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The importance of stress, self-efficacy, and self-medication for pharmacological neuroenhancement among employees and students

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ABSTRACT

Objectives: This study examined the relationship between stress, self-efficacy, self-medication, and pharmacological neuroenhancement (PNE) in the Swiss general population.
Methods: Using the largest Swiss Internet panel, a sample of 10,171 employees and students (unweighted $N = 10{,}084$) aged 15–74 years was recruited and asked to complete a self-administered online survey. The data were weighted for age, sex, and language region to provide results that were representative of the Swiss population. Multinomial logistic regression models were conducted to identify predictors of pharmacological cognitive enhancement (PCE) and pharmacological mood enhancement (PME) over the past year. Two self-medication models and an overall model were determined.
Results: Current medical treatment for a mental disorder was the best predictor of both PCE and PME use as serious self-medication. The overall model revealed that cannabis use, frequent stress, and long-term stress were predictors of both PCE and PME, whereas negative stressors and time pressure at work did not remain in the final model. Furthermore, past-year PCE with and without PME was associated with being male, being a student, and using illegal drugs other than cannabis, whereas being female and having low self-efficacy predicted past-year PME only.
Conclusions: Consideration of the predictor variables identified in this study may help to identify the potential PCE and PME users for whom measures to prevent drug abuse and manage stress are most appropriate. More specifically, the use of PCE and PME as self-medication to enhance performance at work or while studying needs further consideration in the neuroenhancement debate.

1. Introduction

Pharmacological neuroenhancement (PNE) refers to the nonmedical use of prescription drugs, alcohol, and illegal drugs for the purpose of enhancing cognition, mood, or pro-social behavior to improve performance at work or while studying (De Jongh et al., 2008; Maier and Schaub, 2015). Nonmedical use of prescription drugs is defined as use without having a prescription or use for another purpose than prescribed (Maier and Schaub, 2015). More specifically, some people with a mental disorder use their medication in higher doses or through a different route of administration than prescribed for the purpose of enhanced cognitive performance (Arria et al., 2008; Maier et al., 2013).

However, the literature most likely focuses on healthy individuals' nonmedical use of prescription stimulants for pharmacological cognitive enhancement (PCE). For the most part, the discussions are limited to the question whether the drugs used for PCE affect the cognitive processes in users without considering altered emotion sufficiently (Vrecko, 2013). Nevertheless, stimulants' effects are not purely cognitive, but also affective and the motivational effects are significantly involved in performance outcomes (Ilieva and Farah, 2013; Vrecko, 2013). Stimulants' effect on enhanced motivation might also explain why healthy users still perceived an enhanced cognitive function, when no objective cognitive enhancing effects were found (Ilieva et al., 2013). Furthermore, potential motivational enhancing drug effects are also relevant when considering pharmacological mood enhancement (PME) or substance use to cope with stress (De Jongh et al., 2008; Maier and Schaub, 2015).

However, an increasing number of media reports on PNE might generate the misperception that PNE is an acceptable means of coping with stress and overwhelming demands at work or school

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(Schleim, 2014; Wolff and Brand, 2013). Lazarus described stress as a feeling that arises when professional or academic requirements exceed the personal and social resources that an individual is able to mobilize at a given time (Lazarus, 1989). A comprehensive study among German students supported this theory and found an association between performance pressure and PNE (Middendorff et al., 2012). A further interesting study finding was that one quarter of students experienced with PNE reported cannabis use to cope with the study demands (Middendorff et al., 2012).

Notwithstanding, responses to stress can vary greatly among individuals; the use of prescription and recreational drugs for PNE represents only one of many possible pharmacological coping strategies (Maier and Schaub, 2015; Park and Iacocca, 2014). Moreover, PNE with stimulants is strongly associated with risky health behaviors such as illegal drug use (Arria et al., 2008; McCabe et al., 2005). Insufficient coping skills and substance abuse in the face of chronic stress might cause mental health problems, and vice versa (Mohr et al., 2014). Additionally, individual and situation-specific differences in the perception of stress and in coping strategies are related to decisions about whether to engage in PNE (Sattler et al., 2014).

Self-efficacy is the ability to initiate and use successful stress coping strategies (Bandura, 1977) and mediates the path from stress to illness (Sawatzky et al., 2012). In addition, a study found that students with high achievement goals and high self-efficacy performed better than their counterparts (Cheng and Chiou, 2010). These findings refer to Bandura (1986) social cognitive theory, which states that attainable goals, self-motivation, and controllable outcomes are crucial for self-efficacy and personal development. Once the individuals in these studies experienced PNE, they showed lower levels of avoidance self-efficacy because they could no longer avoid using illicit stimulants in highly stressful situations (Bavarian et al., 2013). In other words, they were not confident in their own abilities and the functional use of drugs for enhancement purposes even further diminished self-efficacy when performance was attributed to the drug effects rather than to one's own abilities.

