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Laura LaBerge
University of Alberta - Canada, llaberge@ualberta.ca

Blaire Sangster
University of Alberta - Canada, blaire1@ualberta.ca

Cary A. Brown
University of Alberta - Canada, cary.brown@ualberta.ca

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Evaluation of a Sleep Knowledge Translation Strategy for Occupational Therapists Working with Persons who have Dementia

Abstract

Introduction: Sleep deficiency is a significant, largely overlooked issue for persons with dementia (PWD), and is associated with physical and mental health problems, increased caregiver burden, and increased likelihood of institutionalization. Despite the high prevalence of sleep deficiency in PWD, most health care professionals lack knowledge of the relationship between sleep problems and dementia. This project aimed to determine the feasibility of an archived online presentation, a knowledge translation (KT) strategy to increase therapists' understanding of the impact of blue-spectrum light on sleep in PWD.

Method: Therapists who participated in a previous sleep and dementia survey were recruited via email. Participants completed a pre-knowledge test, accessed an online presentation regarding the relationship between sleep and light, and completed a post-test.

Results: On average there was a 22% improvement in knowledge scores and participants were positive about the KT strategy being accessible, applicable, and evidence based.

Conclusion: For a sample of therapists self-identified as specializing in geriatric rehabilitation, online audio-visual resources appear to be a feasible KT strategy to disseminate information and increase occupational therapists' knowledge regarding the evidence-based relationship between blue-spectrum light and sleep in PWD. Further study is required to determine if this increased knowledge translates to practice settings.

Keywords

Dementia, sleep, knowledge translation, non-pharmacological sleep interventions, bright light therapy

Cover Page Footnote

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Credentials Display and Country

Laura LeBerge, MScOT; Blaire Sangster, MScOT; Cary A. Brown, PhD, BMR(OT)

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Sleep deficiency (SD) is a modifiable risk factor for precipitating and exacerbating the symptoms of dementia (Ancoli-Israel, Klauber, Gillin, Campbell, & Hofstetter, 1994; Bombois, Derambure, Pasquier, & Monaca, 2010; Deschenes & McCurry, 2009; Zhou, Jung, & Richards, 2012). Although the relationship is strongly evidence based, to date, this modifiable risk factor remains largely overlooked and under-addressed. This is of concern given that the prevalence of SD in persons with dementia (PWD) is high (between 50% and 70% in both community and institutional settings). In addition, studies have shown that SD can contribute to caregiver burden and poor health, thus increasing the likelihood of institutionalization for PWD (Beaudreau et al., 2008; Lee, Morgan, & Lindsay, 2007; Lee & Thomas, 2011). A review of the literature highlights that SD contributes to a range of physical and psychological health issues of concern to occupational therapists, including increased risk of falls, aggressive behavior, diabetes and obesity, cardiovascular illness, and lowered pain threshold (Bombois et al., 2010; Bonanni et al., 2005; Postuma, Gagnon, Vendette, & Montplaisir, 2009; Zhou et al., 2012). There is a clear relationship between SD and decreased cognitive functioning, risk-taking behavior, lack of insight, substance misuse, and prevalent mental health problems, including depression and anxiety (Ancoli-Israel et al., 1994; Bombois et al., 2010; Kochar, Fredman, Stone, & Cauley, 2007; Livingston, Blizzard, & Mann, 1993). Although the negative impact of SD is highly significant, there appears to be reason for hopefulness, as some

studies seem to indicate that the relationship between SD and symptoms of dementia may be reciprocal in nature, such that interventions for SD may reduce the risk for, or lessen the severity of, cognitive, emotional, and physical health problems and facilitate independent community living (Bloom et al., 2009; Krystal, 2006).

