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The effect of waterpipe smoking on psychomotor performance required for driving: A quasi-experimental trial

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A B S T R A C T

Objective: The main objective of this study was to find out whether there is a causal relationship, beyond statistical association, between waterpipe smoking (WPS) and driving performance.

Methods: This quasi-experimental study included 22 male students aged 18–22 years who possessed driving license and had a history of WPS and regularly smoked waterpipe for 1–2 times/week or smoked 2–15 cigarettes per week. Using Vienna Test System (VTS) traffic battery tests, each score was measured four times: 1.1: on the first day without (before) WPS, 1.2: the same day after WPS, 2.1: the second day after WPS and 2.2 the second day without WPS (after the effect of smoking was washed out). IBM SPSS 21, STATA 13.1 and PASS 11 software were used for statistical analysis.

Results: WPS significantly improved two hands coordination, attention and concentration, reactive stress tolerance and reaction speed. We did not find any effects on visual observational ability, obtaining an overview, visual orientation ability or speed of perception.

Conclusion: The performance-enhancing effects of WPS observed in this study do not justify the use considering the proved long-term health effects. Moreover, our study did not deal with the long term effects of WPS on road traffic injuries. Further studies are necessary to examine if WPS renders drivers to engage in other risk taking activities such as driving in a high speed due to altered cognitive functions.

1. Introduction

Smoking is among the first three risk factors responsible for global burden of diseases. It is estimated that in 2010, 6.3 million people have died due to tobacco smoking throughout the world, including exposure to second-hand smoke (Lim et al., 2012). Total deaths attributable to tobacco are projected to rise to 8.3 million in 2030 under the baseline trends (Mathers and Loncar, 2006).

One of the potential outcomes of smoking is excess risk of road traffic crashes (RTCs) (Wen et al., 2005; Leistikow et al., 2000a, 2000b). It has also been shown the smoking is associated with risky driving habits such as not using seat belts (Koushki et al., 2003; Ryb, et al., 2007).

An ancient but newly re-emerging form of smoking is through a tobacco waterpipe. Also called hookah, hubble-bubble, shisha, boory, goza, narghile and qalian, it is a device in which tobacco smoke passes through water by user's inhalation. Waterpipe smoking (WPS) has gained popularity in the last decade and can be even more hazardous than cigarette smoking (Association, 2007; Association, 2011; Jukema and Bagnasco et al., 2014).

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Having the origins from the middle East, WPS is becoming increasingly prevalent throughout the world (Maziak, 2013). This prevalence seems to be highest among university and school students in Middle Eastern nations and among groups of Middle Eastern origin in Western countries (Akl et al., 2011). This increasing trend has been attributed to some factors such as the introduction of manufactured flavored tobacco (Maassel), the misconception that WPS is less hazardous than cigarette, low costs, huge immigration of Middle Easterns to the Western world, rapid cultural exchange through mass media and lack of specific regulations against WPS (Maziak, 2013; Akl et al., 2011; Maziak et al., 2014a, 2014b).

In fact, the waterpipe smoker may inhale as much smoke during one session (which takes about 20–80 min) as a smoker inhales consuming 100 or more cigarettes (depending on the duration). This is contrary to the popular belief that waterpipe is less harmful to health due to absorption of smoke passing through water before being introduced to the body (World Health and Regulation, 2015).

Limited research has been performed on the potential harms of WPS on the riding and driving abilities (Elias, 2015). In a previous study, an association between being a smoker and being responsible in a RTC was shown in a population-based study including 2070 drivers (OR = 1.7). In that study, the association was stronger for waterpipe smokers (OR = 2.4) (Saadat and Korbakhsh 2010).

In contrast to cigarette, waterpipe cannot be smoked “while” driving. Having various elements such as water bowl, hose, mouth piece, ash tray, etc, waterpipe has to be lit by hot charcoal for the smoke to be produced and then inhaled after passing through the water. Thus, we intended to design an experimental study to figure out if the observed association in the previous study is due to the direct effect of WPS when used “before” driving and if so, to have specific recommendation for drivers or suggest implementing specific regulations on WPS.

In this quasi-experimental study, we assessed the effect of WPS on psychomotor performance required for safe driving. The main objective of this study was to find out whether there is a causal relationship, beyond statistical association, between WPS and driving performance.

2. Methods

2.1. Study design

This quasi-experimental study included 22 male medical students aged 18–22 years who possessed driving license and had a history of WPS and regularly smoked waterpipe for 1–2 times/week or smoked 2–15 cigarettes per week.

The reasons for recruiting male medical students for this study were multifold. Young males are considered a high risk group regarding road traffic crashes. Moreover, as students of medicine, their knowledge of English language was good enough to let them understand the test instructions which were in English.

A history of WPS was also required for being included in the study, as it was not only unethical to include nonsmokers into this trial, but also the first exposure to WPS might have different results on performance in comparison to further use. As our participants were smokers, the Fagerstrom test was used to assess nicotine dependence among participants (Heatherton et al., 1991). This was necessary as the effect of WPS might be different according to the level of nicotine dependence (low vs. high). The mean Fagerstrom test score among participants (2.6 ± 1.8) showed low level of nicotine dependence, according to available cut points (Fagerstrom et al., 1990).

Being able to smoke a deep inhalation of cigarette in the presence of the investigator and understanding the test instructions which were in English while they appeared on the monitor were other inclusion criteria.

The main purpose of the study and the potential harms of tobacco, even at doses used in the research, were explained to the volunteers and a written informed consent was obtained. Each participant was invited to refer to the Sina Trauma and Surgery Research Center (STSRC) on the scheduled date and refrain from smoking for 12 h before the test to control for different exposure doses of nicotine.

The participants were admitted to the trauma laboratory in the morning and received a breakfast containing 300 KCal, consisting of orange juice and a piece of cake and tea. In order to encourage the best potential performance, they were informed that an incentive would be available for every round of tests, proportional to their best scores. Afterwards, they passed the Vienna Test System (VTS) traffic battery tests. After the tests, they took rest for 45 min and received a 100-kcal snack. Then, they were asked to smoke waterpipe (as 30 deep inhalations in 10 min containing 15 g of apple-flavored tobacco) and then, do the test again. Afterwards, the incentive for the second round of test was paid.

They were asked to come back again after two weeks when they were asked to smoke waterpipe after taking the same breakfast and before beginning the first round of tests. After taking the test, they received the incentive, took a snack of 100-kCal and rested for 45 min and then passed the second round of test. Therefore on the second day, there was a wash out period of 150–165 min between the end of waterpipe smoking and the beginning of the second test. This is while on the first day, the second round of tests was immediately followed by WPS. To summarize, each score was measured four times: 1.1: on the first day without (before) smoking, 1.2: the same day after smoking, 2.1: the second day after smoking and 2.2 the second day without smoking (after the effect of smoking was washed out). This order of tests was used as on a single day, the results of second test can be potentially different from the first test not only due to WPS but also experience and learning the test. This method of trail would enable us to differential between these two effects.

The study protocol was approved by ethical committee of STSRC, affiliated to Tehran University of Medical Sciences (TUMS) and written informed consent was obtained from all volunteers.

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