SOCIETY FOR THE TEACHING OF PSYCHOLOGY

Teaching of Psychology
2020, Vol. 47(1) 92-96

DOI: 10.1177/0098628319889268
journals.sagepub.com/home/top
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Translating for Practice: A Case Study of Recommendations From the Wakeful Rest Literature

Allison Brandmark[1], Meredith Byrne[1], Karly O'Brien[1], Kate Hogan[1], David B. Daniel[1], and Krisztina V. Jakobsen[1]

Abstract

Translational research—a bridge between research in more controlled settings and application in more complex contexts—is an essential step in developing effective evidence-based practices. Yet, it is rare. Previous lab-based research has recommended wakeful rest (WR)—a relaxed state of mind in the absence of activity—as a classroom intervention to promote memory consolidation and improve both short- and long-term memory. We implemented the proposed WR intervention in a simulated classroom context. The results did not support the recommendations from studies in more controlled settings: WR did not improve participants' short- or long-term memory. We discuss the importance of translational research in applying promising principles to classroom settings before making recommendations for practice.

Keywords

translational research, science of teaching and learning, learning science, wakeful rest

Learning scientists have studied many promising principles that can help improve learning. Whereas some field experiments provide promising results (e.g., distributed practice, retrieval practice, and explanatory questioning; see Dunlosky, Rawson, Marsh, Nathan, & Willlingham, 2013), many from the science of learning suggest that lab-based promising principles should be implemented in the classroom without providing compelling evidence that they are, or can be, effective in complex classroom environments (e.g., Roediger & Pyc, 2012). Such recommendations may be premature as conditions in the controlled lab may not reflect the complexity of authentic classroom contexts (Daniel, 2012). For example, cognitive, motivational, and personality factors, among others, contribute differently to the implementation of some of these promising principles (e.g., mind wandering; Kane et al., 2017; study strategies; Lundeberg & Fox, 1991). The development of promising principles in the science of learning and other fields is indeed important, but we should continue to work to translate those principles to real-world contexts if we are to develop useable knowledge for practitioners.

Translational research integrates the advantages of the science of learning and the scholarship of teaching and learning to inform educational practices (Daniel, 2012; Daniel & Chew, 2013); however, researchers need to thoroughly vet promising principles in their intended settings before we can draw conclusions about their effectiveness in practice (Daniel, 2012; Smith, Holliday, & Austin, 2010). In fact, Daniel and Chew (2013) called for collaboration between the science of learning and the scholarship of teaching and learning to conduct translational research and advance educational practices in order to responsibly develop effective recommendations for practice.

Wakeful Rest

WR is a relaxed state of mind during which brain activity occurs in the absence of sleep or engagement in an activity (Craig, Dewar, Harris, Della Sala, & Wolbers, 2016) and is thought to aid memory consolidation (Bergum & Lehr, 1962; Cowan, Beschin, Perini, & Della Sala, 2003; Dewar, Alber, Butler, Cowan, & Della Sala, 2012; Dewar, Alber, Cowan, & Della Sala, 2014; Dewar, Garcia, Cowan, & Della Sala, 2009; Mercer, 2015; Schlicting & Preston, 2014; Wixted, 2004). Numerous studies demonstrate that participants who engage in WR after learning new material remember more information in both the short- and long-term compared to participants who are tested immediately following learning (Müller &

[1] Department of Psychology, James Madison University, Harrisonburg, VA, USA

Corresponding Author:
Krisztina V. Jakobsen, Department of Psychology, James Madison University, 91 E. Grace St., Harrisonburg, VA 22807, USA.
Email: jakobskv@jmu.edu