A recent multi-profession cross-Canada survey (Brown, Wielandt, Wilson, Jones, & Crick, 2014) identified knowledge gaps among healthcare providers regarding the relationship between insufficient sleep, dementia, and other co-morbidities; awareness of standardized sleep assessment tools; knowledge of, and experience with, evidence-based non-pharmacological sleep interventions (NPSIs) for persons with dementia; and preference for knowledge translation (KT) strategies to address these knowledge gaps. Of the 1,846 respondents, 6.2% were occupational therapists. A research-to-knowledge gap was identified among participating healthcare providers, including the occupational therapists. Specifically, the participants in general were unaware of the range of evidence-based NPSIs addressing sleep problems in PWD (Brown et al., 2014).

The use of blue-spectrum light (BSL) interventions to address sleep issues in PWD was one of the NPSIs not well understood by the occupational therapist participants. Currently, most NPSI research involving PWD is limited, and the methodological quality of what little there is in general is low to moderate (Brown et al., 2013). The evidence base for BSL interventions in non-dementia populations is stronger and interest in

these interventions for PWD is growing. A critical review of the NPSI research specific to PWD determined that BSL interventions for PWD have one of the stronger evidence bases in NPSI research (Brown et al., 2013). Additionally, participants in the Brown et al. (2014) study stated that they would be willing to try BSL interventions and felt they were realistic for their patients. For these reasons, the authors selected BSL as the topic for our KT strategy. This is not to suggest that other NPSIs are less important; our goal was to develop and test the feasibility of one KT intervention as opposed to testing specific NPSIs. Readers can find details of other NPSIs (e.g., exercise, massage, music, and gardening) in the review article by Brown et al. (2013).

Blue-Spectrum Light and Sleep

NPSIs are increasingly being promoted as primary treatment options for SD (Turner, 2005). Of the researched NPSIs, BSL interventions had the strongest quality of evidence for improving SD in people with and without dementia (Fukuda et al., 2001). Numerous studies (Ancoli-Israel, Martin, Kripke, Marler, & Klauber, 2002; Burns, Allen, Tomenson, Duignan, & Byrne, 2009; Fetveit, Skjerve, & Bjorvatn, 2003; Haffmans, Sival, Lucius, Cats, & van Gelder, 2001; Yamadera et al., 2000) demonstrate the benefits of morning BSL to improve SD in PWD. The BSL intervention protocols in these studies ranged from 30 min of light exposure a day for 2 weeks to 2 hours a day for 8 weeks, and employed light boxes emitting anywhere from 2,500 lux to 10,000 lux. Lux is a measure of light intensity with dusk being around

20-30 lux, office lighting in the range of 300-500 lux, and a sunny day being 5,000 + lux (for more details about lux see http://www.engineeringtoolbox.com/light-level-rooms-d_708.html). Despite the different exposure times and intensities, all of the studies found improvements in nighttime sleep drive, circadian rhythm quality, sleep efficiency, mental status scores, and nighttime sleeping time.

Additional studies have been conducted at different times of day, such as during the afternoon and evening (Dewan, Benloucif, Reid, Wolfe, & Zee, 2011; Dowling, Mastick, Hubbard, Luxenberg, & Burr, 2005; Satlin, Volicer, Ross, Herz, & Campbell, 1992; Sloane et al., 2007). These studies employed similar BSL protocols and reported comparable results in reducing SD. Reduced nocturnal waking and daytime napping following daytime BSL exposure were also reported along with behavioral changes, including reduced agitation, aggression, and restlessness, and increased cooperation (Dowling et al., 2005; Riemersma-van der Lek et al., 2008; Satlin et al., 1992; Sloane et al., 2007).

Although the evidence appears to be building in support of this pragmatic intervention, the methodological quality of the studies is varied, and a recent systematic review concluded that, “there is insufficient evidence to justify the use of bright light therapy in dementia. Further research should concentrate on replicating the suggested effect on ADLs, and establishing the biological mechanism for how light therapy improves these important outcomes” (Forbes, Blake, Thiessen,

Peacock, & Hawranik, 2014, p. 2). As this body of research builds, it will be important for therapists to understand the physiological basis of the relationship between sleep, light, and dementia so as to judge the quality of the evidence and the relevance of studies for their own clinical practice.

