The use of Stimulus Control, Sleep Restriction Therapy, and Sleep Hygiene Education to Increase Perceived Quality of Life in Inmates with Schizophrenia

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The procedures in this workshop are meant to be used by agency staff, as part of the broader services they provide, or under supervision of agency staff.
ABSTRACT

According to King (2001), as many as 90% of people with schizophrenia experience insomnia at some point in their lives. Studies have shown numerous debilitating results of poor sleep, in particular poor memory, shorter attention span, and reduced daytime alertness (Forest et al., 2007). The consensus of front-line staff at the correctional treatment centre where the current study took place is that inmates with schizophrenia would benefit both mentally and physically from quality sleep throughout the night. If inmates improve overall sleep hygiene and become more attentive and alert, perhaps they will attain an increased benefit from other treatment programs, both while in treatment and over time. Current research has shown that sleep hygiene education (King et al., 2001), stimulus control therapy (Yang & Spielman, 1999), as well as sleep restriction therapy (Bliwise, 1995) have shown to be effective with poor sleepers. The present eight-week study was conducted to ascertain whether these therapies in group counseling sessions will decrease the six participants’ sleep latency (SL); frequency of awakenings (FA); and duration of awakenings (DA), and increase total sleep time (TST) and sleep efficiency (SE). It was also hypothesized that an improvement in sleep quality would produce an improvement in perceived quality of life. At week six of the current study, statistically significant results were attained for the global score of the Pittsburgh Sleep Quality Index (Buysse, 1989) at post testing ($t(5) = 3.32, p < 0.02$). Additionally, four out of five subscales of an abbreviated Quality of Life Enjoyment and Satisfaction Questionnaire (Ristner et al., 2005) improved at post testing, with statistical significance on the physical health subscale ($t(5) = 3.35, p < 0.02$). From pre to post testing, three of the six participants took decreased amounts, or completely stopped taking sleep medication, yet sleep parameters continued to improve across these group members. Further research may determine if higher quality of sleep correlates with higher post-test scores in other treatment programs compared to those with poor sleep quality.
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Chapter I: Introduction

Overview

Incarceration can either be a time of isolation, or a time for attempted rehabilitation. The present study took place in a multi-level correctional institution whose key role is to treat offenders with mental illnesses such as personality disorder and schizophrenia. The offered programs include community re-entry, emotions management, symptom management, medication management, problem solving, substance abuse, and sex-offender programming. According to King (2001), as many as 90% of people with schizophrenia experience insomnia at some point in their lives. The consensus of front-line staff at this correctional treatment centre is that inmates with schizophrenia would benefit both mentally and physically from quality sleep throughout the night. Current research has shown that sleep hygiene education (King et al., 2001), stimulus control therapy (Yang & Spielman, 1999), as well as sleep restriction therapy (Bliwise, 1995) have been shown to be effective with this population. All three therapies are based on cognitive behavioural principles that promote environmental conditions and behaviour which are constructive to healthy sleep. These therapies were introduced in designated group sessions, and were incorporated into each of the other group sessions with topics including: sleep architecture, antipsychotics and schizophrenia, stress and sleep, nutrition and sleep, and exercise and sleep. All sessions will include effective behavioural strategies for overcoming sleep difficulties.

Hypothesis

It was hypothesized that the above-mentioned therapies and group counseling sessions will decrease the participants’ sleep latency, frequency of awakenings, duration of awakenings, and increase total sleep time and sleep efficiency. It was also hypothesized that with this improvement in sleep quality there will also be an improvement in perceived quality of life.

Rationale

Offenders are involved in many treatment programs throughout their sentence at the treatment centre. Studies have shown numerous debilitating results of poor sleep, in particular poor memory, shorter attention span, and reduced daytime alertness (Forest et al., 2007). If these participants improve overall sleep hygiene and become more attentive and alert, perhaps they will attain an increased benefit from other treatment programs, both while in treatment and over time. Also, behavior exhibited within the institution may improve as well.

The chapters included in this thesis are: a review of the literature on schizophrenia and sleep, sleep hygiene education, stimulus control, sleep restriction, antipsychotics and sleep, the relationship between quality of life and sleep quality; the methodology of the present study; results; and a discussion of the findings of the study.
Chapter II: Literature Review

Schizophrenia and Sleep Disturbance

Sleep dysfunction is an important aspect of schizophrenia and is often over-looked (Kantrowitz, 2009). The absence of sleep often results in physical, emotional, and cognitive consequences that can significantly affect an individual’s level of functioning (King et al., 2001). In general insomnia sufferers display higher psychological distress, greater impairment of daytime functioning, and are involved in more fatigue-related accidents than good sleepers. Insomnia is characterized by difficulty initiating sleep or difficulty remaining asleep, and can be described as a complaint of poor quality, inadequate, or non-restorative sleep (King et al., 2001). Cohrs (2008) identified several weaknesses in daily functioning that follow poor sleep. Significantly impaired performance in recall of the Rey-Osterreith complex figure test and spatial memory was found while studying memory function and sleep in patients with schizophrenia. Visuospatial memory is positively correlated with reduction in the amount of slow wave sleep, as well as sleep efficiency. Cohrs (2008) found these results to imply a functional interrelationship between regulation of slow wave sleep and performance in visuospatial memory in schizophrenia. Forest et al. (2007) found a negative correlation between reaction time in a selective attention task and sleep spindle density in patients with schizophrenia. Patients with schizophrenia demonstrated a negative correlation between reaction time and duration of stage four sleep on the selective and the sustained attention tasks. These studies have shown that, several dimensions of neurocognitive performance, including attention, memory, fluid aspects of verbal IQ, and procedural learning are related to sleep quality and architecture.

There are three main categories of risk factors for insomnia (King et al., 2001). The first risk factor is psychological, and includes factors such as stress, conditioning, cognitions unrelated to sleep, and intrusive thoughts. The second risk factor is psychopathology, which involves an underlying mental illness such as schizophrenia. The third risk factor is poor sleep hygiene, which has to do with daily activities and conditions that are incompatible with the maintenance of high-quality sleep and daytime alertness.

As many as 90% of people with schizophrenia experience problems with initiating and maintaining sleep (Haffmans et al., 2004). Sleep problems are frequently distressing to patients, and may worsen underlying psychopathology, which has the potential to further destabilize psycho-social functioning. Patients with schizophrenia have specific abnormalities in sleep architecture, including reduced time spent in the rapid eye movement (REM) stage, and difficulties initiating and maintaining slow-wave sleep. A lack of slow-wave sleep, also the most restorative stage, has been linked to an increase in negative symptoms such as apathy and lack of emotion, and poorer global functioning. Haffmans et al. (2004) suggest that the modification of sleep patterns may have implications for therapeutic results, particularly because sleep disturbances affect most patients with schizophrenia and may be both an early warning sign of the disease and a cause for psychotic deterioration. A number of relevant clinical aspects such as severity of illness, positive symptoms, negative symptoms, outcome, neurocognitive impairment and brain structure correlate with important sleep variables such as sleep latency, sleep efficiency, SWS and REM sleep parameters (Cohrs, 2007). Some studies imply there is an
important connection between sleep and daytime symptomology, and suggest a potential role of sleep disturbance as a causal factor in the pathophysiology of schizophrenia. In addition, sleep may also play a role in mortality and morbidity, as reductions in REM sleep have been linked to a higher rate of suicide in schizophrenia (Singareddy, 2001). Therefore sleep quality should be seriously considered when developing a treatment plan for persons with schizophrenia.

A polysomnographic study with schizophrenia patients by Monti and Monti (2005) found that sleep onset and maintenance insomnia is a characteristic feature of patients with schizophrenia regardless of either their medication status or the phase of clinical course. Compared with controls, never-medicated schizophrenia patients showed an increase of stage 2 sleep latency, wake time after sleep onset, and the number of nocturnal awakenings. Total sleep time and sleep efficiency were reduced in these subjects. Sleep latency, stage 4 sleep, as well as REM duration showed a pronounced decrease in schizophrenia patents. Monti and Monti suggest that insomnia in schizophrenia patients could be partly related to the presumed over-activity of the dopaminergic system.

Some experts suspect the accuracy of self-reports pertaining to sleep experience in persons with schizophrenia or schizoaffective disorder to be questionable at best. However, Rotenberg et al. (2000) conducted a study to assess the relationship between objective sleep variables and subjective estimation of sleep quality. This study involved the use of polysomnography, and included 20 patients with schizophrenia over three consecutive nights. During the following mornings, subjects answered questions regarding subjective estimation of sleep duration, number of awakenings, sleep latency, and sleep depth. Pearson correlations between objective sleep variables and subjective reports were obtained. Results showed a high positive correlation between objective sleep latency and its subjective estimation (0.83, \( P < 0.01 \)), which was absent in healthy subjects. In addition, the study revealed a positive correlation between subjective estimation of sleep depth and percentage of slow-wave sleep, a positive correlation between eye movement density and subjective estimation of wakefulness during the night, and a negative correlation between eye movement density and dream reports. Also, a positive correlation between the estimation of the duration of awakenings during the night and eye movement density (0.60, \( P < 0.01 \)) was observed. This study incorporated a control group consisting of healthy patients, as well as the treatment group. These results show that patients with schizophrenia can accurately report subjective sleep experiences such as sleep latency better than healthy subjects. Rotenberg et al. (2000) pose that healthy patients and patients with mood disorders possibly overestimate the duration of wakefulness before sleep onset, because sleep delay causes emotional tension, which may interfere with the subject’s ability to accurately estimate this duration. For chronic schizophrenic patients, modification of sleep onset does not cause emotional reactions, so its subjective assessment is not distorted. Other studies have found that persons with severe mental illness can generally report the quality of their lives as well as those with other non-psychiatric illness (Hofsetter et al., 2005).