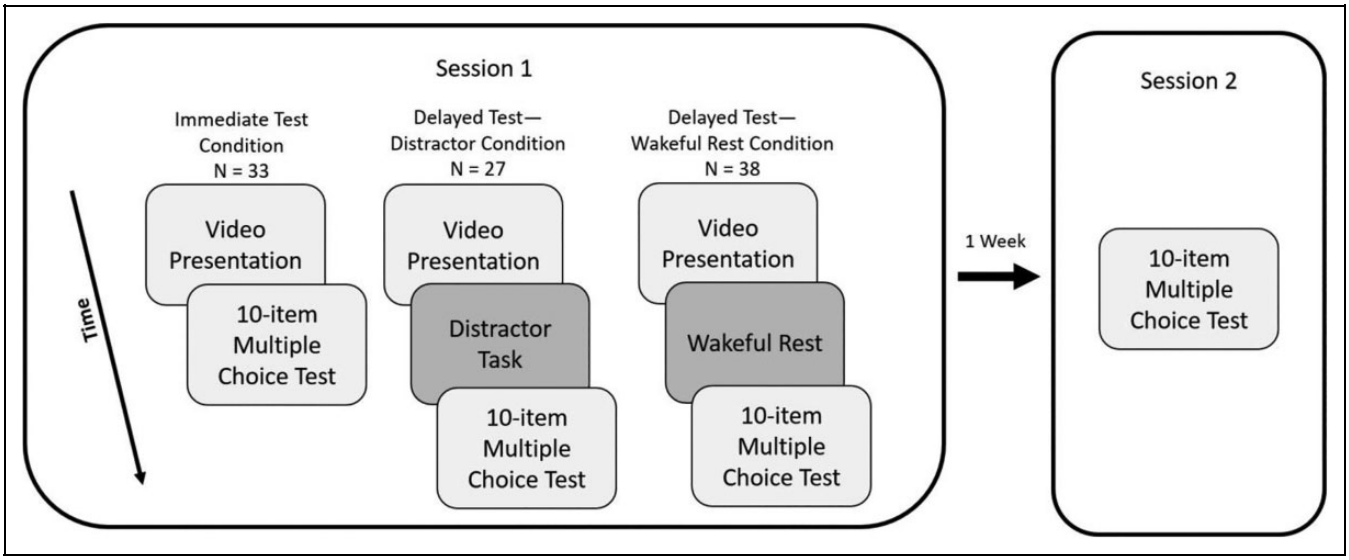

Figure 1. Conditions and sequence of events.

Pilzecker as discussed in Lechner, Squire, & Byrne, 1999) or after a period of engaging in cognitively encumbering tasks (Cowan et al., 2003; Dewar et al., 2012; Martini, Riedlsperger, Maran, & Sachse, 2017). These findings are true for both recognition and recall (Craig et al., 2016; Dewar et al., 2012; Dewar et al., 2014; Lechner et al., 1999) and in college students (Bell, 1942; Craig, Della Sala, & Dewar, 2014; Martini et al., 2017).

Mercer (2015) suggested that because WR increases retention, "it may prove useful within educational settings where students need to remember information for subsequent tests" (p. 134). While WR is, indeed, promising for educational use, the suggestion to use it in the classroom may be premature, given the lack of empirical evidence in this setting. The strict control and relatively simplistic stimuli (e.g., word pairs) used in lab-based studies do not match complex classroom environments. A leap from lab to practice, the current study takes the first steps in translating lab-based knowledge of WR into educational practice. We examined the effect of WR in a simulated classroom environment. Based upon suggestions in the literature, we expected students who engage in WR to show better short- and long-term memory for content compared to students who received no WR.

Before implementing the recommended WR intervention in an educational context, research needs to be conducted to examine its potential utility in representative educational contexts. The purpose of the current study, therefore, is to demonstrate the importance of translational research prior to classroom recommendations by testing a well-researched strategy from controlled studies that was specifically recommended for classroom application—wakeful rest—in a simulated classroom environment. We utilized a simulated classroom setting to insure an intermediate balance of experimental control and contextual complexity.

Method

Participants

One hundred seventy-four participants between the ages of 18 and 26 ($M = 18.72$, $SD = 1.156$; 111 women; 13 unreported) at a large southeastern public university enrolled in general education psychology courses participated in this study for course credit.