Knowledge Translation

Knowledge translation has been defined as “a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge” to improve health and “provide more effective health services and products and strengthen the health care system” (Canadian Institutes of Health Research [CIHR], 2014). The common themes underlying different KT frameworks, such as adapting knowledge to a local context, assessing barriers, and implementing interventions promoting knowledge use (Graham et al., 2006), can be applied to address knowledge gaps like those identified by Brown et al. (2014) regarding light-based sleep interventions. Little evidence exists regarding the use, feasibility, and effectiveness of KT strategies for occupational therapists (Scott et al., 2012). In the Brown et al. study, participating occupational therapists stated that they prefer to receive new knowledge in the form of electronic reports. However, this format is not widely supported by the evidence base for KT, as passive KT methods have been found to be largely ineffective and do not appear to result in behavioral changes (Grimshaw et al., 2004). Distance education via the internet or video has more consistently demonstrated positive results, and this approach has been recommended for KT

projects with healthcare providers (Straus, Tetroe, & Graham, 2009). Additionally, web-based educational videos have been recognized as one of the least resource-intensive KT strategies and are considered feasible and low cost (Grimshaw et al., 2004).

Study Aim

The aim of this study was to develop and evaluate the feasibility of an audio-video online presentation to improve occupational therapists’ knowledge about the relationship between BSL and dementia.

Method

Design

The study used a before-after single-case research design involving occupational therapists practicing in Canada who had participated in a survey to determine their awareness of and practice related to SD in PWD. The intervention, developed by the study team, was a 10.5 min archived online presentation explaining the relationship between BSL and SD in persons with dementia. The University of Alberta’s Human Ethics Research Board granted ethical approval.

Participants

At the completion of a previous study of healthcare providers’ sleep and dementia knowledge and practice (Brown et al., 2014), 68 Canadian occupational therapists working in the area of geriatrics had indicated they were interested in being involved in further research on the topic of sleep and dementia. Our assumption was that, although this recruitment strategy potentially introduced sampling bias, these participants offered

us a unique opportunity to explore the knowledge of those who, because of their self-reported expertise in geriatrics and interest in the topic of sleep and dementia, might assume mentoring roles for other therapists. Accordingly, they were emailed an invitation to take part in this KT study. Seven of the 68 emails were undeliverable, resulting in a sample of 61 therapists. Twenty-seven (44.2%) therapists volunteered for the study and completed the BSL pre-test, 23 participants (37.7%) completed the BSL knowledge post-test, and 22 participants (36.1%) completed the post-test component, which asked for evaluative feedback on the presentation (accessibility, perceived usefulness, design, etc.). The pre- and post-BSL knowledge tests consisted of three demographic questions and the same 15 multiple-choice and YES/NO questions at pre- and post-test presented in random order (see Appendix). The pre- and post-test of BSL and dementia knowledge was based on the presentation contents. Eleven questions had only one correct answer, and four questions (Q6, 12, 17, 18) had numerous variables with no distractors (i.e., all variables in these multiple choice questions were correct and should have been selected). The feedback component of the post-test evaluating the audio-video online KT strategy also included multiple choice and YES/NO questions as well as an opportunity to respond in depth to the open-ended question, "Is there any other feedback you would like to share?" All of the pre- and post-intervention questionnaires were delivered through the electronic survey software "FluidSurvey"

(<http://fluidsurveys.com/>). The testing protocol was

deemed appropriate as no single testing format has been determined to be superior to other formats, and self-completion questionnaires are commonly used in health surveys, require few resources to administer, and are low cost (McColl et al., 2002). All testing materials were piloted prior to recruitment with six practicing occupational therapists who were not contacted for study participation. Feedback from the pilot testing was considered and incorporated where appropriate.