### Sleep Hygiene Education

For many insomnia sufferers, it appears that a cognitive-behavioural approach to treating insomnia is an effective alternative to sleep medications (King et al., 2001). According to King et al. (2001), providing information about sleep hygiene is a fundamental component in the
treatment of insomnia. The following is a summary of good sleep hygiene recommendations from King et al. (2001) which aim to promote environmental conditions and behaviour which is constructive to healthy sleep.

- Sleep as much as needed to feel refreshed and healthy during the following day, but no more.
- Keep a regular sleep schedule.
- Exercise regularly but not close to bed time.
- Take less caffeine, cigarettes, stimulants, or other medications, particularly into the evening.
- Recognize that alcohol may cause fragmentation of sleep.
- People who feel angry and frustrated because they cannot sleep should not try harder to fall asleep but should do another activity.
- Hunger may disturb sleep, so a light snack may help in the evening.

Yang and Spielman (1999) also emphasize the importance of sleep hygiene education. Sleep hygiene refers to the habits and practices of everyday living that have a direct or an indirect impact on sleep, as well as any arousal that interferes with sleep. These authors report that this education improves the participant’s basic knowledge about sleep and sleep disorders, and gives them the skills in order to modify these practices that are counterproductive. This includes information about the process and function of normal sleep, the influence of biological rhythms, variability in night to night sleep, developmental changes in sleep, the effect of daily activities, and the effect of sleep disturbance on daytime functioning. This understanding empowers the participant, eliminates any worry about the consequences of sleep loss, and provides the rationale for specific treatment. The participant is asked to refrain from these specific activities that interfere with healthy sleep practices and in some cases are given alternative behaviours. Participants with insomnia rated behavioural interventions as more acceptable and more suitable than pharmacological approaches for their condition. Helping the insomnia sufferer to cope with stressors by direct action is a logical first therapeutic plan. A very common scenario is the insomnia sufferer worries that they will not sleep at night and will be unproductive the next day, which results in a self-fulfilling prophecy. Important issues to be explored in a patient’s sleep history include primary sleep complaints, the course of the insomnia, daytime consequences, sleep pattern, beliefs about the sleep problem, psychological functioning, and medication and substance use.

**Stimulus Control Therapy**

According to Yang and Spielman (1999), nearly all people who suffer from insomnia develop behavioural adaptations and thoughts that are counterproductive to healthy sleep and help sustain the insomnia. Stimulus control therapy is designed to assist the participant with insomnia to establish a consistent sleep-wake rhythm, strengthen the bedroom and environment as a cue for sleep and weaken the association with activities that might interfere with sleep (Bootzin, 1992). The rationale is the client has formed poor sleep habits, resulting in a conditioned association between bedroom, stimuli, and arousal. King et al. (2001) identifies key guidelines for stimulus control:
- Only go to bed when tired.
- If sleep onset does not occur within ten minutes of going to bed, get out of bed. Upon the return to bed the same rule applies.
- Set an alarm and rise at the same time every morning.
- Do not nap.
- Do not use the bed for anything except sleep.

Morin & Azrin (1988) conducted a study with elderly insomnia patients \( n = 27 \) randomly assigned to one of three conditions: stimulus control, imagery training, or a wait list. Sleep diaries were used by both the patients and significant others for assessment. Stimulus control and imagery training resulted in significant improvement in reducing duration of awakenings. However, stimulus control showed greater improvement rates than either imagery training or the control condition. These sleep improvements were maintained at 3 and 12 month follow-ups.

Stimulus control therapy is based on the conclusion that chronic sleep disturbance may be perpetuated by counterproductive behaviours and arousal at bedtime (Yang & Spielman, 1999). As stimulus control therapy is based on conditioning principles, this process consists of the elimination of sleep incompatible behaviours such as eating, talking, worrying, and other states of arousal. Over time, the repeated association of bedroom cues is said to bring sleep under the stimulus control of the bedroom environment. Confirming this issue, at least one study finds that damaged sleep quality in patients with schizophrenia relates to longer periods of time spent in bed (Hofsetter et al., 2005), which strengthens the association between the bedroom and activities that are incompatible with sleep.

People who suffer from insomnia commonly do not have the energy or motivation for behaviour change. To target this issue, Yang & Spielman (1999) emphasize that the patient needs to be educated that short term sacrifice will produce long-term benefits. Stimulus control therapy has been shown to be effective in treating sleep onset as well as sleep maintenance insomnia. It has also been shown to achieve better results than paradoxical intention, sleep hygiene, and some relaxation techniques for insomnia.

**Sleep Restriction Therapy**

The process of sleep restriction therapy recognizes that poor sleepers often increase their time in bed in a misguided effort to provide more opportunity for sleep, which is a strategy that is more likely to result in fragmented and poor quality sleep (King et al., 2001). This is sometimes called the positive correlation strategy, which is the idea that the more time you spend in bed, the more sleep you will get (Perlis, 2001). Sleep restriction therapy is based on the recognition that many insomnia sufferers spend excessive time in bed attempting to sleep and therefore have poor sleep efficiency, perpetuating the insomnia. It prescribes an individualized sleep-wake schedule that limits the person’s amount of time in bed to the estimated number of hours of sleep that is normally obtained. At the beginning of treatment, partial sleep deprivation is provoked, and daytime sleepiness may be experienced. However, as sleep becomes more consolidated, the sleep-wake schedule is altered by increasing the amount of time in bed.
Bliwise et al. (1995) conducted a controlled study examining the effectiveness of sleep restriction therapy compared to that of relaxation training in elderly insomnia sufferers (n=32). Data regarding sleep times and sleep latency was collected through daily telephone calls. Both treatments were associated with significant improvements; however sleep restriction resulted in superior maintenance at a three month follow up.

Morin, Culbert, and Schwartz (1994) conducted a meta-analysis to evaluate the psychological treatments for insomnia and determine which is the most effective. In total, 59 treatment outcome studies including 2102 patients were reviewed. Studies were selected based on the following criteria: the main topic of interest was sleep maintenance or onset, non-pharmacological, a control-group design was used, and the outcome measures involved sleep latency, number of awakenings, or total sleep time. Psychological interventions, with an average of five hours of therapy, produced reliable changes. The average effect sizes were 0.65 for time awake after sleep onset, and 0.88 for sleep latency. These results show that for sleep latency, treated patients were better off than 81% of untreated patients, and for time awake after sleep onset, treated patients were better off than 74% of untreated patients. When the comparison of treatment procedures was evaluated, results showed that stimulus control was the most effective therapy for both sleep onset and sleep maintenance insomnia. Sleep restriction therapy showed even greater benefits, however this intervention had a limited number of clinical trials. A comparison of relaxation exercises showed that methods pertaining to cognitive arousal such as racing thoughts were slightly superior to those involving physiological arousal, such as muscle tension. This suggests that a perception of control rather than physical control is important in conquering insomnia.

According to Yang and Spielman (1999), getting into bed early and staying in bed longer trying to sleep makes the sleep-wake cycle unstable and is counterproductive. Too much time in bed promotes restless tossing and turning and stress of trying to sleep. Both of these contribute to the perpetuation of insomnia by conditioned anticipation of sleep disturbance. Sleep restriction is a self correcting process, as sleep loss brings on sleepiness and increased need for sleep, which results in sleep-seeking, rapid sleep onset, deeper and longer sleep. Sleep restriction induces a mild sleep loss when treatment begins, and thereby promotes sleep. Treatment begins with a baseline assessment. The clinician gets an estimate of the patient’s correct sleep amount from a sleep log and sets the initial sleep schedule bedtimes so that the time in bed is equal to the report of sleep duration. Total time in bed is divided by total sleep time to calculate sleep efficiency (Silberman, 2008). If sleep efficiency is greater than 90%, the following week receives an additional fifteen minutes of bedtime. If sleep efficiency is between 85% and 90%, the time allowed in bed remains unchanged. Finally, if sleep efficiency is below 85%, fifteen minutes of time allowed in bed is removed.

