just get my covers and cover myself up. It just drives me crazy being in that house.” (p70)

These findings and perspectives are consistent with prior research on self-efficacy (a defining construct for the “beliefs about capabilities” domain) in the context of behavior change.^{37,39} Prior research shows that self-efficacy is a predictor of continued use of skills, and though these findings were not specific to sleep-behaviors, there is evidence to suggest that these findings are generalizable to many kinds of health behaviors.^{37,42} Prior research also shows that individuals struggle to adjust their sleep and maintain behavior change while managing emotional difficulties or social and environmental factors, such as work schedules or time spent with loved ones.^{40,43} Taken together, one might infer that TranS-C should be adapted to include a special emphasis on learning to apply skills from treatment even when faced with unpredictable sleep environments or rigid external structures.

It is interesting to observe that the three least commonly discussed domains overall were optimism (n = 3), social/professional role/identity (n = 6), and goals (n = 18). Within the TDF framework, these terms are defined as “confidence that things will happen for the best,”^{26(p13)} “a coherent set of behaviors and displayed qualities of an individual in a social or work setting,”^{26(p13)} and “mental representations of outcomes or end states that an

individual wants to achieve,”^{26(p14)} respectively. Consideration should be given to adapting TranS-C such that it is able to build on these less often discussed domains. Optimism in particular, can play a role in lowering risk perceptions, which has a moderate association with changes in health behavior.⁴⁴ One participant tied her optimism to her motivation to continue practicing her behavior of interest.

“I know I’m going to get better so that makes me sleep better. That helps me to, you know, to keep with my schedule.” (p126)

Additionally, identity can play a role in goal pursuit, and these domains together can build motivation to adopt health behaviors.⁴⁵ It is possible that placing more emphasis on these domains could help individuals with SMI to formulate and pursue goals that are consistent with their individual values, resources and lifestyles. This could help maintain behavior change and improve TranS-C’s fit for dissemination in a CMHC context.

There are limitations to this research. First, while this study included a small sample, it is comparable to or larger than similar qualitative studies.^{23,27,28} Second, while the TDF is ideal for categorizing facilitators and barriers to behavior, it is ultimately a framework and not a theory. This limited our understanding of how specific domains may interact with one another, a problem future research could serve to remedy. Third, coders struggled to differentiate between domains during training. This was due to overlapping definitions of domains and constructs, an issue that has been observed in multiple studies that used the TDF to guide the coding process.^{23,26,46} However, extra care was taken, while training coders, to highlight domains that share defining constructs, and how these domains differed from one another. Finally, there are also weaknesses that are specific to the inductive and deductive approaches used to qualitatively analyze data.⁴⁷ In short, qualitative approaches to data analysis often suggest that the frequency with which certain themes or categories are discussed is indicative of significance or meaning. As such, it is important that future researchers use quantitative data to examine the strength of the relationship between specific facilitators and barriers, and behavior.

4.1 Implications for Behavioral Health

This research has several implications for behavioral health services, particularly as it relates to behavioral interventions provided in CMHCs. Given that the uptake of evidence-based psychological treatment in a CMHC context is reliant on an intervention’s fit to the CMHC environment,⁷ it is important to understand the challenges that individuals receiving care from CMHCs encounter when trying to change their behavior. The current study highlights the role that specific barriers, such as time spent with loved ones, low-perceived control, cognitive overload, emotional dysregulation and poor sleep environment, can play in hindering behavior change and the maintenance of behaviors learned in treatment. Overall, few participants reported consistent performance of behaviors taught in TranS-C. This emphasizes the challenges that come with changing maintaining new behaviors over time, and the need for further research in these areas. Likewise, this research highlights facilitators that could improve the uptake of behavior learned in treatment. This is exceedingly important, as TranS-C is a relatively new intervention. Providing insight into potential facilitators and barriers to behavior change can strengthen the intervention for

individuals with SMI who receive care from CMHCs. Future research is needed to more fully understand the how TranS-C can address these barriers.

