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Tobacco product use for weight control as an eating disorder behavior: Recommendations for future clinical and public health research

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Abstract

Tobacco product use (TPU; e.g., smoking, e-cigarettes, other emerging products) is elevated in eating disorders (EDs), yet the phenomenology of tobacco use within EDs has not received much attention. Due to the appetite suppressant effects of tobacco products as well as the array of availability of tobacco products in hedonic flavors (e.g., gummy bear, fruit), TPU may be used for weight control, such as to suppress appetite, satisfy cravings, or for meal replacement. The purpose of the current paper was to outline theoretical research on TPU for weight control as a mechanism in EDs as well as key areas for future research. We discuss the conceptualization and nature of TPU for weight control and how it may be related to EDs and associated behaviors, TPU patterns and smoking for weight control in EDs, and the effectiveness of current interventions and development of novel intervention protocols for individuals with EDs who use tobacco. Overall, this paper outlines novel research questions on TPU in EDs and as a weight control behavior and provides recommendations to clarify the conceptualization and role of TPU within EDs.

Keywords

eating disorders; tobacco use; weight control; smoking; cigarettes

Studies have identified links between tobacco product use (TPU; e.g., cigarettes and e-cigarettes) and eating disorders (EDs), particularly binge-spectrum EDs (Solmi et al., 2016). However, little research has examined TPU as a predictor of ED onset, and findings have been mixed regarding TPU as a maintenance factor for EDs (Chao et al, 2016). Current treatments for EDs do not address TPU (Kass et al., 2013), and there is limited literature addressing the need for interventions for TPU in individuals with EDs. Much of the work on the co-morbidity between EDs and TPU has focused on prevalence and shared mechanisms opposed to TPU as a functional ED behavior (e.g., Solmi et al., 2016;

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Zawertailo et al., 2020). While combustible cigarette use (i.e., ‘smoking’) for weight control, or smoking to relieve appetite or cravings or to avoid eating, has been identified as a possible mechanism underlying the co-morbidity between EDs and TPU, little research has studied the phenomenology of TPU for weight control in EDs. Therefore, the purpose of this paper is to outline: a) theoretical research and the conceptualization of TPU for weight control as a mechanism in EDs as well as how TPU relates to ED behaviors and TPU behaviors, b) the effectiveness of current ED interventions and the need for developing novel interventions to address TPU as it relates to EDs, and c) key areas for future research.

TPU for Weight Control as a Key Mechanism.

Numerous biopsychosocial factors may explain the comorbidity between the incidence, onset, and maintenance of EDs and TPU (e.g., genetics, personality, stress, and environmental factors; Anzengruber et al., 2006; Zawertailo et al., 2020), but there has been little attempt to identify differences in ED presentation, course, and treatment between those with EDs who do versus do not use tobacco products. We propose that TPU for weight control may be a critical factor that relates to the maintenance of ED psychopathology. TPU for weight control is a dimensional construct and may be one of several motives for TPU and, for others, it may be the primary or most important motive that maintains TPU.

Current theories.

TPU for weight control in individuals with EDs is correlated with dimensional measures of ED psychopathology and body image concerns (Fairweather-Schmidt & Wade, 2015; George & Waller, 2005). Much of the work in the TPU for weight control literature has focused on the biological processes of nicotine as an appetite suppressant. For example, nicotine increases energy expenditure and reduces appetite by enacting upon brain and hormonal mechanisms (Audrain-McGovern & Benowitz, 2011). Yet, biological processes may not wholly explain the processes underlying TPU for weight control in EDs, particularly given hormonal and brain-based aberrations in EDs (Culbert et al., 2016; Steward et al., 2018). Psychological theories are also important in understanding the onset and maintenance of TPU for weight control behavior in EDs.

Expectancy theory is a motivational theory that describes how individuals select a behavior and suggests that individuals may choose a behavior due to beliefs about a behavior providing a desired outcome (Kirsch, 1997). Behavioral expectancies in general have been shown to predict longitudinal behavioral outcomes like onset and frequency of use (Montes et al., 2019), and elevated smoking-related weight control expectancies were associated with reduced hunger after smoking in daily life (Mason et al., 2021). Yet, it is unclear the extent to which individuals with elevated TPU-related weight control expectancies actually experience physiological hunger reductions, due to the appetite suppressant effects of nicotine, or just perceived hunger reductions. In addition, associative learning models (Rupprecht et al., 2015) suggest that pairing nicotine with other stimuli can cause individuals to be conditioned to smoke when experiencing those stimuli. Thus, for example, pairing nicotine with intrusive thoughts about body or food could make TPU more common during those times. Also, TPU may cue thoughts or cravings for certain types of

food. Relatedly, nicotine has been shown to increase the reward value of food (Rupprecht et al., 2015), and, additionally, product flavors (e.g., candy-flavored e-cigarette) could increase food cravings (e.g., candy).