**Antipsychotics and Sleep**

Antipsychotics are reported to have varying effects on sleep (Haffmans et al., 2005). Low potency antipsychotics produce either a sleep prolonging effect or an increase in sleep efficiency in healthy controls, as well as in patients with schizophrenia (Cohrs, 2008). High potency antipsychotics consistently demonstrate no influence on SWS in healthy subjects or
schizophrenic patients. Withdrawal of these drugs results in a total reduction in sleep efficiency. Most first and second generation antipsychotics promote sleep.

A study by Monti and Monti (2004) has found that atypical antipsychotics olanzapine, risperidone, and clozapine significantly increase total sleep time and stage two sleep. Also, olanzapine and risperidone enhance slow wave sleep. However, the typical antipsychotics haloperidol, thiothixene, and flupentixol significantly reduce stage two sleep latency and increase sleep efficiency.

However, according to Kantrowitz, (2009), the long-term effects of antipsychotics on sleep architecture remain unclear. In two studies of paliperidone and clozapine, stage two and REM sleep increased, but SWS did not. A four-week trial of olanzapine demonstrated improvement in SWS, but in a recent cross-sectional study of quetiapine and risperidone, slow-wave sleep was reduced in medicated patients. Additionally, a recent study using high-density EEG found reduced sleep spindle activity throughout stages two to four in patients with schizophrenia medicated with various antipsychotics. Also, a large proportion of patients in a study by Lieberman (2005) experienced sleep problems despite treatment with atypical antipsychotics, with no significant differences between treatment and control groups. This provides further evidence that antipsychotics may not normalize sleep architecture in the long term.

**Quality of Life and Sleep Quality**

Quality of life (QOL) has become a topic of interest in schizophrenia. Ritsner et al. (2004) conducted an assessment involving 145 schizophrenia patients, with a mean age of 38.2 years, \( SD = 9.6 \), to evaluate the relationship between quality of sleep, and quality of life (QOL). In this study, 56 patients were assessed during hospitalization in rehabilitation settings, 45 at discharge from the hospital, and 41 in outpatient clinics. Out of the entire sample, 66 participants were considered poor sleepers based on Pittsburgh Sleep Quality Index results. Between-group comparisons showed that poor sleepers reported a significantly lower satisfaction with life in general than did good sleepers. Complaints of poor sleep quality and QOL measures demonstrated moderate negative relationships \((r\) ranged from -0.32 to -0.53) with all life quality domains. To determine which components of sleep would predict better QOL outcomes in patients with schizophrenia, a multiple regression analysis was performed. Two of the seven PSQI components predicted life quality outcome, which were daytime dysfunction, accounting for 12.6% of the total variance in the individual QOL index scores, and subjective quality of sleep. Also, after controlling for potential covariate effects, satisfaction with overall QOL and the general activities domain still remained significantly associated with sleep quality. Of all the PSQI components of impaired sleep, daytime dysfunction was reported to be the most significant predictor of QOL index rating in schizophrenia patients. Poorer sleepers reported a significantly lower satisfaction with life in general and life-specific domains than in good sleepers. This association appears both independently and synergistically with depression, distress, and side effects of medications. These findings confirm previous reports concerning correlation of sleep quality with depressive symptoms, adverse effects of medications, and psychological stress. This study concludes that there is a positive correlation between subjective QOL and subjective quality of sleep.
According to Cohrs (2008) poor subjective sleep quality of patients with schizophrenia is significantly associated with reduced quality of life. Sleep disturbance is often part of the prodromal phase of the illness, before symptomology; it may persist during the course of the disorder and appears to be involved in the pathophysiology of a variety of clinical aspects of this illness. Several studies have compared the polysomnographically registered sleep of drug-free patients with schizophrenia with healthy controls. A decrease in sleep efficiency has consistently been observed, and reduced total sleep time and elevated sleep latency was found in most studies. Poor sleep quality correlated inversely with quality of life even after correcting for depression and adverse drug effects in schizophrenia. Poor sleep quality is related to maladaptive coping styles including reduced preference for positive reappraisal.

Hofsetetter et al. (2005) analyzed statistical results from a study with 29 persons with schizophrenia or schizoaffective disorder. Results revealed that poor sleep quality predicted low quality of life ($r = -0.493; p = .022$) and reduced preference for employing positive reappraisal when facing a stressor ($r = -0.0594; p = 0.0012$). Further analysis revealed that persons with schizophrenia or schizoaffective disorder had shorter sleep duration ($p < 0.005$), shorter average sleep episodes ($p < .005$), and a higher frequency of awakenings ($p < .05$) than community norms. Patients with schizoaffective disorder had worse sleep as measured by the PSQI than did patients with schizophrenia (13.7 ± 4.4 vs 9.7 ± 4.7; t-test $p = 0.03$). Poor quality sleep that typically characterizes schizophrenia may have a powerful impact in both patients’ perception of their quality of life and their ability to cope with stress. Independent of age and symptoms, poorer sleep quality predicted poorer quality of life and greater difficulties appraising stressors in a positive light.

Various forms of sleep disturbance have also been linked to heightened levels of thought disorder and symptoms of excitement and may indicate relapse (Hofsetetter et al., 2005). Impaired sleep may make it difficult for persons with schizophrenia to cope with stressors, and might feel especially exhausted and highly inclined to avoid stressors and have difficulty seeing the positive aspects of daily challenges. Also difficulty sustaining interpersonal relationships and adapting to new situations, as well as less social and vocational satisfaction can be a result of poor sleep quality.

The Current Study’s Relationship to the Literature

Offenders are involved in many treatment programs throughout their stay. Previously mentioned studies show the direct result of poor sleep, in particular poor memory, shorter attention span, and reduced daytime alertness. If these offenders improve overall sleep hygiene and become more attentive and alert, perhaps they will attain an increased benefit, both during and over time, from other treatment programs. All participants in the present study have or currently experience all three risk factors for insomnia. This fact further emphasizes the need and importance for this population to receive sleep hygiene treatment.

The present study uses a cognitive behavioural approach to treatment in a group format. The focus of this group is on antecedents and consequences that maintain healthy sleep practices and influence behaviour change. Topics in the sessions are designed to challenge current cognitions and behaviour that have an impact on sleep. When these cognitions are changed, a change in
behaviour is predicted to occur. In group sessions, best practices set out by current research is referenced and utilized. The use of alternative behaviours are encouraged, as the possibilities for environmental change are not extensive in a prison setting.

In the present study, some minor modifications have to be made in order to apply stimulus control changes in a correctional setting. For example, one of the guidelines is to leave the bedroom during a night-time awakening. This is not a realistic activity for an inmate as participants are locked in cells. Instead, of leaving the room, participants are encouraged to get out of bed and either sit in a chair or sit up in bed while doing their activity. In this instance, the behaviour of lying in bed is differentiated from sitting in bed. Therefore lying in bed will continue to be associated with sleep, as sitting in bed will not.

Napping is a common occurrence in a prison setting. Many inmates nap frequently because they are either bored, or do not know what else to do with their time. Napping is restricted during treatment as it has a detrimental impact on sleep during the night, so the discovery and use of alternative activities are of utmost importance.

As previously stated, antipsychotic medication has various affects on sleep. All participants in this study are medicated with antipsychotics. The following antipsychotics are used in this hospital in varying doses: olanzapine, risperidone, clozapine, quetiapine, fluphenazine, haloperidol, zuclopenthixol, and methotrimeprazine.

Life quality is important regardless of age or personal situation. Sleep quality causes a ripple effect on many different facets of daily life. Improved quality of life will not only benefit the participants, but hopefully the staff that is dedicated to working with them as well.

Word Count: 3919
Chapter III: Method

Participants

All participants were inmates currently incarcerated in a multi-security level correctional facility with a diagnosis of schizophrenia or schizoaffective disorder. Participants identified by guards and staff as having sleep difficulties, as well as inmates that had shown an interest in working on existing sleep difficulties were chosen until six positions were filled. Also, all selected participants were taking antipsychotic medications to ensure consistency across the group. All participants were literate and able to actively participate in the reading and writing portions of the group. The last inclusion criterion was a score of five or greater on the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989) which can be seen in Appendix A. All six participants were males with an average age of 29.83, \( SD = 5.98 \). Referrals for the group were made by a Programs Officer, who had been a frequent group facilitator, was supervising a work program, and had extensive rapport with the participants. Correctional Officers also referred some participants to the Programs Officer as they were able to observe behaviour throughout the night and had key insight as to who would benefit from this kind of treatment. Participants had been either observed or had reported trouble initiating or maintaining sleep and were interested in a group program.

Each participant individually met with the group facilitator and co-facilitator, and was given a copy of the modified BPSYC consent form (Appendix B). Key aspects of the consent form were explained, such as the expectation of completing sleep logs, confidentiality, the fact that the group facilitator is a fourth-year student, and the ability to withdraw from the group at any time with no penalty. Participants were encouraged to ask any questions after reading the remainder of the form. Written consent from every participant was obtained, as well as approval from the St. Lawrence College Research Ethics Board.

