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On the Influence of Sleep Deprivation on the Results of Polygraph Testing

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Introduction

Standards of polygraph examination exclude testing sleep-deprived people. Lack of sleep (and examinee exhaustion) is a factor that can contribute to false polygraph examination results (including false positives). Based on behavioral assessments (careful observation of examinee behaviour during a pre-test interview and subsequent stages of polygraph examination), the critical role of examiners is to recognise incidences of lack of sleep and, consequently, to postpone the moment of

testing. Professional literature treats the lack of sleep as a temporal inability to be subjected to the test (Widacki, 2018, 434). However, such a decision is nowadays usually powered with experts' intuition (their experience) rather than the results of empirical research. There is therefore a need for conducting studies like the one presented below.

In practice, a sleep-deprived person could take a polygraph examination for two main reasons. First, examinees may deliberately deprive themselves of sleep to interfere with the results of tests. Secondly, such a deprivation may be connected with external circumstances of a particular examination. In a case involving a jewelry store robbery in Katowice, police officers wanted an expert to examine the building's security staff. They wanted to have outcomes of screening tests on the day of the theft. The expert refused to perform the test because the security guards were tired after the night shift. In any event, a polygrapher should not yield to pressure and test sleep-deprived persons.

The main goal of the research reported in the present article is to explore the influence of sleep deprivation of tested subjects on the accuracy of polygraph test results.

The background

Sleep is a condition connected with the reduction of sensitivity to stimuli, certain lethargy, and slowing down of the bodily functions, combined with the elimination of consciousness in the daily rhythm with a state of arousal (Avidan A. Y., Zee P. C., 2007; 10). It is "a complex behavioral state necessary for neurological, somatic and psychological health throughout the lifespan, affected by the structural and functional condition of the brain, and influential on neuropsychological performance for better or worse" (Colrain, 2011). People who have not slept for 24 hours or more exhibit impairment of such cognitive functions as perception and retention of information and recall; sleep deprivation increases the likelihood of fake memories (Frenda et al., 2014). The lack of sleep reduces concentration (Maquet, 1994) and the ability to process information from the previous day (Crick, Mitchison, 1983). As a rule, strong physiological reactions occur after 24 hours without sleep, and the body becomes weak (Herschner, Chevin, 2014). Since the lack of sleep has such a comprehensive impact on the functioning of the human body, it must also impact the psychophysiological variables recorded by the polygraph to a significant extent.

The number of hours of sleep needed to regenerate the human body is highly individual. It changes during lifespan (Colrain, 2011) and depends on many factors. These include genetic components and individual experiences. The average human demand for sleep is estimated at eight hours a day; sleeping less than six hours does not satisfy the regeneration needs (Greer, 2004).

Sleep disorders belong to two distinct categories: dyssomnias and parasomnias (Sykut et al., 2017; 55). The former relates to the length or quality of sleep, and the latter are disturbances that occur during sleep. Sleep disorders may also be associated with mental and/or somatic disorders. For instance, temporary sleep disturbances may result, among other things, from working various shifts and/or traveling to another time zone. In the context of a polygraph examination, two pieces of information may be significant: temporary or permanent sleep problems affect a third of the population, and these problems often continue for longer spells of time (Colrain, 2011).

The research questions

Based on the information presented above, the authors formulated the following main research question:

- Does depriving the examinee from sleep influence the accuracy of polygraph examination results (in Peak of Tension version)?

The authors also formulated two further research questions:

- Does the effect described in the main research question depend on the examinee's gender?
- Can the effect described in the main research question be modified with energy drinks?

The method

The research described below was experimental. The subjects were 48 persons, aged 20–65, 23 men and 25 women. Participation in the study was voluntary (every subject signed an appropriate statement).

Participants were divided into groups A, B, and C. Group A was the control group and included well-rested subjects who had slept for at least six hours be-

fore being tested. The persons from group B had not slept in at least the last 24 hours before being tested. Group C included subjects who had not slept in at least the last 24 hours before the moment of test, but they had drunk the same energy drink (100ml) 30 minutes before being tested. Every group (A, B, C) was divided into subgroups (a and b). Participants of subgroups marked “a” (Aa, Ba, Ca) watched a 3-minute video showing a robbery with breaking an entry (the perpetrators took the money). Members of the subgroups marked “b” did not watch the movie. The experimenters offered special care for members of B and C groups (to protect them against the negative consequences of sleep deprivation), however the expert who conducted the polygraph examinations did not know the affiliation of examinees to a specific group (to avoid the expectations effect). Every group and subgroup included a similar number of men and women, and the participants were also distributed evenly by education.