Future directions.

Little research has studied TPU-related weight control expectancies and associative learning, and even less research has included the assessment of newer tobacco products like e-cigarettes. Given the relevance of appetite regulation in EDs, TPU for weight control is a key behavior of importance in EDs and may be important to target in prevention and intervention programming. TPU for weight control has received little attention in ED research beyond cross-sectional questionnaire-based examinations. Given this, several key areas for future research on tobacco use for weight control in EDs are conceptualization and nature of TPU for weight control and its relation to ED behaviors, emerging tobacco products like e-cigarettes, use patterns, and weight control. Further, studies on the effectiveness of current interventions, as well as studies targeting the development of novel intervention protocols and gender and diversity issues, are needed. Each of these future directions will be discussed in more detail below.

Conceptualization and Nature of TPU for Weight Control and its Relation to ED Behaviors.

Almost all research has studied weight control expectancies using self-report measures, and little research has examined actual discrete episodes of TPU for weight control. A previous cross-sectional study using self-report questionnaires provided some evidence for these functional relationships by showing associations between compensatory TPU and binge-eating frequency in women who smoke (White, 2012). Experimental research has supported this plausibility by finding that body image primes led to increased endorsement of smoking as an effective weight control behavior in women high in restraint (McKee et al., 2006). One study has shown that smoking for weight control is higher in EDs with binge-purge episodes (Anzengruber et al., 2006), but it is unclear if this is due to the functionality of TPU for weight control, impulsive traits, or as a compulsive, habitual behavior. Relatedly, over time TPU may be maintained through addictive properties of nicotine and other addiction mechanisms rather than functional mechanisms related to ED psychopathology.

Future directions.

More focused research is needed on the prevalence of TPU for weight control, particularly among those with EDs. This includes the daily patterns of TPU for weight control as well as the functional nature of TPU for weight control. Future research should study whether TPU is used to combat future eating, either as a preventive measure or in direct response to cravings, or if TPU serves as a meal replacement or compensatory behavior. For example, tobacco products may be used while eating to prevent overeating or may be used after a binge-eating episode to curb later hunger and cravings. Studies should also examine if eating- and body-related concerns across the day might trigger TPU for weight control and if TPU alleviates eating- and body-related concerns. Consistent with previous models of

ED behaviors (see Pearson et al., 2015 for a review), it will be critical for future studies to investigate the time-course of TPU for weight control. That is, the extent to which the functionality of TPU may change over time from a behavior used for weight control to a compulsive, more addictive-like behavior.

Similar to research on other ED behaviors (Engel et al., 2016), ecological momentary assessment (EMA) studies, which involve naturalistic methodology that collects information on behaviors and experiences multiple times a day for a short period, will be needed to clarify the conceptualization and functionality of TPU for weight control in the daily life of individuals with EDs. EMA will allow for understanding the within-subject variance in ED behaviors and the momentary antecedents and consequences associated with TPU for weight control (e.g., elevated body dissatisfaction→TPU for weight control→restriction). It will also be important to understand the role of TPU for weight control within different EDs and as a function of weight-related indicators, such as weight status or overvaluation of shape and weight. Multi-wave EMA studies are needed to understand how the functionality of TPU (e.g., patterns of use, products used, nicotine dependence) changes across time.

Emerging Tobacco Products, Use Patterns, and Weight Control.

Historically, combustible cigarettes have been the most used tobacco product and have been the target of regulatory efforts (e.g., indoor smoking laws, tobacco free workplaces). Nicotine, which is a primary constituent in tobacco products, is a metabolism booster and can pharmacologically suppress appetite and promote mild weight loss (Jensen et al., 2005). Currently, there are numerous tobacco products available beyond combustible cigarettes. In recent years, e-cigarette use has increased particularly among adolescents and young adults (Jones & Salzman, 2020). In addition to menthol and tobacco flavors, e-cigarettes are available in a range of sweet, fruit, and candy flavors, which enhances their appeal (Leventhal et al., 2019). E-cigarettes also have a variety of characteristics which may enhance their utility as they relate to EDs and/or weight control, including increased nicotine content and additives that affect the e-cigarette sensory experience (e.g., pH level, nicotine type [freebase, nicotine salt], device characteristics like wattage/power). In one study, adults with a current ED reported more daily vaping, vaping for weight loss, vaping for the sweet flavors, and used higher concentrations of nicotine e-liquid (Morean & L'Insalata, 2017). In addition to elevated rates of cigarette smoking and e-cigarette use, recent data have shown increased rates of dual cigarette and e-cigarette use among individuals with EDs (Solmi et al., 2016; Smith et al., 2021).

