

A Napping Soundtrack Can Enhance Well-being More than Traditional Relaxation Soundtracks

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Abstract

Sleep deficits are common and dangerous, with negative consequences for cognitive ability, motor functioning and mental health. Although short daytime naps can attenuate these negative consequences, some people may have difficulty taking daytime naps and turn to relaxation soundtracks for assistance. Recently, software has been developed to generate soundtracks specifically designed to assist with napping. Many technological pundits have reviewed this product—called pzizz—positively, but there is no empirical evidence of its effectiveness. We asked a group of people to listen to pzizz and take a 20-minute nap each working day for two weeks, and asked another group to listen to traditional relaxation soundtracks and do the same thing. We found that both groups benefited from naps, reporting better well-being over time. However, these increases in well-being were higher among people who listened to pzizz than people who listened to other soundtracks, and were consistent with the hypothesis that pzizz generated a response expectancy. Our study suggests that pzizz might be an effective tool for enhancing the benefits of daytime naps.

Index Terms: sleep, nap, response expectancy

Many of us suffer from a lack of sleep. Not only do we often report feeling sleepy, but we persist in behavior that maintains our lack of sleep—one of only a handful of species to do so.^{1,2} In the US, for example, approximately one quarter of adults surveyed reported that over the course of one month, they had gone without sufficient sleep for more than two weeks.³ In Japan, students attending a university-bound high school reported going to bed significantly later than students attending a vocation-bound high school,⁴ a pattern suggesting that the demands on the university-bound students led them to choose between sleeping and studying. In short, people today spend significantly less time sleeping than people in previous generations did.⁵

Sleep is not merely something we do to restore energy; in fact the brain does not actually get to "rest" during sleep.⁶ Instead, sleep involves active processes that are essential to general health and mental functioning. Insufficient sleep has been linked to increased risk of health problems such as diabetes and heart disease, as well as obesity and weight difficulties.⁷ Sleep plays an important role in memory consolidation, and may be involved in processing new memories in a way that helps them to fit them in with existing memory networks.⁸ More specifically, research suggests that sleep can “restore” information degraded by interference or decay during the day.^{9,10} Sleep also improves motor memory.¹¹

Given the cascade of beneficial processes that occur during sleep, it is not surprising that sleep deficits can have serious consequences for well-being. For instance, a lack of sleep—whether intentional or unintentional—is linked to depression. A survey of almost 80 000 people found that those who reported at least 14 days of inadequate sleep in the previous month were more likely to report worse general health, and more symptoms of depression, anxiety, pain, physical and mental distress than people who reported fewer than 14 days of inadequate sleep in the same period.³

Napping

One way to catch up on sleep debt, avoid fatigue and improve well-being might be through napping.¹²⁻¹⁵ Short naps during the day may help to reduce some of the problems associated with lack of sleep— even in less-than-ideal settings, such as at work.¹⁶ In one study¹⁷, researchers found that a ten-minute nap produced greater alertness and increased cognitive performance, improvements that persisted over time. Conversely, a 30-minute nap produced immediate negative effects on both factors, effects that lessened over time— an hour after the nap, subjects experienced the same improvements as those who took the 10-minute nap. Thus, the researchers suggested that the shorter nap was the best option to avoid negative effects.

Although there are obvious benefits associated with napping, many people are not used to sleeping during the day, and may have difficulty in doing so—in part because they mistakenly fear that daytime naps will interfere with their night-time sleeping ability.¹² One way to encourage daytime napping might be to ask people to listen to a guided relaxation soundtrack. These soundtracks include some combination of music, nature sounds, guided imagery, narrated meditations, and instructions about breathing. In other words, although these relaxation soundtracks are not designed to assist with napping per se, they feature many techniques that are commonly used by clinicians in treating sleep difficulties and promoted by sleep researchers in self-help books.^{18,19} There is also some evidence that listening to these soundtracks confers benefits. For example, when cardiac patients listened to a guided relaxation tape with both audio and visual components, they showed reduced anxiety and greater relaxation.²⁰

None of these soundtracks, however, are designed to assist people to take a short daytime nap; we wondered if a soundtrack designed specifically for that purpose could confer benefits beyond those associated with using a conventional relaxation soundtrack for a short daytime nap.