The polygraph examinations conducted used POT (Peak of Tension) tests, a test commonly used in polygraph examinations (Widacki, 2018; 445; Konieczny, 2009; 68). The authors believe that the test is more suitable to laboratory test conditions and the nature of the event the test questions were designed for. During the examination, participants were asked about a stolen thing (presented in the video). All the subject underwent three tests. Each of the three tests included the same general question (did you know it was stolen) and the same six detailed answers (A car? A painting? A TV-set? Money? A watch? A laptop?), but the questions were arranged in different orders. The detailed questions were designed to be equally likely for people who had not seen the movie. Strength of the response to individual detailed questions was ranked. The question which received the strongest response in a single test was assigned 2 points. The question that elicited the second most significant response was assigned 1 point. For the psychophysiological index of concealing knowledge of the event, the subject was assumed to obtain at least 4 points (in three tests) when asked about money. (It was money that was stolen in the video.) The date of the polygraph test was set at random for each subject. The examination took place between the 2nd and 5th day from being shown the video. It was impossible to test all people on the same day, as there was only one expert examiner. All participants were instructed before the examination (not by the examiner) that during the test they were expected to confirm that they possessed no knowledge of the event that the investigation concerned.

The results

In group Aa, six subjects (75 per cent) responded in a way that was characteristic of concealing their knowledge of the stolen item in the video they had seen. In group Ab, three subjects (37.5 per cent) responded in that way, giving false positive outcomes.

In group Ba, two subjects (25 per cent) responded typically for concealing their knowledge of the stolen item, and in group Bb there was one person (12.5 per cent) reacting in that way.

In group Ca, four subjects (50 per cent) responded like people who conceal their knowledge of the circumstances of an incident. In group Cb, one person (12.5 per cent) reacted in that way.

The results of polygraph tests achieved by women and men were similar. In groups Aa, Ba, and Ca, the reactions characteristic of concealing information about the burglary were displayed by seven out of fourteen women. Among men, that was the case with five out of ten. In groups Ab, Bb, and Cb, such responses were displayed by two out of eleven women and by four out of thirteen men.

	Group A (16) subjects without the deprived need for sleep, eight men and eight women, aged 19-25		Group B (16) subjects with the deprived need for sleep, eight men and eight women, aged 19-65		Group C (16) subjects with the deprived need for sleep who consumed the energy drink, seven men and nine women, aged 18-63	
	Subgroup Aa (8) subject with knowledge of an event item (stolen money)	Subgroup Ab (8) subject without knowledge of an event item (stolen money)	Subgroup Ba (8) subject with knowledge of an event item (stolen money)	Subgroup Bb (8) subject without knowledge of an event item (stolen money)	Subgroup Ca (8) subject with knowledge of an event item (stolen money)	Subgroup Cb (8) subject without knowledge of an event item (stolen money)
with symptomatic response to conceal knowledge of an event item (stolen money), at least 4 points	6	3	2	1	4	1
without symptomatic response, less than 4 points	2	5	6	7	4	7