Procedure

The study team determined the content for the online archived presentation based on a comprehensive scoping of the BSL NPSI and dementia literature. Similarly, decisions about the design, length, and format of the online archived presentation reflect the current evidence base for KT, which supports web-delivered materials as feasible, cost-effective KT strategies (Grimshaw et al., 2004). The BSL archived online presentation was limited to 10.5 min in length. An initial letter describing the study was emailed to the participants and contained a URL link to the pre-test (Phase 1), which was made available for 2 weeks. At the end of the 2-week period, the URL for the pre-test was made inactive, and the URL for the Phase 2 narrated presentation, streamed via YouTube (www.youtube.com), was made available for the 2 intervention weeks. The link to the narrated presentation was made inactive after the 2-week period and for Phase 3, the URL links for Part 1 (the BSL knowledge post-test) and Part 2 (the presentation evaluation feedback questions) of the post-test were made active for 2 weeks.

The participants' responses for all phases of the study remained anonymous. Sending the URL to all of the participants at the same time for each phase reduced inadvertent contamination, as professionals did not have access to different phases of the study before their colleagues. Reminders for each phase of the study were provided with 1 week and with 1 day remaining in each phase. The responses for the post-tests were only analyzed if the participant indicated they had answered the pre-test and had watched the online presentation, as the aim of this study was to measure change in knowledge.

Data Analysis

Due to the small sample size (N = 27 pre-test, N = 23 post-test), statistical analysis was not appropriate and no assumption of representativeness should be made. Questions (Q) 1, 2, and 3 were demographic and Q4-Q18 tested sleep and BSL knowledge. Descriptive statistics were used to calculate the percentage of participating occupational therapists that answered each question correctly on the pre-test and Part 1 of the post-test (Knowledge). The researchers calculated the percentage of correct responses for multi-response questions by determining the actual number of correctly selected responses and dividing by the total number of possible correct responses for each question. Data from Part 2 of the post-test (KT website resource evaluation feedback) collected the participants' ratings based on their perceptions of the effectiveness, relevance, clinical applicability, and scholastic grounding of the KT strategy.

Results

With the exception of the Northern territories, Prince Edward Island, and Newfoundland/Labrador, participants practicing across Canada took part in this study. The highest rates of participation were from British Columbia (29.6%, n = 8), Alberta (17.2%, n = 5), and Ontario (17.2%, n = 5).

The participants' years of experience in working with PWD ranged from 2 years to 32 years, with the majority of the participants (59.3%, n = 16) practicing for 10-20 years. Most of the participants practiced in outpatient (40.7%, n = 11) or community settings (51.9%, n = 14), followed by supported living/long-term care (29.6%, n = 8), acute care/inpatient (14.8%, n = 4), and private practice (3.7%, n = 1). The results indicated that a number of the participants worked in more than one setting.

The average score for the pre-test was 63.31% correct, compared to 85.04% correct for the post-test (see Figure 1).

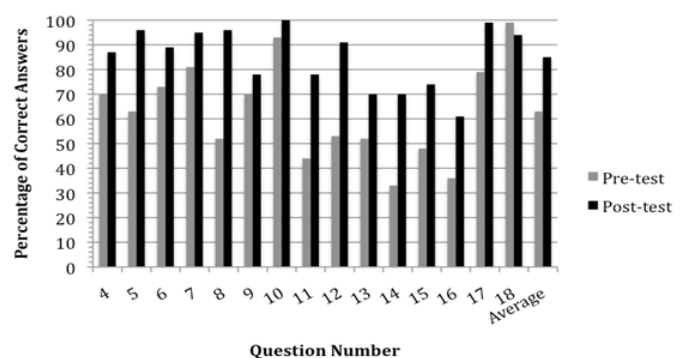


Figure 1. Rate of correct response for pre- and post-tests.

At pre-test, 80% of the participants or greater correctly answered questions about whether

SD is a modifiable risk factor for dementia (Q7), the environmental factor that is the strongest cue for circadian rhythm regulation (Q10), sources of sleep-interfering BSL located in the bedroom at night (Q17: variables a, d, & e), and considerations in selection of BSL interventions (Q18). Questions where the participants' pre-test knowledge was 60%-79% correct included the estimated prevalence of SD in PWD (Q4), other conditions for which SD can be a risk factor (Q6), the population for which an evidence base for the use of BSL therapy exists (Q9), and sources of possible sleep-interfering BSL located outside of the bedroom at night (Q17: variable c-streetlights). The questions that were answered correctly by only 59% or fewer of the participants included whether decreased ability to sleep is a normal part of aging (Q5), which NPSIs are supported by research evidence (Q8), the effect of BSL on the sleep-wake cycle (Q11), evidence-based BSL therapy interventions (Q12), the most effective source of BSL (Q13), the neuro-physiological pathway of circadian rhythm regulation (Q14), the gland responsible for melatonin production (Q15), and hallway or bathroom lights as sources of possible sleep-interfering BSL at night (Q17: variable b).