Responsible self-medication with indicated over-the-counter drugs for self-recognized conditions is an important element of self-care that reduces the burden on health care systems (WHO, 1998). However, Khantzian (1997) self-medication hypothesis of addictive disorders claims that addicts use alcohol or illegal drugs to change the painful affect states that can result in addiction. The nonmedical use of prescription drugs or alcohol and illegal drugs for PCE or PME to treat an undesired physical or mental condition represents a form of *self-medication* that falls in the middle of the range between healthy self-care and addiction. However, the terms nonmedical use or misuse are preferred in the scientific literature, and definitions that contain the term "enhancement" arise from the bioethical debate (Racine and Forlini, 2008). These technical and optimistic terms increase good performers' fear of inadequacy and distract from the issue of *serious self-medication* among individuals with a mental disorder who use drugs to diminish certain higher-order capacities that cause specific symptoms of a disorder (Earp et al., 2014). An example provided by Earp et al. (2014) is the diminishment of memory to reduce traumatic memories. Another example might be diminishment of a certain brain function to reduce rumination in patients suffering from depression. Consequently, it often remains unclear whether drug use for cognitive enhancement in individuals with an undiagnosed mental disorder, such as ADHD, is self-treatment or misuse (Peterkin et al., 2011; Rabiner et al., 2009a,b). Both PCE and PME might be considered *self-medication* when healthy individuals use drugs to maintain good performance when few resources are available or to improve performance from good to excellent or from pathological to normal. Thus, PCE and PME are means of achieving specific health or performance goals (Wolff et al., 2014). For the most part, studies of academic PCE have focused on PCE as *moderate self-medication* in terms of the self-optimization of healthy individuals who suffer from stress (Singh et al., 2014; Wolff and Brand, 2013). Research has often excluded individuals with mental disorders to avoid the discussion of where treatment ends and enhancement begins (Barrett et al., 2008; Maslen et al., 2014). The use of PCE and PME as *serious self-medication* to combat symptoms of mental disorders or the adverse side effects of medical treatment is prevalent (Kasten, 1999) but has not yet been investigated in the neuroenhancement literature. Therefore, the current study aimed to investigate factors associated with the use of both *moderate self-medication* and *serious self-medication* to enhance performance at work or while studying.

1.1. Current study

The current study is the first to perform an in-depth analysis of the predictors of two different forms of neuroenhancement, namely PCE and PME, based on representative national-level estimates. Mental disorders and their associated medical treatments as well as different forms of stress and self-efficacy were considered as possible predictors of PCE and PME. Taking into account the above-mentioned theoretical work, stress and insufficient stress coping, other illegal drug use, and impaired mental health were assumed to predict both PCE and PME. Moreover, it was assumed that different enhancement intentions are related to different predictors. PME with the intention to increase psychological well-being differs from the rather competitive intention of PCE (Maier and Schaub, 2015; Schleim, 2014). Finally, the following hypotheses were made in terms of a *moderate self-medication*:

- past-year PCE and PME are both associated with higher levels of past-year stress and long-term stress;
- past-year PCE is associated with time pressure and other negative professional or academic stressors in the past year;
- past-year PCE and PME are both associated with illegal drug use in the past year;
- past-year PME is associated with low self-efficacy.

In addition, the following *serious self-medication* hypothesis was made:

- past-year PCE and PME are both associated with current medical treatment for underlying mental disorders.

The understanding of the predictors of PCE and PME derived from this cross-sectional study has important implications for preventive measures and future longitudinal research that aims to disentangle the relationships among stress, self-efficacy, mental health, and PCE and PME.

2. Methods

2.1. Enrollment procedure and study sample

Participants were recruited through a national Internet panel. The Internet panel of the LINK institute for market and social research in Switzerland includes more than 130,000 people living in Switzerland who consented to be contacted about online public opinion surveys during computer-assisted telephone interviews. The panelists were representative of the 15- to 74-year-old population in Switzerland that uses the Internet at least once per week for private purposes and is able to answer a questionnaire in German, French, or Italian. In March 2013, the LINK institute invited 39,996 panelists to participate in a study about health and stress at work and in education, and 18,094 panelists took the survey. Following screening for exclusion criteria (currently unemployed and not in education = 3535), quota overflow (n = 2155), and dropouts (n = 2320), the final sample size was 10,084. The data were weighted for age, sex and language region (weighted N = 10,171). Informed consent was obtained from all of the participants who were included in the study.