Procedure

Participants signed up for a time slot for the study. We randomly assigned each time slot to a condition: control, immediate test, delayed test—distractor, and delayed test—WR conditions. Upon arrival, all participants (except those in the control condition) watched a video and were quizzed on it at the end of the session. Participants viewed an 11-min informational video on telescopes created by the CrashCourse® YouTube channel. The video discussed how telescopes work, the difference between refractors and reflectors, technology, and the light spectrum. Because our participants were enrolled in psychology courses at the time of the study, we selected a topic with which we expected them to be unfamiliar. Each condition received the same 10-item multiple choice quiz at some point during the session. The quiz included questions based on the content of the telescope video, including knowledge, application, and comprehension questions. Each question had four answer choices, with one correct answer.

Participants in the *immediate test condition* took the quiz immediately following the video (Figure 1). Participants in the *delayed test—distractor condition* were to find as many differences as they could in spot the difference picture search activities for 10 min (e.g., Lechner et al., 1999) immediately after the video. Following the delay, participants took the quiz. In the *delayed test—WR condition*, immediately following the

video, participants listened to nature sounds such as running water and bird chirping for 10 min. The lights were off, and participants were asked to stay in their seats, rest quietly, close their eyes, and think of a place that makes them happy. Following the WR break, participants completed the quiz. Participants in the *control condition* completed the quiz during the first session, without having seen the video. All participants (except those in the control condition) returned for a second session 1 week later to take the same quiz and to complete a demographics survey, which included a question about their familiarity with the topic of the video.

Results

First, we ran an independent samples *t*-test to determine whether the video resulted in learning by examining the quiz scores of participants who viewed the telescope video compared to those who did not view the video. Participants who viewed the telescope video ($M = 6.45$, $SD = 2.00$) scored significantly higher on the quiz compared to participants who did not view the video ($M = 4.72$, $SD = 1.94$), $t(171) = 5.77$, $p < .001$, $d = 0.82$. Most participants were unfamiliar or slightly familiar ($n = 123$) with the content of the video, 32 participants were moderately familiar with the content of the video, 3 participants were very familiar with the content of the video, no participants were extremely familiar with the content of the video, and 13 participants did not report their familiarity with the content of the video. Participants' scores on the quiz did not differ based on their familiarity with the video, $F(3, 154) = .58$, $p = .63$, so we collapsed participants across familiarity levels.

We ran a mixed-design analysis of variance (ANOVA), with the within-subjects variable of Time (Time 1, Time 2) and between-subjects variable of condition (immediate test, delayed test distractor, delayed test WR). There was a main effect of time, $F(1, 96) = 5.19$ $p = .025$, $\eta_p^2 = .05$, with participants scoring significantly higher at Time 1 ($M = 6.46$, $SD = 1.99$) than Time 2 ($M = 6.07$, $SD = 1.78$). There was no main effect of condition, $F(1,96) = .276$, $p = .759$, and no Time × Condition interaction, $F(1, 96) = .862$, $p = .426$ (Figure 2).

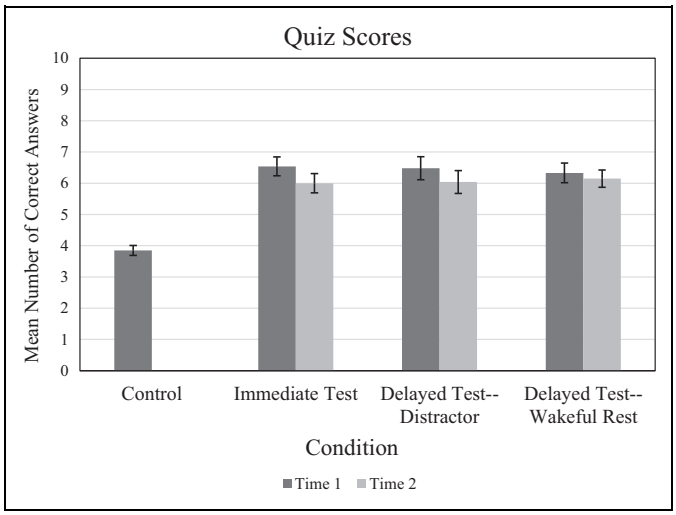

Figure 2. Short- and long-term memory across condition. Error bars represent standard error of the mean.

