

Social judgments of behavioral versus substance-related addictions:

A population-based study

Barna Konkoly Thege¹, Ian Colman², Nady el-Guebaly³, David C. Hodgins¹, Scott B. Patten^{3,4},
Don Schopflocher⁵, Jody Wolfe⁵, T. Cameron Wild⁵

¹ Department of Psychology, University of Calgary, 2500 University Drive, Calgary, Canada
T2N 1N4, bkonkoly@ucalgary.ca, dhodgins@ucalgary.ca

² Department of Epidemiology and Community Medicine, University of Ottawa, Room 3105,
451 Smyth Road, Ottawa, Ontario K1H 8M5, icolman@uottawa.ca

³ Department of Psychiatry, University of Calgary, 1403 – 29 Street, Calgary, Canada
T2N 2T9, nady.el-guebaly@albertahealthservices.ca

⁴ Department of Community Health Sciences, University of Calgary, 3rd Floor, TRW Building,
3280 Hospital Drive, Calgary, Canada T2N 4Z6, patten@ucalgary.ca

⁵ School of Public Health, University of Alberta, 3-300 Edmonton Clinic Health Academy,
11405-97 Avenue, Edmonton, Canada T6G 1C9, donald.schopflocher@ualberta.ca,
jody.wolfe@ualberta.ca, cam.wild@ualberta.ca

Correspondence concerning this article should be addressed to Cameron Wild, PhD, Addiction
and Mental Health Research Laboratory, School of Public Health, University of Alberta. 3-300
Edmonton Clinic Health Academy, 11405 – 87 Avenue NW, Edmonton, AB, Canada T6G 1C9.
Email: cam.wild@ualberta.ca

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Background: Recently, the concept of addiction has expanded to include many types of problematic repetitive behaviors beyond those related to substance misuse. This trend may have implications for the way lay people think about addictions and about people struggling with addictive disorders. The aim of this study was to provide a better understanding of how the public understands a variety of substance-related and behavioral addictions.

Methods: A representative sample of 4,000 individuals from Alberta, Canada completed an online survey. Participants were randomly assigned to answer questions about perceived addiction liability, etiology, and prevalence of problems with four substances (alcohol, tobacco, marijuana, and cocaine) and six behaviors (problematic gambling, eating, shopping, sexual behavior, video gaming, and work).

Results: Bivariate analyses revealed that respondents considered substances to have greater addiction liability than behaviors and that most risk factors (moral, biological, or psychosocial) were considered as more important in the etiology of behavioral versus substance addictions. A discriminant function analysis demonstrated that perceived addiction liability and character flaws were the two most important features differentiating judgments of substance-related versus behavioral addictions. Perceived addiction liability was judged to be greater for substances. Conversely, character flaws were viewed as more associated with behavioral addictions.

Conclusions: The general public appreciates the complex bio-psycho-social etiology underlying addictions, but perceives substance-related and behavioral addictions differently. These attitudes, in turn, may shape a variety of important outcomes, including the extent to which people

believed to manifest behavioral addictions feel stigmatized, seek treatment, or initiate behavior changes on their own.

Keywords: substance-related addictions, behavioral addictions, etiology, lay theory, stigma

1. Introduction

In recent years, the concept of addiction has expanded to include many types of problematic repetitive behaviors, and not only those related to the misuse of substances (Hellman, 2009; Mudry et al., 2011). For example, technological addictions have been described as involving excessive use of computers, smart phones, and other devices that have become increasingly accessible to people in the vast majority of the developed world (Griffiths, 1995). Other excessive behaviors that have, until now, not usually been regarded as pathological (e.g., consumption of healthy foods, tanning, shopping) are increasingly being seen as potential addictions (Donini, Marsili, Graziani, Imbriale, & Cannella, 2004; Kourosch, Harrington, & Adinoff, 2010; Lejoyeux & Weinstein, 2010; Varga, Dukay-Szabó, Túry, & van Furth, 2013). Still other behaviors have been classified as disorders in psychiatric diagnostic systems for a long time, but until recently were located in diagnostic categories that lay outside of addictions *per se*. Pathological gambling, for instance, was listed among the Impulse Control Disorders before being relocated to the Addictions and Related Disorders category in the latest edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013). Excessive food consumption was also considered for reclassification in the DSM-5 from eating to addictive disorders in the DSM-5 (Moreno & Tandon, 2011).