Design

This study followed an ABA design consisting of one week of baseline, six weeks of intervention, and one week of maintenance. Baseline data was collected over seven consecutive days via sleep logs recorded by each participant. This baseline phase influenced no change in behavior and measured pre-intervention levels of sleep latency (SL), frequency of night time awakenings (FA), duration of awakenings (DA), total time in bed (TIB), total sleep time (TST), and sleep efficiency (SE). The intervention phase involved seven group sessions with topics including an introduction to sleep; sleep hygiene, stimulus control, and sleep restriction; sleep architecture, antipsychotics and schizophrenia; stress and sleep; nutrition and sleep; exercise and sleep; as well as a summary session. Sessions were very interactive and incorporated brainstorming as a group and filling in answers on session hand-outs. The researcher acted as the group facilitator, and a Programs Officer was the co-facilitator. Data was collected for one week following the cessation of the final session to assess maintenance. A paired-samples t-test was used to determine the statistical significance of the attained changes in the pre and post testing. A single-factor ANOVA was used to determine the statistical significance of the sleep parameter data.
Setting and Apparatus

All group sessions were conducted in a designated group room at the treatment centre. Participants were escorted from upstairs ranges from the same building, and across the property from another building. The group room was in the same section of the treatment centre as classrooms and other day programming. Equipment in the room consisted of a window into the hall, chairs placed in a circle around the room’s perimeter, a white board, and a flip chart. A Correctional Officer was present at the main entrance of the building and had access to real-time video footage of activities in the room. The co-facilitator was equipped with a personal protective alarm that would notify multiple Correctional Officers if its button was pressed. Facilitators sat adjacent to the door to allow for quick exit in the event of an emergency.

Measures

**Pre and post assessment measures.** Both pretests were completed individually over a two-day period in the co-facilitator’s office, and a nursing room on a range. The researcher and co-facilitator were present. Four participants read and completed the questionnaires with no assistance, while two participants required the researcher to read the questions aloud and record the participant’s answers.

**Pittsburgh Sleep Quality Index (PSQI).** The PSQI (Buysse, 1989) is a widely-used standardised measure of subjective quality of sleep. It has 19 individual items that generate seven component scores for subjective sleep quality (C1), sleep latency (C2), sleep duration (C3), habitual sleep efficiency (C4), sleep disturbances (C5), use of sleep medication (C6), and daytime dysfunction (C7), as well as a total score with a range of 0-21. The PSQI has an internal consistency and a reliability coefficient of 0.83 for its seven components. Numerous studies using the PSQI have supported high validity and reliability. Scoring of answers is based on a 3-point Likert scale, with 1 showing high satisfaction and three reflecting a negative extreme on the Likert Scale; therefore lower scores reflect higher satisfaction. A global sum of five or more indicates a poor sleeper. Question ten and its five components are omitted for this study as it related to having a bed partner or roommate and do not apply in this institution.

**The Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q-18).** The Q-LES-Q-18 (Ritsner et al., 2005) (Appendix C) is an abbreviated questionnaire for patients with schizophrenia, schizoaffective, or mood disorder. It is a self-report measure of the degree of enjoyment and satisfaction that has been revised from the original measure to include five of the original seven domains: physical health (PH), with a possible high score of 20; subjective feelings (SF), with a possible high score of 25; leisure time activities (LTA), with a possible high score of 15; social relationships (SR), with a possible high score of 25; medication satisfaction (MS), with a possible high score of 5; and finally a total score, with a possible high score of 90. The questionnaire uses a 5-point scale with higher ratings indicating higher QOL. A recent study found that these 18 items accurately predicted these domains and general index scores. Also, this measure shows high reliability, validity, and stability of test-retest ratings.
Sleep parameter measures.

Sleep log. Sleep parameters during baseline, intervention and maintenance were recorded in a sleep log by each participant (Appendix D) that had been modified from its original version as cited in Silberman (2008). A space for the participants’ names and “time allowed in bed this week” had been added. This log was easy to record, and the researcher reviewed these logs to measure SL, FA, DA, TIB, TST, and SE. SL refers to the duration in minutes from an attempt to sleep and sleep onset. FA refers to the frequency of nighttime awakenings. DA refers to the duration of awakenings measured in hours, over one night. TIB includes all time spent in bed awake as well as sleeping over a 24-hour period. TST refers to only actual time spent sleeping in bed over a 24-hour period. SE is TST divided by TIB multiplied by 100, which is the percentage of time spent in bed sleeping opposed to lying in bed awake. Higher SE is ideal, and means the participant is following sleep hygiene instructions, and is spending less time lying in bed awake.

An additional form was used to calculate sleep efficiency, which aided in determining sleep modifications that would be necessary for sleep restriction therapy. This form was adapted from a well-known insomnia workbook (Silberman, 2008). Also, overall percent improvement of sleep latency, number of awakenings, duration of awakenings, time spent in bed and total sleep time are recorded on a separate data sheet.

Procedure

Group sessions were held Tuesday afternoons from 1:30 pm to 2:30 pm in the designated group room. Also, participants had the opportunity to meet with the group facilitator and co-facilitator on Thursday afternoons if there were any questions or concerns. This also gave the group facilitator an opportunity to meet with participants individually, if necessary. Sleep logs were collected Tuesday mornings and were measured before the beginning of group in the afternoon.

The following is a detailed summary of each session. The facilitator manual is included in Appendix F.

Session one: Introduction. The first group meeting was intended to be a general introduction to the topic of sleep hygiene. All participants had previously met each other as well as the group facilitators; so a formal introduction was not necessary. Group rules were the first discussed topic. Participants brainstormed rules from past groups, and together decided on "confidentiality, one person talks at a time, listen, be respectful of others, be on time, and participate" to be the group rules. These goals consisted of education about why sleep is important, encouragement to reflect on sleep habits, learn how everyday activities and simple choices can affect sleep quality, and learn ways to improve sleep so to wake less during the night and wake up feeling rested and refreshed. The first activity involved reading quotes from people explaining their sleep problems (Silberman, 2008). Each participant was asked to circle or place a check beside the examples they could relate to. The group shared its answers, which stimulated open discussion as well as self-reflection. After this exercise the group discussed common sleep myths (Silberman, 2008), first discovering if the participants believed they were true or false. Next, the group was asked to brainstorm differences they had noticed in the way we feel when
we get a poor night's sleep versus a good night's sleep. The facilitator wrote these answers on the flip chart. This exercise was intended to show the benefits of sleeping well and build motivation to participate in the upcoming stimulus control and sleep restriction session. Lastly, the group facilitator explained the importance of the sleep logs, as well as how to use them. Each morning, the participants were to record the previous night's sleep in this sleep log, and are given a blank version every week. The group facilitator explained that these logs will be used to calculate sleep latency, frequency of awakenings, duration of awakenings, total time spent in bed, total sleep time, and sleep efficiency.

No behaviour changes were taught in session one as baseline data was collected between session 1 and session 2.

**Session two: Sleep hygiene, stimulus control, and sleep restriction.** Group started with a summary of the previous week's topics. Next, the idea of sleep hygiene was introduced (Yang & Spielman, 1999). The group facilitator discussed what sleep hygiene is about, and then asked the group to brainstorm some habits that interfere with sleep, with additional examples from Silberman (2008). These examples were written on a flip chart and shared to stimulate discussion. Next, participants brainstormed environmental factors that interfere with sleep, which generated discussion. Further examples from the group facilitator were shared. Discussion continued regarding examples the participants could relate to, which encouraged self reflection. This was an important aspect of the group because the participants were able to recognise aspects of their own behaviour in order to change their habits. The better they were able to reflect on their own behaviour, the easier it would be for them to identify ways to change.

After summarizing sleep hygiene, the next topic of discussion was stimulus control (King et al., 2001). This began by clarifying what a stimulus is, in the context of sleep. The group then began to identify activities they like to do to relax. They wrote these down as this list is important later on. There were ten stimulus control tips on the handouts, and everyone took turns going around the circle reading one at a time. At this point questions were asked, and the answers helped in reinforcing the importance of these guidelines.

After all questions were answered, the next topic of sleep restriction (Perlis, 2001) was explained. Participants were asked to refer to the current week's sleep logs. Each sleep log had been individually labelled with a recommended sleep time and rise time by the group facilitator. Just like stimulus control, there was a list of tips for sleep restriction. Participants took turns reading the guidelines. The facilitator frequently asked if everyone understood, and when there was a question this opportunity was used to generate discussion with the rest of the group. Everyone was encouraged to try these guidelines and be ready to share what they had changed for the following week. A no-nap challenge was suggested for the group members for the coming week, so the group could discuss experiences during the next group session. The topic of the next week's session, sleep architecture, was shared. Everyone was thanked for the great participation.

**Session three: Sleep architecture, antipsychotics, and schizophrenia.** This session began with an overview of last week's topics. The facilitator asked if anyone took the challenge and tried not to sleep last week, and participants shared their experiences. Participants shared which habits they had been working on and how they had affected their sleep. Key aspects of
sleep hygiene, stimulus control and sleep restriction were reinforced and participants are further encouraged to continue following the guidelines. The current week’s sleep logs were passed out.