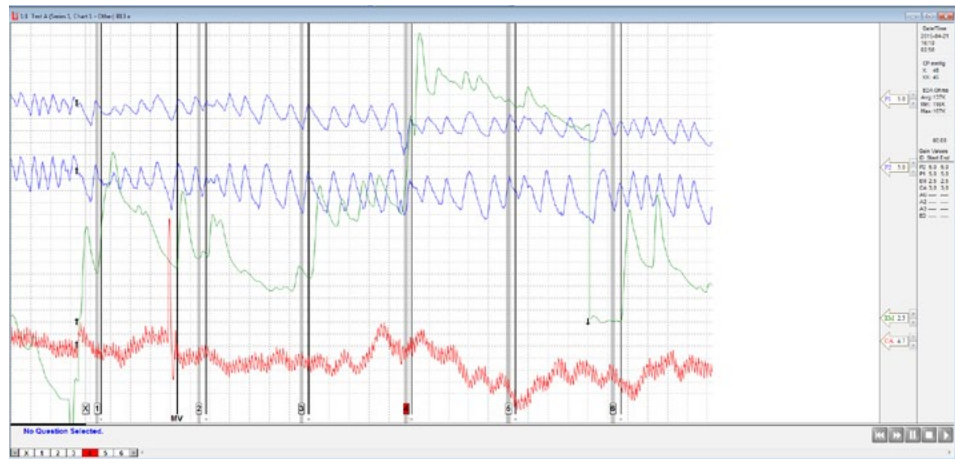


Image 1

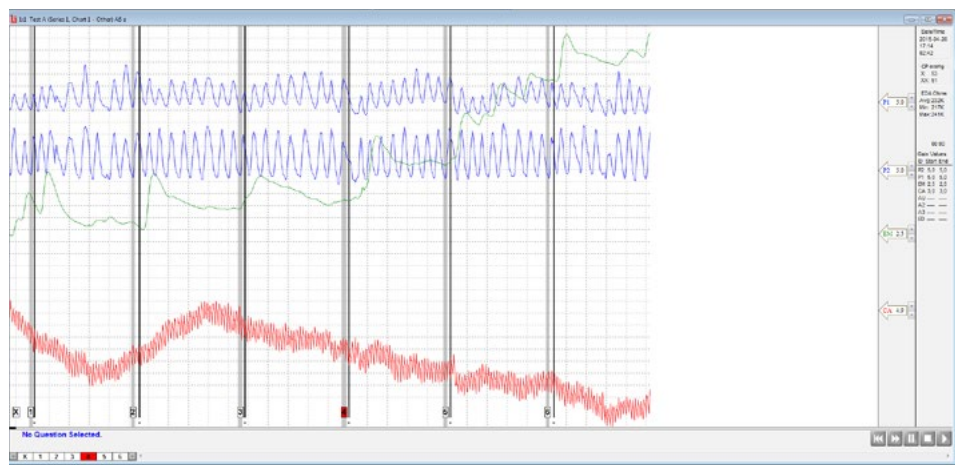


Image 2

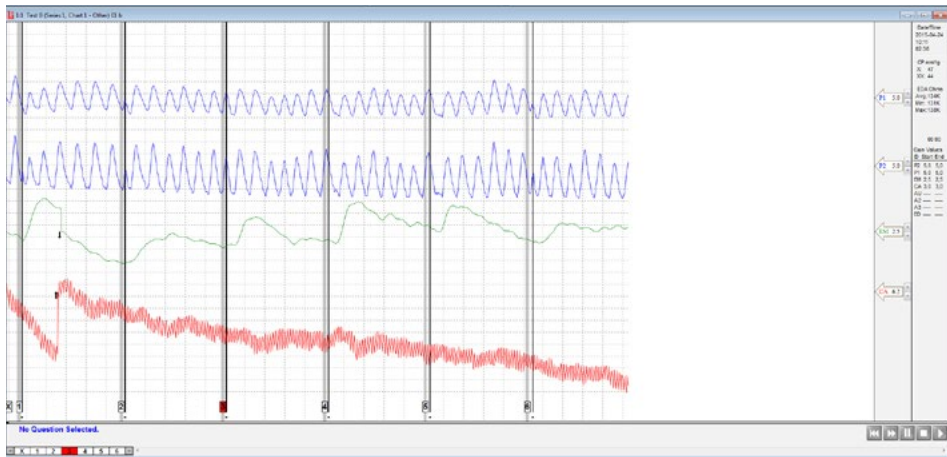


Image 3

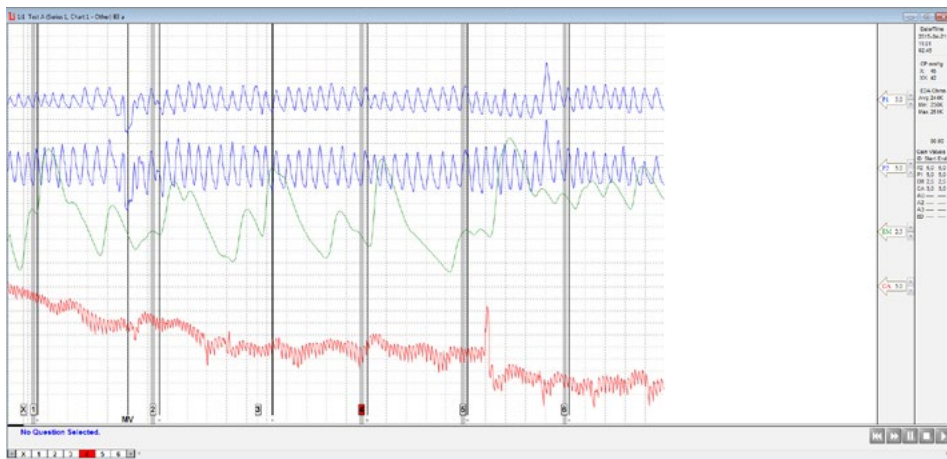


Image 4

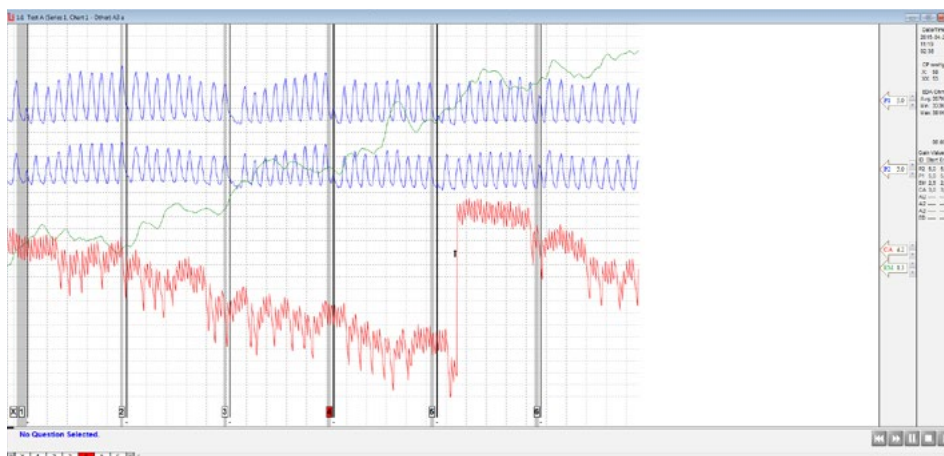


Image 5

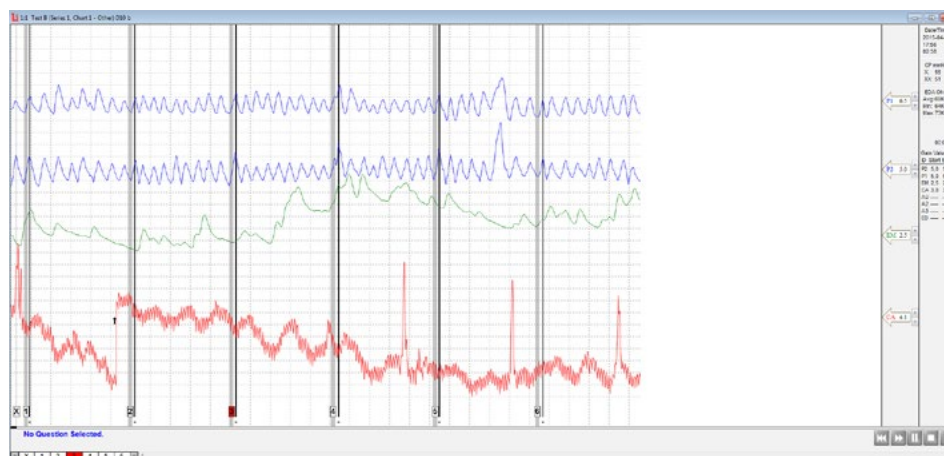


Image 6

The results obtained in the study justify the claim that:

- Sleep deprivation in a subject reduces the accuracy of a POT test polygraph examination. Such a lack of sleep reduces the accuracy to a level that renders the test useless.
- Energy drink intake by people with sleep deprivation increases the accuracy of a POT test polygraph examination. Nonetheless, in this case, the accuracy of test results is still in no way superior to predicting the outcome of a coin roll.

- The effect of sleep deprivation on the outcome of polygraph testing does not depend on the subject's gender.

Discussion

In the light of the reported research results, the expert should routinely ask the person if they slept on the day of testing and if so for how many hours. The existing practice is justified by the results. Pre-test interview forms usually include asking about the subject's sleep hours (also in computer programs used in polygraph testing). However, the discussion about the minimum number of hours of sleep required for taking the examination remains open. The way people behave in sleep deprivation is highly individualised, and depends on many factors. Considering the research described above, it seems reasonable to test only subjects who have slept at least six hours. However, sleep quality may vary, and even such a period of sleep may fail to guarantee proper recovery.

The discussed results show that consumption of an energy drink by the subject does not improve the effectiveness of the study to a sufficient extent. Therefore, even having multiple cups of coffee will not change the situation. Regardless of the pressure from the person who commissions testing (or a supervisor), polygraphers should be assertive and refuse to examine in such circumstances.

Sleep deprivation causes similar disorders in psychophysiological reactions in women and men. In general, the accuracy of results in the group of people who did not conceal their knowledge of the circumstances of the event was somewhat higher among women. However, the number of women was lower (by two) than that of men. Therefore, this outcome requires verification in studies on a larger population.

The study presented in this article was intended to be extended to a larger population, because the current project is too small for statistical inferences. Unfortunately, the restrictions caused by the Covid-19 pandemic did not allow an extension. Such studies are, however, planned for the future and will include an attempt to determine specific patterns of reactions in sleep-deprived persons. Such patterns can be used, for example, to detect people who conceal the fact of being sleep-deprived from the expert.

As already mentioned in the first part of this article, sleep deprivation is usually considered a temporary obstacle to conducting a polygraph examination. As noted in The Background section, such a deprivation may be caused by serious mental and/

or somatic disorders. In the latter case, it may not be possible to carry out the polygraph test at all. Such a situation should be disclosed during the pre-trial interview. It should also be remembered that temporary and permanent sleep problems affect as many as a third of the population (Colrain, 2011).

Obviously, the polygrapher too needs a good night's sleep too to carry out their tasks properly. They should not be tired while conducting the test, and are also vulnerable to sleep disorders. Yet this is a subject for another study.

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