Discussion

Translational research—a bridge between research in more controlled settings and application in more complex contexts—is an essential step in developing effective evidence-based practices. It is critical to be iterative and strategic when translating findings across contexts differing in complexity to ensure a level of control sufficiently to track the source of potential changes in the dependent variable(s). To address this goal, we developed a context part way between the strict control of the laboratory and the more complicated interactions of a classroom. The addition of an intermediate level of complexity in a simulated classroom environment did not support explicit recommendations from the WR literature: Our results revealed that WR did not improve short- or long-term memory for participants in a simulated classroom. Based upon these findings, we are skeptical of recommendations to confidently deploy this intervention in even more complex classroom settings.

These findings do not, however, preclude further explorations of the conditions under which such an intervention may be effective. It is possible that WR may be useful in the classroom, but implementing the intervention would require certain components relevant to the target classroom context. For example, the instructor's goals, the cost to implement, and the characteristic of students involved are important factors when evaluating potential classroom interventions.

If an instructor's goal is student retention of information, there are numerous evidence-based ways of doing this, with WR possibly being one of them. However, WR may not be the most efficient classroom intervention to achieve this goal. In this case, it is possible that there was not enough time to consolidate the material in the wakeful rest condition operationalized in this study. Whereas 10 min of wakeful rest may have been enough time to consolidate relatively simpler material in previous studies (e.g., Dewar et al., 2012; Dewar et al., 2009; Mercer, 2015), it may take longer to attain similar benefits from more authentic educational materials. For example, the additional complexity of the video in the current study—compared to word pairs, aural stories, and word lists used in lab-based studies—may require additional consolidation time (Vogel, Woodman, & Luck, 2006), which may be neither feasible nor desirable in the classroom. Thus, it is also important that recommendations be explicit about the potential costs of the proposed intervention for the instructor and student.

A related issue to consider when recommending an intervention for practice may be the complexity of the material to be learned relative to the learner's related prior knowledge. In the present study, we minimized familiarity with the subject in order to control for prior experience. However, familiarity with a topic may facilitate the learning of new information, resulting

in better performance (Recht & Leslie, 1988; Srull, 1983; Taylor, 1979). Prior knowledge can also serve to support the deployment of metacognitive skills as students who are unfamiliar with the material may not know what information from the lesson is important to prioritize for further processing (e.g., Aleven & Koedinger, 2000). Thus, WR may be particularly beneficial when new information can be assimilated into the context of previously learned information (Groch, Schreiner, Rasch, Huber, & Wilhelm, 2017).

It is, therefore, critical to consider practical issues inherent to classroom practices when making recommendations for the practice. It may be a hard-sell to convince educators to deploy lengthy interventions like WR, especially if it is not yet demonstrated to be effective in the classroom. WR, like any intervention, necessitates accommodation and consequent adjustment of lesson plans to allow time for the intervention, taking time away from lecture or other important activities. Any costly interventions, whether they be costs in time, money, or other resources, require educators to reprioritize with hopes of increasing learning outcomes for their students. An educator may be able to spend time more effectively than introducing WR, or another lab-base intervention, in their classroom. So, we advise educators, and those who recommend to them, to weigh the potential impact of the proposed intervention relative to other available interventions and competing priorities before committing to them or suggesting them for classroom use.

Conclusions

We want to encourage translational work of this sort to continue. The fact that we did not find a benefit for WR does not necessarily mean that there is no way to realize benefits of WR in the classroom environment. Instead, it suggests that the translation of a technique from a highly controlled context to a complex learning environment may require adjustments to balance fidelity to the principle and ecological validity. In other words, the construct may be valid, but it may require a useable design specifically for an educational context to achieve the desired impact. These same principles apply for lab-based interventions beyond WR. Our study sheds light on the need to further examine lab-based findings in ecologically valid settings prior to making recommendations for classroom use. Whereas we encourage continued exploration of translational work, we urge caution when moving from lab-based studies to more complex real-world contexts.

Acknowledgment

The authors would like to acknowledge the Alvin V., Jr., and Nancy C. Baird Professorship to KVJ which provided additional time for research work.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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