Sleep architecture was introduced. EEGs are explained as this is how people have been able to study the brain’s activity during sleep. Sleep stages N1, N2, N3 and REM are summarized by the group facilitator (Silberman, 2008). The group was frequently asked if there were any questions, to further explain the summaries. Sleep cycles were explained.

The next section was about the difference in sleep architecture in people with schizophrenia (Monti & Monti, 2005). The group was asked if there were any questions. Participants were then asked if they could recall the type of antipsychotic they take. The next section of information was about the different ways in which various kinds of antipsychotics affect sleep (Monti & Monti, 2004). Sleep logs were handed out.

**Session four: Stress and sleep.** This group began by thanking everyone for coming and introducing the topic of stress. The group was asked to recall times when stress had affected sleep. The facilitator then asked if anyone would like to share how stress had affected their sleep in the past. Good stress and bad stress were differentiated with examples. This is the difference between motivation to get things done and social anxiety, for example. The group brainstormed ideas and examples, and the facilitator wrote these on the flip chart. Next, physical stress and mental stress were differentiated with examples from the facilitator, and then examples from group members. At least five examples of each were listed, and the facilitator thanked the group for the examples. All brainstorming was recorded by group members on the worksheets. Next, coping strategies for mental stress were introduced. Cognitive distortions were described and the group was asked if anyone had ever thought in these ways. Personal examples were shared by group members. Self-talk was taught, and the facilitator explained how to use this skill. As well as previously-made examples, additional self-talk statements were written on the flip chart. Diaphragmatic breathing (Stress Relief Tools, 2010) was taught as a way to cope with physical stress. The group facilitator explained why oxygen is important to our bodies, and asked if anyone knew what the diaphragm was. This was explained, as well as the difference between the oxygen absorbed by shallow breathing versus diaphragmatic breathing. A diagram showing this principle was drawn on the flip chart. The facilitator guided the group through at least five deep breaths, and comments were encouraged and made about noticeable physical changes. The facilitator asked if there were any questions about what was covered. The group was thanked for the participation and sleep logs were handed out.

**Session five: Nutrition and sleep.** This group began by welcoming everyone and asking if anyone had tried coping strategies that were discussed during the previous week. The group was asked if anyone could tell the group facilitator what nutrition was, and what it had to do with sleep. It was explained that the healthier you eat, the more energy you will have during the day - the more energy you have, the more you do - the more you do, the easier it will be to fall asleep at night. The group was asked if anyone could tell the facilitator what food groups are, and if they knew any. The facilitator prompted the participants, and answers were written on the flip chart. After all food groups were covered, the group brainstormed examples of foods that fall under each category. Then, attention turned to a picture from Health Canada (2010) that showed the hierarchy of food groups, and which were most important for daily nutrition. The group was
asked what foods are not represented (all junk food), and why, and these answers were written on the handouts. The next page was introduced, which was about recommended servings for people in this age group. Discussion was generated about past and current food practices both before and during prison. The facilitator stated that it was understood that participants did not have any choice as to what meals were provided for breakfast, lunch, and dinner. However, they did have access to a canteen. It was this food over which participants had control, therefore everyone was distributed a copy of the canteen list. The group leader highlighted foods that were healthier choices, and discussion was made regarding what group members currently purchased. The group finished with a discussion about the importance of drinking water, both for health (Ezine, 2010) and to combat side-effects of medications. The group was thanked for their participation and sleep logs were distributed.

**Session six: Exercise and sleep.** The group was started by commenting on last week's sleep logs, and everyone was thanked for coming. The session began by explaining the relationship between the previous group’s topic of nutrition, and the current week's group about exercise. The following relationship was explained and discussed: energy from healthy foods could be a motivator for exercise, which later would encourage sleep. Many participants said they were too tired to exercise, so it was important to remind the group that many ways had been discussed to increase energy levels in previous sessions. The facilitator asked the group if anyone exercised regularly. Group members were asked to explain what they did to exercise. The facilitator then made a point of asking the participants if they found it easier to sleep when they had exercised during the day, compared to when they did not exercise (Sobel, 2010). Generally it should be easier to fall asleep when exercise had occurred. This answer is written on the handouts. The facilitator then asked the group how exercise affects sleep. Based on the answer of the previous question, the answer was discussed in detail. The next discussion was about the importance of not exercising too close to bedtime. Next, the group brainstormed realistic ways in which the group members could engage in exercise around the prison, and the facilitator wrote these examples on the flip chart. A significant amount of time was spent on this topic because it was important for group members to write these examples on the worksheets so they had examples to refer to at a later time. The group was thanked for the examples. Next, other mental health and physical benefits of exercise were brainstormed, discussed and written on the flip chart, and participants wrote these answers on the worksheets. The group was asked if there were any more ideas. The facilitator asked the group members if they agreed that these were good reasons to exercise, and all participants agreed. The facilitator asked the group if everyone could think of an exercise activity they would like to try, and ensured that everyone had an idea. Participants were encouraged to try these activities during the following week. The facilitator asked if there are any more questions, thanked everyone for their participation, and handed out sleep logs.

**Session seven: Summary.** This session began by welcoming everyone, and thanking everyone for coming. This session was meant to be an overview of all major topics and key concepts that have been taught over the past several weeks. Handouts were followed and participants were encouraged to use previous answers from prior weeks to complete the current week’s work sheets. The facilitator and co-facilitator alternated in leading discussions and answering questions. When the work sheets were completed, the facilitator asked the participants if they remembered filling out two questionnaires before the first group. They were asked to complete these questionnaires a second time so the facilitator could measure any changes. The
PSQI and Q-LES-Q-18 were handed out to each group member for post-testing. Participants were encouraged to take as much time as needed and not to rush through answers. When all tests were complete, certificates were presented to each group member which included the participant’s name, title of the program, date, and the facilitator and co-facilitator’s signatures. The group was asked for feedback regarding their favourite part of the group and any ways in which the group could be improved in the future. The facilitator explained that sleep logs would be collected for two more weeks to see if everyone had maintained these new sleep habits. Group members were thanked for their participation and the group came to a close.
Chapter IV: Results

Pre and Post Testing

**PSQI pre test scores.**

The following table shows pre-test results for the PSQI for each participant.

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Participant</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>C4</th>
<th>C5</th>
<th>C6</th>
<th>C7</th>
<th>Total</th>
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<tr>
<td>A</td>
<td></td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>11</td>
</tr>
</tbody>
</table>

- **Average** 1.5   2.17  0.67  0.5   2.67  1.83  1.83  11.17
- **SD** 0.55     1.17  1.03  0.84  0.82  0.75  1.33  3.97

All participants attained score of five or greater. Overall, the two highest-rated components, or most significant complaints, were sleep latency (C2) and sleep disturbances (C5). These findings are consistent with current research in sleep disturbances in schizophrenia.

**PSQI post test scores.**

Pre and post scores are represented in the Figure 1. Subscale C1, which measures subjective sleep quality, decreased from a score of 1.5 to 0.5 from pre to post testing. C2, which measures perceived sleep latency remained the same in pre and post testing. C3, which measures subjective sleep duration, decreased from an average score of 0.67 to 0.5. C4, or perceived habitual sleep efficiency, remained unchanged. C5, or perceived sleep disturbances, decreased from a score of 2.67 to 2. The average score of C6, the subscale measuring the use of sleep medication, decreased from 1.83 to 1.33. The last scale, C7, which measures daytime dysfunction, decreased from a score of 1.83 to 1.5. Overall, the global score decreased from 11.17 to 8.5. A paired-samples test revealed statistically significant improvements in pre and post scores of the C1 subscale ($t(5) = 3.87, p < 0.015$) as well as the global score ($t(5) = 3.32, p < 0.02$). The subscale C6 was approaching significance at ($t(5) = 2.24, p < 0.076$).
Figure 1. Average group PSQI pre and post scores by subscale.

Q-LES-Q-18 pre-test scores.

The following table shows pre-test scores for the Q-LES-Q-18 for each participant.

Table 2.

<table>
<thead>
<tr>
<th>Participant</th>
<th>PH</th>
<th>SF</th>
<th>LTA</th>
<th>SR</th>
<th>MS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10</td>
<td>17</td>
<td>7</td>
<td>17</td>
<td>4</td>
<td>55</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
<td>20</td>
<td>8</td>
<td>17</td>
<td>5</td>
<td>62</td>
</tr>
<tr>
<td>C</td>
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<td>19</td>
<td>5</td>
<td>8</td>
<td>4</td>
<td>44</td>
</tr>
<tr>
<td>D</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>18</td>
<td>4</td>
<td>46</td>
</tr>
<tr>
<td>E</td>
<td>8</td>
<td>15</td>
<td>10</td>
<td>14</td>
<td>4</td>
<td>51</td>
</tr>
<tr>
<td>F</td>
<td>15</td>
<td>8</td>
<td>10</td>
<td>19</td>
<td>5</td>
<td>67</td>
</tr>
<tr>
<td>Average</td>
<td>9.4</td>
<td>16</td>
<td>7.2</td>
<td>14.8</td>
<td>4.2</td>
<td>54.17</td>
</tr>
<tr>
<td>SD</td>
<td>1.67</td>
<td>4.36</td>
<td>1.92</td>
<td>4.09</td>
<td>0.45</td>
<td>9.02</td>
</tr>
<tr>
<td>% vs. Possible</td>
<td>47</td>
<td>64</td>
<td>48</td>
<td>59.2</td>
<td>84</td>
<td>60.19</td>
</tr>
</tbody>
</table>

Overall, PH and LTA have the lowest scores, at 47% and 48% respectively.
Q-LES-Q-18 post-test scores.