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Table 1

Demographic Information

Characteristic	Number of participants n (%)
Female	9 (64%)
Age (median, IQR [*])	54 years old (14)
Ethnicity	
Hispanic or Latino	1 (7%)
Not Hispanic or Latino	12 (86%)
Refused to answer/missing	1 (7%)
Race	
White	6 (43%)
Black or African American	3 (21%)
Native American or Alaskan	1 (7%)
Native	
Asian	1 (7%)
Native Hawaiian or Other Pacific	1 (7%)
Islander	
Other	1 (7%)
Missing	1 (7%)
Annual Income Personal Family	
20,000	9 (64%)
30,000	3 (21%)
20,001–50,000	3 (21%)
50,001–100,000	1 (21%)
100,001–200,000	0 (0%)
200,001–500,000	1 (7%)
500,001–1,000,000	0 (0%)
1,000,000+	0 (0%)
NA	2 (14%)
Missing	9 (64%)
Education Level	0 (0%)
8 th grade	0 (0%)
Some high school	1 (7%)
Completed high school	2 (14%)
Some vocational	0 (0%)
Completed vocational	1 (7%)
Some college	6 (43%)
Completed college	4 (29%)
Some graduate school	0 (0%)
Completed graduate school	0 (0%)

^{*}IQR = Inter-Quartile Range

Table 2

Quantitative ratings from the Behavior Change Interview

Question	Mean Rating (SD)
Perceived difficulty of skills	45.33 (32.81)
Influence of external factors	61.84 (31.33)
Confidence in ability to perform behavior of interest	79.15 (26.77)
Necessity of behavior of interest	87.69 (20.77)

*SD = Standard Deviation

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Table 3

Theoretical domains, frequency of domain, % barrier, inductive codes, and quotes

TDF Domain	Frequency N (% Total)	%Barrier	Inductive Codes	Illustrative Quotes
Behavioral regulation	72 (12.04%)	23.61%	Action planning (F) Difficulty breaking a former habit (B) Poor self-monitoring (B) Self-monitoring (F) New helpful habit (F)	"I get my scheduling done for the next day and that helps to improve my sleeping pattern" (ID 84; Action planning)
Beliefs about consequences	68 (11.37%)	29.41%	Negative outcomes after not performing Behavior of interest (F) Belief that a skill is not always effective (B) Positive outcomes after performing behavior of interest (F) Positive outcomes after not performing a behavior of interest (B) No observed consequences of skill use (B)	"Emotionally and physically my mood will be different. I'll be sad, I'll be upset, I'll feel tired, exhausted. Especially exhaustion." (ID 84; Negative outcomes after not performing behavior of interest) "It doesn't really affect me. I'll still get to sleep. It's basically the same." (ID 70; No observed consequences of skill use)
Beliefs about capabilities	67 (11.20%)	35.82%	Empowerment (F) High self-efficacy (F) Low self-efficacy (B) Low perceived control over behavior of interest (B)	"Different exercises and tools like opened my mind and my eyes like "Oh, I can actually have some type of control" and that sounds empowering, and it really has helped." (ID 84; Empowerment) "My body doesn't always listen to me. If I'm not tired, I can't sleep. If I wake up and I can't go back to sleep, I can't go back to sleep." (ID 66; Low perceived control over behavior of interest)
Knowledge	67 (11.20%)	7.46%	Factual knowledge (F) Understanding rationale (F) Procedural knowledge (F) Lack of knowledge (B)	"It's important for the body to be consistent, you know what I'm saying? To have a schedule for it so you can have better sleep at night." (ID 126; Factual knowledge)
Skills	66 (11.04%)	4.55%	Practicing a skill (F) Lacking capability or skills (B) Identification of a skill (F)	"I tried the technique... Not [looking] at the lights or [turning] on the lights so I can get back to sleep right away instead of keeping myself awake for an hour or two hours sometimes." (ID 28; Practicing a skill)
Social influences	54 (9.03%)	50.00%	Lack of Social support (B) Social support (F) Social pressure (B) Compromising sleep in favor of time with loved ones (B) Supportive sleep coach (F)	"I went and visited my daughter, who I'm going to see today, a month ago. We stayed up till 3 in the morning binge-watching Jessica Jones, okay. I don't have a TV so we're just sitting there watching Netflix, like c'mon. I mean who's going to miss that?" (ID 66; Compromising sleep in favor of time with loved ones) "I want to have a little bit more fun with certain things or stay on the phone with certain people so it's kind of managing that" (ID 84; Compromising sleep in favor of time with loved ones) "My friend knows that I need to stay up. So, when I see her on Tuesdays, she... it's like, we're constantly going" (ID 26; Social support)
Environmental context and resources	51 (8.53%)	66.67%	Poor Sleep environment (B) Good Sleep environment (F) Trouble with case manager (F) Cues (F) Salient events (B) External routine (F)	"I guess another thing that makes it easy is that I mean, I have a safe, comfortable place to sleep. It's not like I live in a neighborhood where I'm hearing gunshots freaking me out or living with loud neighbors or whatever. At night our neighborhood is pretty calm so it's easy to, you know, close your eyes and go to sleep and not worry about all that mess that's going on outside." (ID 123; Good sleep environment) "I don't actually have a bedroom anymore, so I'm just couch-surfing right now. So, it's just lack of a bedroom is the number one reason." (ID 113; Poor sleep environment)
Memory, attention and decision making	45 (7.53%)	73.33%	Cognitive overload/tiredness (B) Impulsivity (B) Forgetfulness (B)	"I mean there have been times where I've been caught up in the moment, my friends are over, it's two o'clock in the morning, I forgot my bed time." (ID 123; Getting distracted)