The overall percentage improvement in correct responses between pre- and post-test was 21.73% (see Figure 2).

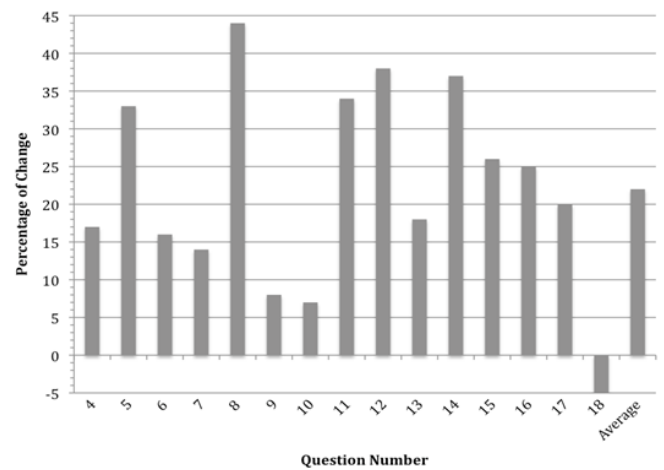


Figure 2. Percentage change in correct responses between pre- and post-test.

With the exception of Q18, all of the questions showed an increase in the percentage of correct responses following the KT presentation. Q18 included five variables that should be considered when planning a BSL intervention and showed a decrease in correct responses from 99.51% correct on the pre-test to 93.91% correct on the post-test. The largest changes in correct responses were for Q5, 8, 11, 12, and 14, with improvements ranging from 32.69% to 43.80%. All other questions showed changes in the percent of correct answers between 7.41% and 29.90%. For questions that were missing one participant's responses (Q7, 16, 17, and 18), the percentages of correct responses were adjusted accordingly to reflect the response sample size.

In the Phase 3, Part 2 feedback component that evaluated the KT strategy overall, the participants indicated that over 90% of the material in the KT BSL online archived presentation was new information. All of the participants indicated that the KT strategy was relevant to their practice,

useful in acquiring new knowledge, evidence based, and accessible. Twenty out of the 22 participants who provided feedback on the online archived presentation stated that the online presentation was relevant to advance their knowledge interests. Only one participant stated the presentation was not an effective use of time. Several of the participants commented on the narrator's voice being too soft at times and this feedback highlights the importance of attending to both accessibility and content in designing KT resources.

Discussion

The results of the pre-test and post-test indicate that the BSL KT strategy in the form of a short (10.5 min) archived online presentation was feasible for disseminating knowledge on sleep and dementia. Questions demonstrating the greatest improvement in frequency of correct responses mainly focused on knowledge of NPSIs, sleep physiology, and the anatomical structures and physiological processes involved in the sleep cycle. The relatively low pre-test scores suggest that practicing therapists possess lower levels of knowledge regarding specific, detailed information on the relationship between BSL, SD, and PWD. These findings are consistent with the gap in therapists and other healthcare providers' sleep and dementia knowledge demonstrated in the Brown et al. study (2014).