Pre and post scores are represented in figure 2. From pre to post testing, participants’ average score pertaining to physical health increased from 9.4 to 13.33, an increase of 41.81%. The subscale measuring subjective feelings increased from 16 to 18, an improvement of 12.5%. Satisfaction of leisure time activities increased from a score of 7.2 to 8.67, an improvement of 20.42%. Social relationship satisfaction increased from a score of 14.8 to 17.17, an improvement of 16.01%. Medication satisfaction decreased from an average score of 4.2 to 3.67, a reduction of 12.62%. Finally, the global score increased from 54.17 to 60.83 from pre to post testing, which is a 12.29% improvement. A paired-samples test revealed statistically significant improvement on the PH subscale from pre test to post test, \( t(5) = 3.35, p < 0.02 \).

![Figure 2. Average group Q-LES-Q-18 pre and post scores by subscale.](image)

**Group Sleep Parameter Averages**

Sleep parameters during baseline, intervention and maintenance were recorded in a sleep log (Appendix D) by each participant. This sleep log had been modified from its original version as cited in Silberman (2008). This log was easy to record, and the researcher reviewed these logs to measure SL, FA, DA, TIB, TST, and SE. SL refers to the duration in minutes from an attempt to sleep and sleep onset. FA refers to the frequency of night time awakenings. DA refers to the duration of awakenings measured in hours, over one night. TIB includes all time spent in bed awake as well as sleeping over a 24-hour period. TST refers to only actual time spent sleeping in bed over a 24-hour period. SE is TST divided by TIB multiplied by 100, which was the percentage of time spent in bed sleeping opposed to lying in bed awake. Higher SE is ideal, and
meant the participant was following sleep hygiene instructions, and was spending less time lying in bed awake.

Scruggs et al. (1987) suggested using the percentage of non-overlapping data (PND) between baseline and intervention as a measure of treatment effectiveness. This procedure involves drawing a line through the baseline data and counting the number of treatment data that falls above or below this line, depending on if the intervention is meant to increase or decrease behaviour. This number is then divided by the total number of data points in the intervention phase and multiplied by 100 to determine the PND. Scruggs and Mastropieri (1998) suggest the following categories of effectiveness based on PND: > 90% is considered very effective, 70% to 89% is considered effective, 50% to 70% is considered questionable, and PND < 50% is considered ineffective.

Sleep latency. Figure 3 displays group averages of SL during baseline, intervention, and maintenance. Each data point represents 42 pieces of data as it signifies averages of six participants over seven days.

The preceding figure shows a decreasing trend and a PND of 100%, which suggests a very effective intervention. Also, average group SL decreased by 38.36 minutes from baseline to week six of intervention. Overall, SL decreased by 73.04% from baseline to week six of intervention. Percent change is calculated by subtracting week 6 intervention data from baseline, dividing the resulting number by the baseline, and multiplying by 100%. A single-factor
ANOVA revealed a statistically significant improvement from baseline to intervention, \((F(2, 43) = 9.61, p = 0.001)\). Treatment gains were maintained at a one-week follow-up.

**Frequency of awakenings.** Figure 4 displays group averages of FA during baseline, intervention, and maintenance. Each data point represents 42 pieces of data as it signifies averages of six participants over seven days.

![Figure 4](image)

*Figure 4. Average group FA.*

The preceding figure shows a decreasing trend and a PND of 66.66%, which suggests a questionable intervention. Also, average group FA decreased by 0.41 times per night from baseline to week six of intervention. Overall, FA decreased by 44.57% from baseline to week six of intervention. Treatment gains were maintained at a one-week follow-up.
Duration of awakenings. Figure 5 displays group averages of DA during baseline, intervention, and maintenance. Each data point represents 42 pieces of data as it signifies averages of six participants over seven days.

Figure 5. Average group DA.

The preceding figure shows a decreasing trend and a PND of 66.66%, which suggests a questionable intervention. Also, average group DA decreased by 1.2 hours, or 72 minutes from baseline to week six of intervention. Overall, DA decreased by 56.87% from baseline to week six of intervention. A single-factor ANOVA revealed a statistically significant improvement from baseline to intervention, ($F(2, 41) = 8.65, p = 0.001$). Treatment gains were maintained at a one-week follow-up.

Total time spent in bed. TIB is not graphed as is only used it in calculating SE.
**Total sleep time.** Figure 6 displays group averages of TST during baseline, intervention, and maintenance. Each data point represents 42 pieces of data as it signifies averages of six participants over seven days. Treatment gains were maintained at a one-week follow-up.

![Figure 6](image)

*Figure 6. Average group TST.*

The preceding figure shows an increasing trend and a PND of 100%, which suggests a very effective intervention. Also, average group TST increased by .79 hours, or 49.38 minutes, from baseline to week six of intervention. Overall, TST increased by 10.14% from baseline to week six of intervention.
**Sleep efficiency.** Figure 7 displays group averages of SE during baseline, intervention, and maintenance. Each data point represents 42 pieces of data as it signifies averages of six participants over seven days.

![Figure 7. Average weekly group SE.](image)

The preceding figure shows an increasing trend and a PND of 100%, which suggests a very effective intervention. Also, average group SE increased by 9.43% from baseline to week six of intervention. Overall, SE increased by 11.69% from baseline to week six of intervention. A single-factor ANOVA revealed a statistically significant improvement from baseline to intervention, \( F(2, 43) = 5.76, p = 0.006 \). Treatment gains were maintained at a one-week follow-up.

Individual participant sleep parameter averages can be found in Appendix E.
Chapter V: Discussion

Sleep Parameters

Group sessions provided the participants with numerous behavioural strategies to decrease sleep latency (SL), frequency of awakenings (FA), and duration of awakenings (DA); and to increase total sleep time (TST) and sleep efficiency (SE). This study’s results are consistent with the current literature. After sessions involving sleep hygiene education, stimulus control, and sleep restriction, all sleep parameters changed in the hypothesized ways. Statistically significant improvements were evident in SL, DA, and SE by week six of intervention, maintaining at a one-week follow-up. A spike that occurred in the FA and DA data at week five could be due to three of the six participants receiving methadone early that week, as this treatment typically has this effect on sleep.

Pre and Post Testing

Perceived quality of sleep is an important aspect of this study. One hypothesis stated that as perceived sleep quality improved, so would perceived quality of life. This seemed to be the case. It was important to determine if perceived quality of sleep as measured by the PSQI was consistent with the reported sleep parameters in the sleep logs. Participants reported a large improvement in subjective sleep quality, which is measured by subscale C1. The sleep logs verified this improvement. Also, sleep disturbances, subscale C5, were also reported to be less of an issue in post testing, which can also be verified by the sleep logs. Interestingly, there were inconsistencies. Perception of SL, measured by subscale C2, did not decrease from pre to post testing, although statistically significant changes were reported in the sleep logs. Perceived SE, as measured by subscale C4, also did not decrease although changes in this sleep parameter throughout intervention also resulted in statistically significant improvements. Perhaps the most interesting change from pre to post testing was the decrease in use of sleep medication, as measured by subscale C6. Three of the six participants took decreased amounts, or completely stopped taking the sleep medication, yet sleep parameters continued to improve across all group members.

Strengths and Limitations

One of the main strengths of this study was that all participants were active in the sessions and were eager to learn. This meant they were at the sessions because they wanted to be, not because they had to. An experienced Programs Officer offered direct input, which was helpful in making the sessions as effective as possible. Another strength of this study is that all interventions were evidence-based, and backed by empirical support. Finally, group sessions took place in a well-known environment, so participants did not have to adjust to new surroundings and were comfortable.

A limitation of this study was that baseline and maintenance phases were relatively short due to time constraints. More data could have been collected had they been longer. There was no control group from which to compare treatment gains. Additionally, data was based upon self-report, which although can be accurate, also creates limitations due to potential dishonesty and fabrication.
Multilevel Challenges

Programs are frequently cancelled in the winter months. Correctional Officers are scheduled for special training, which results in unmanned posts. Additionally, the government has attempted to cut back on the amount of overtime that officers have been receiving, which results in more circumstances of unmanned posts. This leaves the Programs Officers with little to do except plan for future programs and groups, as programs cannot run while there is no Correctional Officer present. This affects efforts at the client level, because inmates are unable to receive treatment as frequently as planned. It is very important for inmates to receive treatment as soon as possible, and as frequently as possible to benefit from being at the centre. This is especially true because treatment usually targets symptoms of mental illnesses from which they are currently suffering. This issue has a negative effect on the organization level because it is difficult for Programs Officers to do their jobs in these situations. This delay in program implementation has given the impression that the officers are not being productive in their work when statistics are examined, even though they do as much as they can. This difficulty affects society because there is an expectation that inmates are treated in a reasonable amount of time, especially in intensive programs.