Excessive shopping, eating, sex, working, and so on are obviously different from more traditional addictions because they do not involve ingestion of psychopharmacological agents. Nevertheless, there is an emerging consensus that so-called “behavioral addictions” are similar to substance-related addictions insofar as they generate short-term rewards that promote behavioral persistence, despite knowledge of adverse consequences (Grant, Potenza, Weinstein, & Gorelick, 2010; Karim & Chaudhri, 2012; Mudry et al., 2011). Application of the addiction concept to an increasing number of behaviors – ranging from the generally accepted (e.g., online gaming

addiction; Hellman, Schoenmakers, Nordstrom, & van Holst, 2013; Wong & Hodgins, in press) through the more controversial (e.g., sex, television, and pornography addiction; Clarkson & Kopaczewski, 2013; Garcia & Thibaut, 2010; Sussman & Moran, 2013), to the highly speculative [e.g., so-called binge flying (Cohen, Higham, & Cavaliere, 2011) and street addiction; (Bergen-Cico, Haygood-El, Jennings-Bey, & Lane, in press)] – can be observed not only in professional discussions and scholarly publications but in mass media as well (Hellman, 2009; Webb, 2012; Whitelocks, 2012).

What are the implications of this openness to conceptualizing a wide range of behaviors as addictions for inferences made by the general public about whether they, or people they know, are suffering from an addiction? The relevance of this question stems from the fact that lay judgments about what ‘counts’ as an addictive behavior can influence a variety of important outcomes, including the extent to which people believed to manifest behavioral addictions feel stigmatized, seek treatment, and/or initiate behavior changes on their own (Keyes et al., 2010; Kushner & Sher, 1991; Lloyd, 2013; Luoma et al., 2007).

There is a limited literature on the structure and organization of lay perceptions of addictive behaviors. However, Haslam proposed a typology of laypeople’s conceptions of mental disorders which may be usefully applied to addictions as well (Haslam, 2003, 2005). Haslam’s ‘folk psychiatry’ model (Haslam, Ban, & Kaufmann, 2007) suggests that the general public uses four dimensions to understand mental disorders. The *pathologizing* dimension of the model represents beliefs that a given behavior or experience is abnormal or deviates from norms of the reference population. *Moralizing* corresponds to a judgment that people affected by the given deviance are morally accountable for their abnormal behavior or experience. *Medicalizing* embodies an opinion that an abnormality has specific physical causes undermining normal

functioning. Finally, the *psychologizing* dimension reflects views that a given abnormality is rooted in some kind of psychological malfunction.

Empirical research on lay judgments of addictions typically emphasizes public views of alcohol problems or other substance misuse relative to conditions such as schizophrenia, cancer, or AIDS (Corrigan, Kuwabara, & O'Shaughnessy, 2009; Crisp, Gelder, Goddard, & Meltzer, 2005; Switzer & A. Boysen, 2009). These studies consistently show that greater stigmatization and larger social distance are associated with substance-related addictions compared to other physical or mental diseases (Deng, Li, Sringeriyuang, & Zhang, 2007; Link, Phelan, Bresnahan, Stueve, & Pescosolido, 1999; Livingston, Milne, Fang, & Amari, 2012; Lloyd, 2013; Pescosolido et al., 2010). Other investigations have focused on core contents of public opinion concerning addictions such as perceived prevalence or perceived etiology (Adlaf, Hamilton, Wu, & Noh, 2009; Furnham & Lowick, 1984; Gagnon, Côté, April, Julien, & Tessier, 2013; Jackson, 1997; Konkoly Thege et al., in press; Lai, Ho, & Lam, 2004; Neighbors, Geisner, & Lee, 2008). Results of these studies suggest that substance-related addictions are often viewed by the general public as acts of personal choice and/or moral failure, and less likely to be considered as medical conditions (cf. the moralizing versus medicalizing components of Haslam's typology).

Unfortunately, the literature on lay judgments of addictions is limited because studies typically use small, unrepresentative samples, mostly drawn from the United States. In addition, previous research in this area usually focuses on one or two addictive behaviors (typically alcohol or tobacco abuse). Most importantly for the present paper, very few studies have examined public views on so-called behavioral or process addictions. The present study was designed to address these limitations, and in so doing, provide a better understanding of how the public understands both substance-related and behavioral addictions. Specifically, we investigated whether the general public's views on behavioral addictions differ from substance-

related addictions with regard to perceived addiction liability, beliefs about etiology, and accuracy of prevalence estimation. We were also interested if public perceptions varied depending whether or not respondents had personal experiences with the addiction problems under investigation.