Implications for Practice

Several implications stem from the findings of this study. In the Menon, Korner-Bitensky, Kastner, McKibbin, and Straus (2009) systematic review of strategies to improve rehabilitation

therapists' research to practice uptake, it was noted that little evidence exists specific to occupational therapists. As such, this study adds to the limited body of evidence regarding the feasibility and effectiveness of KT strategies among occupational therapists in particular. Our findings are consistent with the results of previous studies (Casebeer et al., 2004; Straus et al., 2009), which also found that archived online presentations were an effective KT strategy. Similarly, other studies (McKenna et al., 2005; McQueen, 2008; McQueen, Miller, Nivison, & Husband, 2006) have demonstrated that single-component interventions (such as the single-component online presentation in this study) can improve the knowledge and attitudes of occupational therapists and result in behavior change. However, multi-component interventions using several methods of KT, while largely untested with occupational therapists, were found to be effective for physical therapists (Menon et al., 2009). A future area of research could therefore be an extension of this study, examining a multi-component KT strategy to increase knowledge and action related to BSL NPSIs for PWD.

Rehabilitation therapists are expected to incorporate evidence-based strategies into practice. While most therapists place a high value on such strategies, it is routinely reported that access to relevant information is limited (Rappolt & Tassone, 2002). Economic, administrative, and interpersonal factors have been identified as barriers to integrating new knowledge into practice (Rappolt & Tassone, 2002). The findings of this study, however, suggest that KT in the form of an archived

online presentation may be a feasible way to promote implementation of new knowledge into practice. The low cost, ease of access, and low resource intensity of web-based videos (Grimshaw et al., 2004) offers a feasible alternative for therapists.

Limitations

The response rate of 44.2% was acceptable for survey-based research; however, given the sampling strategy of recruiting from those with previously expressed specific interest in the topic area, the potential for bias is clear and the findings should be interpreted with caution and should not be assumed to generalize to all occupational therapists. Nor should the findings be interpreted as support that online archived presentations are the best option for KT to the exclusion of other strategies. For example, Rappolt and Tassone (2002) reported that rehabilitation therapists rely heavily on peers to gain new information regarding best practice, intervention options, and assessments. Knowledge

flow is non-linear, and those who are planning KT activities should be cognizant that ‘one-size’ does not fit all (Grimshaw et al., 2004).

Conclusion

This study has added to the body of evidence regarding feasible KT strategies for occupational therapists. Additional research would be required to determine if the participating therapists translated new knowledge into practice by applying their new BSL and SD knowledge to their work and if any short-term and long-term changes in the participants’ clinical practice occurred. Future studies should explore if this type of KT intervention is feasible and effective for occupational therapists working in other areas or contexts and who do not self-identify as experienced and interested in the topic area. The archived BSL presentation can be viewed at <https://www.youtube.com/watch?v=OHnGbTk9qOM>.

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Appendix

Pre-Post Knowledge Test

1. Practice setting
2. Location in Canada (postal code)
3. Years of experience as an occupational therapist
4. What is the estimated prevalence of sleep deficiency in people with dementia?
5. Decreased ability to sleep is a normal part of aging. (True/False)
6. Sleep deficiency may contribute to increased: (Please select any of the 8 following variables that apply)
7. Sleep deficiency is a modifiable risk factor for dementia. (True/False)
8. Which non-pharmacological sleep intervention is supported by the strongest evidence base in current literature?
9. Exposure to bright light has been demonstrated to improve disordered sleep in which of the following?
10. What is considered the strongest cue for regulating circadian rhythm?
11. Which of the following correctly describes the effect of bright, blue-spectrum light on sleep/wake cycles?
12. Which of the following light-based interventions is/are effective non-pharmacological sleep interventions for people with dementia? (Please select any of the 5 variables that apply).
13. The most evidence-based recommendation for a source of bright light to promote wakefulness is: (Please select)
14. After striking the retina and traveling along the optic nerve, what area of the brain involved in circadian rhythm does the signal travel to next?
15. What gland is responsible for the production of melatonin?
16. Exposure to bright, blue-spectrum light in the afternoon and evening DOES NOT: (Please select)
17. At nighttime, which of the following forms of bright light affect sleep? (Please select any of the 5 following variables that apply).
18. Which of the following variables need(s) to be considered when planning bright light therapy in practice? (Please select any of the 5 following variables that apply).

19. POST-TEST question only. Approximately how many of the above questions were you able to answer independently, without referencing the additional materials provided by this study or other informational resources?