Implication for the Behavioural Psychology Field

This cognitive behavioural study resulted in effective outcomes in a correctional setting with inmates with schizophrenia. The participants’ perception of change in sleep parameters were not always consistent with reported outcomes. Further research could investigate if this inconsistency also occurs to the same extent in the general population. This study is another example of a behavioural treatment that is more effective than solely medication. When inmates attain appropriate sleep habits, they might be more alert and learn more in other treatment programs. This improvement could assist these inmates in getting the most out of treatments in the behavioural psychology field. Also, when inmates have more energy and become more involved in activities throughout the prison, these social interaction and active changes in daily life has shown to increase perceived quality of life.

Recommendations for Future Research

There are several recommendations for future research. The first recommendation is to specify trouble initiating or maintaining sleep opposed to a more general “sleep difficulty” in inclusion criteria. Although the PSQI was used as a screening tool and measures sleep quality, it does not differentiate between those who do not sleep enough and those who sleep too much. Another recommendation is to split the second session into three separate sessions, when time allows. The purpose of this change is to spend more time on the material and perhaps provide more thorough explanations of the core therapies. One of the most important recommendations for future research is to incorporate time for individual counseling, so participants have an opportunity to share topics that might be too uncomfortable to share in a group setting. In addition, this would be an opportune time to discuss changes in sleep parameters as reported by the sleep logs, and to provide encouragement. As discussed earlier, participants did not always notice changes in SL and SE, which emphasizes the need to discuss changes and bring them to the participants’ attention. Finally, further research can determine if higher quality of sleep
correlates with more participation and higher post-test scores in other treatment programs compared to those with poor sleep quality.

Word Count: 12,206
REFERENCES


Appendix A: Pittsburgh Sleep Quality Index

INSTRUCTIONS:
The following questions relate to your usual sleep habits during the past month only. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions.

1. During the past month, what time have you usually gone to bed at night?
   
   BED TIME ______

2. During the past month, how long (in minutes) has it usually taken you to fall asleep each night?

   NUMBER OF MINUTES ______

3. During the past month, what time have you usually gotten up in the morning?

   GETTING UP TIME ______

4. During the past month, how many hours of actual sleep did you get at night? (This may be different than the number of hours you spent in bed.)

   HOURS OF SLEEP PER NIGHT ______

For each of the remaining questions, check the one best response. Please answer all questions.

5. During the past month, how often have you had trouble sleeping because you . . .
   
a) Cannot get to sleep within 30 minutes

   Not during the past month ______  Less than ______ once a week ______  Once or twice ______ a week ______  Three or more ______ times a week ______

b) Wake up in the middle of the night or early morning

   Not during the past month ______  Less than ______ once a week ______  Once or twice ______ a week ______  Three or more ______ times a week ______

c) Have to get up to use the bathroom

   Not during the past month ______  Less than ______ once a week ______  Once or twice ______ a week ______  Three or more ______ times a week ______

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c) Cannot breathe comfortably
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

   e) Cough or snore loudly
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

   i) Feel too cold
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

   g) Feel too hot
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

   h) Had bad dreams
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

   l) Have pain
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

   j) Other reason(s), please describe________________________________________________________

   How often during the past month have you had trouble sleeping because of this?
   Not during the past month_____ Less than once a week_____ Once or twice a week_____ Three or more times a week_____ 

6. During the past month, how would you rate your sleep quality overall?
   Very good ____________
   Fairly good ____________
   Fairly bad ____________
   Very bad ____________
7. During the past month, how often have you taken medicine to help you sleep (prescribed or "over the counter")?

| Not during the past month | Less than once a week | Once or twice a week | Three or more times a week |

8. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?

| Not during the past month | Less than once a week | Once or twice a week | Three or more times a week |

9. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?

   No problem at all
   Only a very slight problem
   Somewhat of a problem
   A very big problem

10. Do you have a bed partner or room mate?

    No bed partner or room mate
    Partner/room mate in other room
    Partner in same room, but not same bed
    Partner in same bed

If you have a room mate or bed partner, ask him/her how often in the past month you have had...

a) Loud snoring

| Not during the past month | Less than once a week | Once or twice a week | Three or more times a week |

b) Long pauses between breaths while asleep

| Not during the past month | Less than once a week | Once or twice a week | Three or more times a week |
c) Legs twitching or jerking while you sleep

<table>
<thead>
<tr>
<th>Not during the past month</th>
<th>Less than once a week</th>
<th>Once or twice a week</th>
<th>Three or more times a week</th>
</tr>
</thead>
</table>

c) Episodes of disorientation or confusion during sleep

<table>
<thead>
<tr>
<th>Not during the past month</th>
<th>Less than once a week</th>
<th>Once or twice a week</th>
<th>Three or more times a week</th>
</tr>
</thead>
</table>

e) Other restlessness while you sleep; please describe ________________________________

<table>
<thead>
<tr>
<th>Not during the past month</th>
<th>Less than once a week</th>
<th>Once or twice a week</th>
<th>Three or more times a week</th>
</tr>
</thead>
</table>
Appendix B: Informed Consent Form

Consent Form

TITLE: The use of Stimulus Control and Sleep Restriction Therapy to Increase Perceived Quality of Life of Inmates with Schizophrenia

STUDENT: Jennifer Smith

COLLEGE SUPERVISOR: Dr. Frank Kane

Invitation

I am a student in my 4\textsuperscript{th} year in the Behavioural Psychology at St. Lawrence College and I am currently on placement at the Regional Treatment Centre. As a part of this placement, I am completing a special project called an applied thesis and am asking for your assistance to complete this project. The information in this form is intended to help you understand my project so that you can decide whether or not you want to participate. Please read the information below carefully and ask all the questions you might have before deciding whether or not to participate.

WHAT IS THE PURPOSE OF THE STUDY?

The purpose of this study is to improve the sleep hygiene of a selection of inmates currently placed at the Regional Treatment Centre. Employees report that the majority of offenders, especially those with schizophrenia, do not sleep well throughout the night; and this has a detrimental effect on their behaviour throughout the day. Sleep hygiene education, stimulus control therapy, as well as Sleep Restriction therapy is likely to improve the quality and duration of sleep throughout the night, which will have a positive effect on behaviour throughout the day. As sleep improves, attitude, mood, and overall quality of life is thought to improve as well.

WHAT WILL YOU NEED TO DO IF YOU TAKE PART?

You will be individually tested using the Pittsburgh Sleep Quality Index and Quality of Life Enjoyment and Satisfaction Questionnaire (PSQI), and an abbreviated Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q-18). These questionnaires will tell me what the quality of your sleep is right now, as well as how you rate your quality of life.
Group sessions will be held twice per week for eight weeks- on Tuesday and Thursday afternoons for one hour. Tuesday sessions will include education about sleep hygiene education with topics including the biological nature of sleep, stimulus control and sleep restriction, energy management, nutrition, mental illness and sleep, stress, and relapse prevention. You will be taught how to keep a sleep log in the first session, and you will use this to record your sleep experiences throughout the program. Thursday sessions will be used to talk about experiences and review progress. Sleep logs will be collected Thursday mornings so the clinician can look-over the sleep logs and modify each sleep plan based on the results. This will give me an opportunity to share the results and modifications with you and the rest of the participants (individually) when you meet for the group session in the afternoon.

**WHAT ARE THE POTENTIAL BENEFITS TO ME OF TAKING PART?**

There are many benefits to taking part in this program. Your overall level of functioning throughout the day should increase because you will likely have more energy, and should feel better rested. Your relationships with staff and other inmates should improve, because you will be more cooperative and less confrontational. You will be better able to concentrate, form memories, and stay alert. You may be able to engage in activities that you recently have not had the energy to engage in.

**WHAT ARE THE POTENTIAL BENEFITS TO OTHERS OF TAKING PART?**

If you participate in this program, others could benefit as well. You, as well as those that come into contact with you, (i.e. - staff, inmates) will be likely to have a positive experience and will be more likely to engage in wanted and meaningful social interaction. When people are in a pleasant mood, this has a positive impact on the environment and everyone around you. Also, you might find yourself to be less “grumpy” and more friendly and alert.

**WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART?**

The risks of participating in this project are minimal but may include becoming tired during the first phases of treatment. This is normal, and as treatment progresses and instructions are followed, this lost sleep will be regained.

**WHAT HAPPENS IF SOMETHING GOES WRONG?**

Everybody is different and if you do have any strong reactions to treatment, please tell a staff member and we will change your treatment accordingly.