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TDF Domain	Frequency N (% Total)	%Barrier	Inductive Codes	Illustrative Quotes
			Getting distracted (B) Attention to behavior of interest (F) Easily remembering behavior of interest (F)	"I always kind of keep it in mind when I'm planning my stuff." (ID 84; Attention to the behavior of interest)
Emotions	38 (6.35%)	92.11%	Anger (B) Worry (B) Emotional dysregulation (B) Sadness (B) Burnout (B) Positive affect (F) Good emotion regulation (F)	"When I get depressed, I want to go to sleep [regardless of what time it is.]" (ID 26; Sadness)
Intentions	33 (5.52%)	15.15%	Drive (F) Complacency (B) Action (F) Contemplation (B)	"I would like to improve my sleep. I would like to improve it a lot." (ID 113; Drive) "I try to sleep [at the same time] anyway no matter what." (ID 83; Action)
Reinforcement	26 (4.35%)	23.08%	Incentive (F) Lack of reward (B) Reward (F)	"If I don't have a reason for getting up, I like to sleep in." (ID 35; Lack of reward)
Goals	18 (3.01%)	5.56%	High importance of goal (F) Distal goals (F/B) Proximal goal (F)	"I would love to go to sleep naturally and be off Seroquel and not need caffeine to get going the next day. I want to be able to sleep naturally and wake up naturally without uses of sedatives and stimulants" (ID 123; Distal goals)
Social role/ identity	6 (1.00%)	33.33%	Responsibilities within a relationship (B) Lack of commitments to others (F)	"I try to do as much as I can with house chores or whatever my mom needs help with. Sometimes this requires us staying up late, you know, being in the kitchen or whatever or doing things or things like that." (ID 84; Responsibilities)
Optimism	3 (0.50%)	33.33%	Unrealistic optimism (B) Positive outlook (F)	"If have my own place, I'll have no problems [with sleeping]." (ID 72; Unrealistic optimism) "I know I'm going to get better so that makes me sleep better." (ID 126; Positive outlook)

* TDF = Theoretical Domains Framework; F=Facilitator; B= Barrier