2. Material and methods

2.1. Sample and procedure

The procedures and measures of the present study (Alberta Addiction Survey) were approved by the University of Alberta Health Research Ethics Board. The sample included 4,000 adults recruited from an online research panel (Ipsos Canadian Online Panel). A random, representative sample of panel members in Alberta, Canada was sent an email invitation to take part in the survey. Respondents completed the survey online at their convenience in December 2009. In order to maximize participation and minimize non-response bias, email reminders were sent approximately three days following the initial invitation, and an incentive was provided to all those who completed the survey. In total, 18,982 invitations were sent out to online panel members to achieve 4,000 completed online surveys (response rate = 21.1%). The final dataset was weighted to ensure that regional, age, and sex composition reflected that of the actual Alberta population aged 18 years or older according to 2006 Canadian Census data. Detailed characteristics of the sample are provided in Table 1.

Table 1

2.2. Measures

The survey included three modules: (1) a problem prevalence section, (2) a randomly-assigned problem behavior module, and (3) sociodemographic questions. The survey included questions regarding four substances (alcohol, tobacco, marijuana, and cocaine use) and six behaviors (problematic gambling, eating, shopping, sexual behavior, video gaming, and work),

and the survey methods ensured that respondents answered questions regarding one of these 10 attitudinal targets, as described below.

2.2.1. Perceived prevalence, self- and other-attributed problems. The problem prevalence module assessed *perceived prevalence* (“What percentage of Alberta adults /18 and older/ do you think experienced a problem with [problem behavior] in the past 12 months?”), *social network experiences* (“Have you ever known someone who has had a problem with [problem behavior]?”), and *personal experience* with each of the 10 problem behaviors (“Thinking back over your life, have you ever personally had a problem with [problem behavior]?”). The order of the problem behaviors was randomized for each respondent and for each of the target behaviors a definition was provided (Table 2). Because the present study adopted a lay perspective, addictions were described without imposing particular symptoms and syndromes derived from any nosological systems. Instead, the descriptions were intended to roughly characterize ‘problems’ with a broad range of substance-related and behavioral addictions without explicitly using the term ‘addiction’ in order to avoid respondent reactivity.

Table 2

2.2.2. Perceived addiction liability and etiology. All respondents were randomly assigned – independently from their previous responses regarding personal experience – to one of 10 problem behaviors. As a result of this methodology, we received answers from 400 persons per problem behavior (altogether, 1,600 for substance-related addictions and 2,400 for behavioral addictions). First, respondents were asked to rate the *perceived addiction liability* of the given problem behavior (“How addictive do you believe [problem behavior] is for most people?”) on a 5-point scale (1 = not at all addicting, 5 = very addicting) (Chassin, Presson, Rose, & Sherman, 2007). Lay perceptions of *etiology* were measured by the question “In your opinion, how likely it is that [problem behavior] might be caused by [possible cause]?”. The etiologic factors offered

were: ‘A character problem or flaw’, ‘A chemical imbalance in the brain’, ‘A genetic or inherited problem’, ‘The way a person was raised’, ‘Exposure to traumatic events in early childhood’, and ‘Stressful circumstances in a person’s life’. Participants rated the likelihood of these possible problem origins of the given behavior on a 5-point scale (1 = very unlikely, 5 = very likely).

2.2.3. Finally, the third module assessed participants’ demographic characteristics including sex, age, educational level, marital status, employment status, and household income (Table 1).