We were aware of only one designed specifically for short naps: pzizz (Brainwave Enterprises) is software that generates digital soundtracks of varying user-specified lengths. Each soundtrack contains music, nature sounds, and narration. Rather than guide the listener into a general state of relaxation, the narrator instructs the listener about how to take a nap—describing the purpose of the session, a sequence for relaxing, and the expected outcomes of the napping session. The software uses an algorithm to generate an infinite number of “napping scripts,” that all follow this basic recipe. The fact that the narrator describes expected outcomes is important. Research shows that when people anticipate that a treatment will produce a certain outcome, they often behave—without realizing it—in such a way as to produce that outcome. As a result, they attribute the outcome to the treatment instead of to themselves.²¹⁻²⁴ More specifically, pzizz might produce what is called a “response expectancy” in the clinical literature, and response expectancies themselves produce changes in mental and physiological experience.²¹ In concrete terms, the response expectancies pzizz might produce include anticipation of napping, and anticipating the benefits afterwards, such as feeling more refreshed.

Thus, we reasoned that users might respond better to the pzizz soundtrack than they would to soundtracks with a more global focus on relaxation. The anecdotal evidence for pzizz’s effectiveness, particularly when compared to other relaxation endeavours such as relaxation soundtracks or meditation—is abundant among people sometimes described as the “digerati”—computer experts who spend significant time on the Internet, and who are widely viewed as wielding influence among their peers²⁵⁻²⁷. Although their endorsements of pzizz might serve to create expectancies about pzizz’s effectiveness—much in the same way that advertising is thought to increase response to antidepressant medication²⁸—there is no empirical evidence that

pzizz confers any benefit at all, let alone more benefits than listening to more conventional relaxation soundtracks.

To examine this issue, we asked two groups of subjects to come to the laboratory and take a 20-minute nap each working day for two weeks (ten days). Half the subjects listened to a pzizz soundtrack, while the other half listened to one of a number of other commercially-available relaxation soundtracks. Our primary research question was whether listening to pzizz while trying to nap would cause more improvement in measures of well-being than listening to other relaxation soundtracks while trying to nap.

We gathered measures of well-being before and after each session.

Methods

Design

The study used a between subjects design with three conditions. In the “pzizz” condition, subjects listened to a different, randomly-generated pzizz nap soundtrack each session. We used more traditional relaxation soundtracks in a second condition, but further split those subjects into two groups— half listened to the same relaxation track repeatedly, and half heard a different relaxation track each day. In the “other-repeat” condition, subjects listened to one of five other soundtracks in all 10 sessions. In the “other-rotate” condition, subjects listened to one of the other five soundtracks each day; the tracks were rotated so that each track was played once per week, and by the end of the study, subjects had listened to each track twice. The purpose of the “other-rotate” condition was to control for the fact that each pzizz nap soundtrack is unique, although all the soundtracks pzizz generates share similar features. The School of Psychology Human Ethics Committee gave approval for the study.

Subjects

Thirteen men and sixteen women were recruited through advertisements around the campus and in university publications. Subjects' ages ranged from 19 to 55 years, with median age 27. The majority of the sample were students, and the remainder had various occupations at the university. Subjects came to ten half-hour sessions at the same time each day, from Monday to Friday, for two weeks. They were allowed to miss one of the ten sessions without jeopardizing their participation in the study. At the end of the study, each subject received a \$75 grocery voucher. A maximum of five subjects took part in each napping session ($M = 2.89$, $SD = 1.52$). They were instructed not to listen to any other relaxation tapes, nor to engage in additional naps, for the duration of the study.

Traditional relaxation soundtracks. We selected five “other” soundtracks to compare with pzizz. Each track was available on the US version of the iTunes Store (Apple, Inc.), and specifically marketed as promoting deep relaxation. All soundtracks included background music with a narrative, like pzizz. From shortest to longest, the duration of these iTunes tracks was 13.52 minutes, 15.23 minutes, 17.59 minutes, 29.22 minutes and 31.18 minutes. Regardless of the duration of the assigned track, nap sessions were always 20 minutes long; thus, the first three iTunes soundtracks looped back around to the beginning to “fill in” the remaining time in each session.

Pzizz soundtrack. We used pzizz software to generate 10 random 20-minute nap soundtracks, using the “energizer module” on its default settings: stereo output, narration all the way through the soundtrack (versus at the beginning or end only), voice and music volume at half of maximum. All subjects in the pzizz condition listened to the same 10 pzizz soundtracks, in the same order.

Procedure

Subjects chose a time that suited them to take part in the study. They were brought into the room, and were given an information sheet that described the study and what was required of them, and a consent form to sign before they could participate. The consent form required that subjects did not listen to any other relaxation soundtracks or nap music for the duration of the study.

The room was internal, with no windows. It was set up with four 1.2 metre wide by 1.6 metre high partition boards to make five cubicles, three against one wall and two against another. The experimenter sat at a desk in the empty corner, away from the sleeping cubicles. Each cubicle had an armchair for subjects to sit in facing the wall. Subjects could not see any one else while taking part in the study, and no one (other than the experimenter) could see them. A cardboard envelope was attached to the back of each chair; in the envelope was an Apple, Inc. iPod nano with headphones.