Future directions.

Research is needed on how properties of tobacco products (e.g., flavors, nicotine content, e-cigarette device used, additives) relate to use for weight control. For example, e-cigarettes that are sweet may be used as weight control products to satisfy desire for high sugar and/or high fat foods (Morean & L'Insalata, 2018) and flavors may serve to reduce the aversive properties of the high nicotine included in newer types of e-cigarette products (Leventhal et al., 2019). Directed research focusing on understanding the role of flavored tobacco products is needed. Alternatively, tobacco/menthol flavors and/or combustible cigarettes,

which are typically more bitter and harsh tasting, might be used for weight control to reduce the desire to eat. It is also possible that nicotine content, which has well-known appetite suppressant properties (Jensen et al., 2005), is a key mechanism related to which tobacco product(s) are used as opposed to other product properties like flavor. Since dual use of cigarettes and e-cigarettes appear to be common among individuals with EDs, it is important to consider whether e-cigarettes versus traditional cigarettes serve different or similar weight control functions. Multi-method approaches, including observational and experimental paradigms, with well-characterized information about tobacco products under investigation (e.g., flavors, nicotine content, e-cigarette device used, additives) are critical to understand these research questions.

Gaps in Current Interventions and Treatment Targets for Future Intervention Development.

It is unclear the degree to which current ED interventions address TPU for weight control behaviors and expectancies. Given observed decreases in other ED behaviors and weight and body concerns, it is possible that TPU for weight control behaviors and expectancies would decrease as well. Research has yet to examine whether continued TPU following treatment may lead to relapse in ED psychopathology due to the plausible functional link between TPU and weight control expectancies and other ED behaviors.

Future directions.

Future studies will need to examine the role of TPU for weight control behaviors and expectancies in ED treatment. First, it is necessary to understand how TPU for weight control behaviors and expectancies are associated with treatment response in treatments for EDs. Second, because current ED treatments do not explicitly target TPU, research should examine if some treatments for EDs are more efficacious in reducing TPU (e.g., cognitive behavioral therapy versus interpersonal therapy), whether combined approaches (e.g., ED treatment with smoking cessation), or whether new therapies are needed. This will inform the need for cessation treatment in tandem with ED treatment as well as possible sequencing and stepped treatments for EDs and tobacco cessation. Third, it will be important to study how TPU may be associated with ED relapse. For example, continued or new TPU following ED treatment could be associated with relapse in ED behaviors and cognitions. Answering these research questions necessitates the initiation of rigorous randomized clinical trials with well-characterized TPU and psychometrically-sound measures of TPU behaviors and expectancies among individuals with comorbid EDs and TPU across the treatment trial as well as during a follow-up period. These future studies could lead to the development, implementation, and dissemination of multiple health behavior change interventions targeting tobacco cessation and problematic eating behaviors common among EDs.

Gender and Diversity Issues

Tobacco products are used by individuals across gender, race/ethnicity, and sexual and gender identity, yet TPU and product appeal differ by product (e.g., Kasza et al., 2018;

Pang et al., 2020). While some TPU has decreased in the Western world, products such as combustible cigarettes are increasing in use in other countries due to targeted marketing by tobacco companies (Savell et al., 2015). Given the increasing spread of ED risk factors (e.g., thinness ideals) worldwide (Hoek, 2016), there may be an increased use of TPU for weight control which could be associated with ED development. It will be necessary when researching TPU in EDs to examine differences by demographic groups and to develop hypotheses based on TPU within the countries being studied.

Conclusions

It is well understood that there are multiple associations between TPU and EDs. Yet, the conceptualization and treatment implications of TPU as a weight control behavior has received little attention in the ED literature. This paper highlights key areas for future research including conceptualization and nature of TPU for weight control and its relation to ED behaviors, emerging tobacco products, use patterns, and weight control, effectiveness of current interventions and development of novel intervention protocols, and gender and diversity issues. Many research questions remain unanswered regarding TPU as a weight control behavior and a variety of research methods. Multi-method approaches with data on TPU, ED psychopathology, and related theoretical constructs (e.g., expectancies, cueing) with EMA, biological, and behavioral measures embedded within prospective observational and treatment studies are needed to clarify the conceptualization and role of TPU within EDs.

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