2.3. *Analyses*

To evaluate accuracy of prevalence estimation, perceived population prevalence of each addiction (answer to the question “What percentage of Alberta adults /18 and older/ do you think experienced a problem with [problem behavior] in the past 12 months?”) was deducted from the ‘true’ prevalence rate of the given problem behavior (data on past-year prevalence extracted from the answers to the question “Thinking back over your life, have you ever personally had a problem with [problem behavior]?”). Positive values reflect underestimations, while negative values reflect overestimations of population prevalence, with larger absolute values indicating greater discrepancy (Konkolý Thege et al., in press). To assess whether an individual had previous experience with any of the ten excessive behaviors, both personal and social network experiences were considered (see relevant questions described in Section 2.2.1. above)

The distributions of the answers concerning perceived addiction liability, beliefs about etiology, and accuracy of prevalence estimation were described using means and 95% confidence intervals for each of the 10 addictive behaviors separately. Then, the two groups of behavioral (alcohol, tobacco, marijuana, and cocaine use) versus substance-related (problematic gambling, eating, shopping, sexual behavior, video gaming, and work) addictions were compared in terms of perceived addiction liability, etiologic factors, and accuracy of prevalence estimation

using the non-parametric Mann-Whitney test. Effect size was calculated using the following formula: z/\sqrt{n} .

Sociodemographic characteristics of the two groups (respondents answering questions about behavioral versus substance-related addictions) were also examined by the Mann-Whitney test in the case of ordinal or non-normally distributed continuous variables (age, educational level, and household income), and were examined by the Pearson chi-square test when analyzing nominal variables (sex, marital and employment status). The same methods were used when comparing sociodemographic characteristics of those with and without prior personal history with the evaluated problem behavior.

Discriminant function analysis determines whether a weighted set of input variables can jointly predict category membership. Therefore, this type of multivariate analysis was performed to investigate whether lay perceptions of addiction liability, beliefs about etiology, and accuracy of population prevalence estimation could discriminate between lay judgments of substance-related versus behavioral addiction problems.

3. Results

3.1. Public perceptions of ten individual substances and behaviors

Figure 1 summarizes how the respondents perceived each of the ten substances and behaviors under investigation according to perceived addiction liability, etiologic factors, and accuracy of prevalence estimation. A systematic comparison of all possible problem behaviors lies beyond the scope of the present study. However, a number of statistically significant differences in perceptions of the addictive behaviors studied are apparent concerning all characteristics investigated even if examining only those confidence intervals that do not overlap.

Figure 1

3.2. Public perceptions of the substance-related versus behavioral addictions as groups

Initial analyses confirmed that participants who were randomly assigned to rate a substance-related addiction (n = 1,600) did not differ significantly with respect to sex, age, educational level, marital status, employment status, and household income, compared to respondents who rated a behavioral addiction (n = 2,400). Nevertheless, those with (n = 2,326) and without (n = 1,674) prior personal history with the evaluated problem significantly differed across marital status ($\chi^2 = 24.3$, $p < .001$; lower rate of married and higher rate of divorced individuals among respondents with personal history of the evaluated problem) and employment characteristics ($\chi^2 = 17.7$, $p = 0.007$; lower rate of retirement and higher rate of disability-related unemployment among respondents with personal history of the evaluated problem). However, these relationships were marginal in strength (Cramer's V was .078 and .067, respectively) and the other sociodemographic variables (sex, age, educational level, and household income) did not differ significantly between respondents reporting the presence or absence of prior personal histories of problems with the target behaviors and substances.

Table 3 shows that that public perception of behavioral and substance addictions differed across almost all etiological indicators included in our study. The exceptions were genetic or inherited factors and childhood trauma as etiologic agents – in these cases no significant differences were found between the two types of social judgments. Concerning perceived addiction liability, substances were perceived by the respondents as significantly more addictive than behaviors. The relevance of the etiologic factors of 'character flaw', 'chemical imbalance in the brain', 'childhood upbringing', and 'current stressful circumstances' was estimated as being lower in the case of traditional substance addictions, compared to behavioral addictions. Finally,

the estimation of the population prevalence was more accurate with respect to behavioral addictions.

Table 3

At the multivariate level, a series of discriminant function analyses were conducted to investigate whether the combination of the investigated variables was able to classify public perceptions of behavioral versus substance addictions and to help determine an order of discriminative power among the predictors. Three analyses were conducted: one using the total sample (I), one using the subsample of those participants who had had previous experience with the addictions they reported on (II), and one using the subsample of respondents without any personal experience with the substance or behavior they were randomly assigned to (III). For all three analyses, only one statistically significant discriminant function was generated: (I) Wilk's lambda = 0.875, $\chi^2 = 371.6$, $df = 8$, $p < .001$; (II) Wilk's lambda = 0.913, $\chi^2 = 160.3$, $df = 8$, $p < .001$; (III) Wilk's lambda = 0.788, $\chi^2 = 240.8$, $df = 8$, $p < .001$. Table 4 provides the classification accuracy for each analysis as well as the within-group correlations of each predictor variable with the standardized canonical discriminant function.