To control for expectancy effects and limit the likelihood that subjects would start trying to guess what condition they were in,^{29,30} we told all subjects that we were evaluating “new power napping software that was designed to help you relax, take a 20-minute ‘power nap,’ and awake feeling (in the company’s words) ‘recharged, refreshed and rejuvenated.’ We told all subjects that they would be listening to soundtracks produced by this new software, and we maintained that deception until the end of the study, when we debriefed everyone and told all subjects what condition they had actually been in.

We randomly assigned subjects to each condition by the time of their session; we controlled for time-of-day effect by having approximately equal numbers of pzizz and traditional soundtrack sessions at the same times of day. In each nap session, subjects were reminded to turn off any beeping watches and cell phones, were asked not to talk during the study session, and not

to talk to each other nor anyone else about the study outside of the session. There were three phases in each session: the first survey, the nap, and the second survey.

Phase 1. First, subjects completed a survey [see Appendix A]. Except for the first survey, all surveys were identical. This first survey requested demographic information about the subjects including their sex, occupation and age. After the demographic questions, and in all remaining surveys, 19 items assessed subjects' thoughts on various dimensions. We selected these dimensions from pzizz promotional material.

More specifically, Appendix A shows that the 19 items were a mix of general and specific appraisals of well-being. The first three items asked subjects how they felt, and they answered using a 5-point Likert-type scale. For example, one question read, "How much energy do you have?" where "1" was "Very Little Energy" and "5" was "A Great Deal of Energy." For the remaining 16 items, subjects read a statement and rated the extent to which they agreed with it on a 5-point Likert scale where "1" was "Strongly Disagree" and "5" was "Strongly Agree". For example, one statement read, "I slept well last night".

Phase 2. After they completed the first survey, we gave subjects instructions for the nap phase. Specifically, we told them:

Now you will listen to the power nap soundtrack. Please ensure that you are as comfortable as possible. This part of the experiment lasts for 20 minutes, and I will let you know when the 20 minutes is up. Please leave your headsets on for the full 20 minutes even if the audio finishes before that time.

Subjects put on the headphones, and the experimenter went around the room, attached the headphones to the iPods, and started the soundtracks, checking with subjects each time to ensure that tracks were playing. During this phase, the experimenter dimmed the lights.

Phase 3. After 20 minutes had elapsed, the experimenter announced that 20 minutes was up, turned the lights back up and asked subjects to remove their headphones. Each subject completed another copy of the 19-item survey.

At the end of each session, the experimenter thanked everyone and reminded them to come back at the same time for the following sessions. At the end of the final session, subjects received a \$75 grocery store voucher.

Results and Comment

There were no differences on any measures between the “other-repeat” condition and the “other-rotate” condition so we collapsed across these two “other” groups for all further comparisons. Recall our primary question of interest was whether listening to pzizz while trying to nap caused more improvement in measures of well-being than listening to other relaxation soundtracks while trying to nap.

To address this question, we first reduced variance across our sample by treating each of the 19 survey items as a case. Then, we calculated four kinds of scores. First, for each of the 19 survey items, we summed the pretest responses across all subjects and all five sessions from the first week. Second, we calculated similar scores for the posttest responses from the first week. Finally, we repeated these two calculations for responses from the second week. We classified these responses according to whether they were produced in the pzizz condition or from an “other” condition, and display them in the figure below. As the figure shows, well-being ratings increased over time—but more to the point, the type of soundtrack mattered—ratings were higher in the pzizz condition than in the other condition. In other words, a repeated measures ANOVA showed a main effect for both the type of soundtrack, $F_{1,36} = 4.24$; $P < .05$, and time, $F_{3,34} = 5.03$; $P < .01$. Follow-up analyses showed that the type of soundtrack did not influence

ratings until the second week. That is, pzizz and traditional soundtracks showed similar ratings at week 1 pre-session and week 1 post-session, both $t_{36} < 1$. At week 2, pzizz pre-session ratings were higher than traditional soundtrack pre-session ratings, $t_{36} = 2.62$; $P < .01$; and pzizz post-session ratings were also higher $t_{36} = 2.77$; $P < .01$. The effect for week 2 pre-session ratings was large, *Cohen's d* = .85, as was the effect for week 2 post-session ratings, *Cohen's d* = .90. In addition, within the pzizz condition well-being ratings at week 2 pre-session were higher than those at week 1 pre-session, $t_{18} = 4.64$; $P < .01$, *Cohen's d* = 1.07. This pattern of results was not found in the traditional soundtrack condition, $t_{18} = 1.22$; $P = 0.24$, and suggests that pzizz was effective at generating a response expectancy.²¹