**WILL MY TAKING PART IN THIS PROJECT BE KEPT PRIVATE?**

We will make every attempt to keep any information that identifies you strictly confidential unless required by law. All documents will be identified only by the initial of your first name as well as a number and kept in a locked filing cabinet in an office. Only
myself and other staff directly involved in this program will have access to your information. Information on computer will be password protected. You will not be identified by name in any reports, publications, or presentations resulting from this project.

**DO YOU HAVE TO TAKE PART?**

It is up to you to decide whether or not to take part. If you do decide to take part, you will be asked to sign this consent form. If you do decide to take part, you are still free to withdraw at any time, without giving any reason, and without incurring any penalty. If you have a legal guardian that speaks on your behalf, we will need their consent as well.

**CONTACT FOR FURTHER INFORMATION.**

This project has been approved by the Research Ethics Board at St. Lawrence College. The project will be developed under the supervision of Dr. Kane, my supervisor from St. Lawrence College. I really appreciate your cooperation. If you have any additional questions or concerns, feel free to ask me, Jennifer, or you can contact my College Supervisor, Dr. Kane at 613-536-6686. You may also contact the Research Ethics Board at appliedresearch@sl.on.ca.

**CONSENT**

If you agree to participate in the project, please complete the following form and return it to me as soon as possible. A copy of this signed document will be given to you for your own records. An additional copy of your consent will be retained at the agency and in a secure location with the Research Ethics Board at St. Lawrence College.
CONSENT

By signing this form, I agree that:

- The study has been explained to me.
- All my questions were answered.
- Possible harm and discomforts and possible benefits (if any) of this study have been explained to me.
- I understand that I have the right not to participate and the right to stop at any time.
- I am free now, and in the future, to ask any questions about the study.
- I have been told that my personal information will be kept confidential.
- I understand that no information that would identify me will be released or printed without asking me first.
- I understand that I will receive a signed copy of this consent form.

I hereby consent to participate.

Participant/Guardian Printed Name: ____________________________

Signature: _______________________________ Date: ________

SLC Student Signature: ____________________ Date: ________

Printed Name: ____________________________
## Appendix C: Abbreviated Quality of Life Enjoyment and Satisfaction Questionnaire

### An Abbreviated Quality of Life Enjoyment and Satisfaction Questionnaire for Schizophrenia, Schizoaffective, and Mood Disorder Patients

### During the past week how much of the time have you

<table>
<thead>
<tr>
<th>Question</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Felt in at least very good physical health?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Been free of worry about your physical health?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Felt good physically?</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Felt full of pep and vitality?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Felt satisfied with your life?</td>
<td></td>
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<tr>
<td>6. Felt happy or cheerful?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7. Felt able to communicate with others?</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8. Felt able to travel about to get things done when needed?</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>9. Felt able to take care of yourself?</td>
<td></td>
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</tr>
</tbody>
</table>

### The following questions refer to leisure time activities such as watching TV, reading the paper or magazines, household activities, hobbies, etc

<table>
<thead>
<tr>
<th>Question</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. How often did you enjoy leisure time activities?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. How often did you concentrate on the leisure activities and pay attention to them?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. If a problem arouse in the leisure activities, how often did you solve it or deal with it without undue stress?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### During the past week how often have you

<table>
<thead>
<tr>
<th>Question</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>13. Looked forward to getting together with friends?</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>14. Enjoyed talking to friends?</td>
<td></td>
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<tr>
<td>15. Felt affection toward one or more people?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>16. Joked or laughed with other people?</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>17. Felt you met the needs of your friends or relatives?</td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

### Taking everything into consideration, during the past week how satisfied have you been with your

<table>
<thead>
<tr>
<th>Question</th>
<th>Very rarely</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. Medication? (if not taking any check here___ and leave item blank)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix D: Example Sleep Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Sun</th>
<th>Mon</th>
<th>Tues</th>
<th>Wed</th>
<th>Thurs</th>
<th>Fri</th>
<th>Sat</th>
<th>Sun</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Time allowed in bed this week:
- p.m.: 6 7 8 9 10 11 12 1 2 3 4 5 4 3 2 1 1 2 3 4 5
- a.m.: 6 7 8 9 10 11 12 1 2 3 4 5 4 3 2 1 1 2 3 4 5

### Woke up
- U = Woke up
- ↑ = Got out of bed

### Went to bed, turned off lights
- ↓ = Went to bed, turned off lights
Appendix E: Baseline and Intervention Sleep Parameter Averages by Participant

Participant A.

Table 3. Percent Improvement from baseline to intervention: Participant A

<table>
<thead>
<tr>
<th>Sleep Parameter</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Percent Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (minutes)</td>
<td>97</td>
<td>35</td>
<td>63.92</td>
</tr>
<tr>
<td>FA (times per night)</td>
<td>0.86</td>
<td>0.42</td>
<td>104.76</td>
</tr>
<tr>
<td>DA (hours)</td>
<td>1.2</td>
<td>1</td>
<td>16.67</td>
</tr>
<tr>
<td>TST (hours)</td>
<td>6.14</td>
<td>7.53</td>
<td>22.64</td>
</tr>
<tr>
<td>SE (%)</td>
<td>73.4</td>
<td>90.4</td>
<td>23.16</td>
</tr>
</tbody>
</table>

Participant B.

Table 4. Percent Improvement from baseline to intervention: Participant B

<table>
<thead>
<tr>
<th>Sleep Parameter</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Percent Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (minutes)</td>
<td>37.14</td>
<td>15.8</td>
<td>57.46</td>
</tr>
<tr>
<td>FA (times per night)</td>
<td>1.17</td>
<td>1</td>
<td>14.53</td>
</tr>
<tr>
<td>DA (hours)</td>
<td>2.4</td>
<td>1</td>
<td>58.33</td>
</tr>
<tr>
<td>TST (hours)</td>
<td>6.5</td>
<td>7.5</td>
<td>15.38</td>
</tr>
<tr>
<td>SE (%)</td>
<td>75.84</td>
<td>86.2</td>
<td>13.66</td>
</tr>
</tbody>
</table>

Participant C.

Table 5. Percent Improvement from baseline to intervention: Participant C

<table>
<thead>
<tr>
<th>Sleep Parameter</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Percent Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (minutes)</td>
<td>40</td>
<td>5</td>
<td>87.5</td>
</tr>
<tr>
<td>FA (times per night)</td>
<td>0.33</td>
<td>0.14</td>
<td>57.58</td>
</tr>
<tr>
<td>DA (hours)</td>
<td>0.8</td>
<td>0.5</td>
<td>37.5</td>
</tr>
<tr>
<td>TST (hours)</td>
<td>5.83</td>
<td>8.14</td>
<td>39.62</td>
</tr>
<tr>
<td>SE (%)</td>
<td>72.53</td>
<td>94.65</td>
<td>30.5</td>
</tr>
</tbody>
</table>

Participant D.

Table 6. Percent Improvement from baseline to intervention: Participant D

<table>
<thead>
<tr>
<th>Sleep Parameter</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Percent Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (minutes)</td>
<td>60</td>
<td>5</td>
<td>89.28</td>
</tr>
<tr>
<td>FA (times per night)</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>DA (hours)*</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TST (hours)</td>
<td>10.16</td>
<td>11</td>
<td>8.27</td>
</tr>
<tr>
<td>SE (%)</td>
<td>88.01</td>
<td>97.95</td>
<td>11.29</td>
</tr>
</tbody>
</table>

* No DA was recorded for Participant D because there were no nighttime awakenings.
Participant E.

Table 7.

Percent Improvement from baseline to intervention: Participant E

<table>
<thead>
<tr>
<th>Sleep Parameter</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Percent Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (minutes)</td>
<td>54</td>
<td>30</td>
<td>44.44</td>
</tr>
<tr>
<td>FA (times per night)</td>
<td>1</td>
<td>0.57</td>
<td>43</td>
</tr>
<tr>
<td>DA (hours)</td>
<td>2.3</td>
<td>0.7</td>
<td>69.57</td>
</tr>
<tr>
<td>TST (hours)</td>
<td>7.2</td>
<td>7.96</td>
<td>10.56</td>
</tr>
<tr>
<td>SE (%)</td>
<td>69.64</td>
<td>90.69</td>
<td>30.23</td>
</tr>
</tbody>
</table>

Participant F.

Table 8.

Percent Improvement from baseline to intervention: Participant F

<table>
<thead>
<tr>
<th>Sleep Parameter</th>
<th>Baseline</th>
<th>Intervention</th>
<th>Percent Improvement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (minutes)</td>
<td>27</td>
<td>5</td>
<td>81.48</td>
</tr>
<tr>
<td>FA (times per night)</td>
<td>0.71</td>
<td>0.43</td>
<td>39.44</td>
</tr>
<tr>
<td>DA (hours)</td>
<td>2</td>
<td>1.33</td>
<td>33.5</td>
</tr>
<tr>
<td>TST (hours)</td>
<td>7</td>
<td>7.79</td>
<td>11.29</td>
</tr>
<tr>
<td>SE (%)</td>
<td>81.86</td>
<td>90.69</td>
<td>10.79</td>
</tr>
</tbody>
</table>