Taken together, these data suggest that short naps can produce higher ratings of well-being no matter whether subjects listen to a soundtrack specifically designed to aid napping, or a soundtrack merely designed to aid in relaxation. However, the data also suggest that the pzizz napping soundtrack produced an additional increment in well-being, both prior to and immediately after sessions. Why this additional benefit occurs is not entirely clear, although the clinical literature on response expectancies suggests a plausible mechanism.²³

Recall that we found no differences between our “other-repeat” and “other-rotate” conditions. This result suggests that it cannot be simply the novelty of the pzizz tracks that afforded those subjects a better outcome—there must be something extra involved in pzizz that contributed to the more positive result. In retrospect, because we asked subjects to come to the lab and listen to the tracks each day, we could not assess whether they would be more likely to continue listening to a novel track or a repeated track. If people did become bored with the repeated tracks, they might stop listening, and benefits would plateau. Future research could compare the effects of listening to the same pzizz track repeatedly, to the effect of listening to

novel pzizz tracks to gauge exactly what role the novelty of the pzizz tracks play. Furthermore, it may be fruitful to compare the effects of repeated or novel tracks when subjects are responsible for their own listening behaviour in their day-to-day lives, rather than being required to come to the lab each day to ensure they do listen to the tracks.

One obvious criticism of our design is that we did not actually measure whether people succeeded in napping. Thus, we do not know whether people followed our instructions, regardless of condition. There are at least three reasons we do not view this criticism as seriously undermining our conclusions. First, because the sessions were small we can say that subjects appeared to be at least trying to sleep, and in fact many subjects showed obvious signs of sleeping. Second, at least one other study has foregone gathering independent measures of sleep onset or duration, yet still found benefits consistent with the napping literature among workers who were asked to nap for 15 minutes on the job.¹⁵ Third, although some might suggest we could have gathered self-report measures, retrospective reports are notoriously unreliable, even in the short term.³¹ These three reasons aside, it remains true that we did not gather objective measures of subjects' sleeping and thus do not know if the benefits we can attribute to pzizz are due to its ability to generate a superior state of rest, or if it specifically promoted sleep-induced improvements to well-being. Yet we do know that simple rest in the absence of sleep—as well as extremely brief episodes of sleep—have not been shown to produce substantive benefit, and instead sometimes promotes sleepiness.³² Considered as a whole, our findings suggest that pzizz can be a useful aid to napping, although additional research using objective measures of sleep onset, duration and quality are warranted.

More research is also needed in this area to ascertain just how helpful napping software might be, and under what circumstances it offers the most benefit. However, our study suggests

that napping software, such as pzizz, may provide an effective means to improve well-being, and an effect that is greater than listening to conventional relaxation soundtracks— a positive outcome for individuals, families, employers and society alike.

Acknowledgements

Brainwave Enterprises, the developers and producers of pzizz software, supported some of the costs associated with the research reported in this paper.

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Appendix A

Questions asked of participants pre and post nap

Consider how you feel right now, and use the scale to answer the following questions.

How much energy do you have? (1 = very little energy, 5 = a great deal of energy)	1	2	3	4	5
How refreshed do you feel? (1 = not at all, 5 = very refreshed)	1	2	3	4	5
How stressed do you feel? (1 = not at all, 5 = very stressed)	1	2	3	4	5

Consider your experiences since your last session [or: at the beginning of this session] and please rate the extent to which you agree with each of the following statements, 1 = strongly disagree; 5 = agree.

I slept well last night.	1	2	3	4	5
When I woke up in the morning, I felt refreshed.	1	2	3	4	5
My energy levels have increased.	1	2	3	4	5
It is easy for me not to indulge in bad habits.	1	2	3	4	5
I am bored.	1	2	3	4	5
I am more tolerant of difficult situations.	1	2	3	4	5
I feel more optimistic.	1	2	3	4	5
Some people are getting on my nerves.	1	2	3	4	5
I have less energy.	1	2	3	4	5
I feel stuck in a bad habit.	1	2	3	4	5
My skin looks better.	1	2	3	4	5
I am more irritable.	1	2	3	4	5
Work is more enjoyable.	1	2	3	4	5
Life is more fun.	1	2	3	4	5
I am more creative.	1	2	3	4	5
A difficult situation is annoying me.	1	2	3	4	5

Figure Caption

Figure. Mean Pre- and Post-session Item-responses for Week 1 and Week 2.