In all three analyses, perceived addiction liability proved to be the variable with the strongest ability to discriminate between judgments of behavioral versus substance-related addictive behaviors, indicating that respondents attributed more addiction liability to substances than to behaviors. In the total sample and among those having experience with the problem behavior they reported on, the etiologic factor of character flaw proved to have the second strongest discriminative potential – respondents viewed moral failures to be more relevant etiologic factors in case of behavioral addictions. It is worthy of noting that together with perceived addiction liability, character flaw was the only variable reaching the conventional cut-off value of .30. The weakest correlation with the discriminant function was observed concerning

the genetic and inherited etiologic factors in these samples. However, in the subsample of respondents without personal experience with the behavior they evaluated, the variable with the second strongest discriminative power was the etiologic factor of childhood upbringing but even this did not reach the value of .30. Further, the etiologic factor of childhood trauma showed the weakest connection with the discriminant function in this subsample (see Table 4).

Table 4

4. Discussion

In the past fifteen years, the concept of addiction has been applied to an increasing number of behaviors (Demetrovics & Griffiths, 2012; Grant et al., 2010; Karim & Chaudhri, 2012), a trend that can be observed not only in the scientific literature but also in mass media. This raises the question of how the general public views a broadened conceptual landscape for addictive behaviors. Although lay perspectives on substance addictions have been studied previously, no prior studies that we are aware of have explicitly compared a broad range of both substance-related and behavioral addictions.

Our results showed that behavioral addictions were perceived differently compared to substance-related addictions by the public in several respects. Bivariate analyses revealed that our respondents considered substances to have more addiction liability than other potential behavioral problems. Further, with the exception of the etiologic factors of childhood trauma and genetics, where no distinction was made, participants saw most of the possible etiologic factors (i.e., moral, biological, or psychological in nature) as more relevant risk factors for the development of behavioral addictions, compared to substance-related addictions. In addition, results of the multivariate analyses demonstrated that perceived addiction liability was clearly the most distinguishing variable between the behaviors versus substances – independently of whether the respondents themselves had had own previous experiences with the given addictive

behavior or not. The other variable with still considerably strong discriminative power among the subsample of individuals with personal experience of the given problem was a flawed character as an etiologic factor being a more relevant determinant in the case of behavioral addictions.

This pattern of results is consistent with the moralizing dimension of Haslam's lay psychiatry model (Haslam, 2003, 2005; Haslam et al., 2007). The model suggests that the general public judges persons struggling with behavioral addictions more negatively from a moral point of view besides (or perhaps directly caused by) perceptions that work, sex, shopping, and so on exhibit less liability to addiction compared to substances, and therefore, people with such problems should have more freedom and thus personal responsibility to give up these behaviors when problems arise. This interpretation is in line with the findings of a recent study investigating the US and Australian public's opinion on food addiction. This survey revealed that most respondents consider compulsive eating as a matter of choice and individual responsibility, while other etiologic factors such as genetics or environmental influences were seen as less relevant to food addiction (Lee et al., 2013).

The moralizing attitude towards addiction problems can increase the stigmatization of individuals struggling with addictions which in turn can influence social reactions to these mental disorders both at the individual (e.g. anger, larger social distance) and community levels (e.g. criminalization, creation or discontinuation of services as needle exchange, methadone substitution). Further, addiction-related stigma has an adverse effect on many areas of life of the stigmatized person including but not limited to employment, housing, and poor mental and physical health outcomes (Ahern, Stuber, & Galea, 2007; van Olphen, Eliason, Freudenberg, & Barnes, 2009). Research evidence shows that despite anti-stigma campaigns no substantial improvement has occurred in the past decades in the general public with regard to the stigmatization of persons with addictive disorders (Pescosolido et al., 2010). These findings

suggest that more needs to be done concerning the implementation of effective interventions to reduce addiction-related stigma and its detrimental effects on persons suffering from either substance- or behavioral addictions. Authors of a recent systematic review on the effectiveness of different stigma reduction interventions suggest that favorable changes in the attitudes of the general public towards people with addiction problems might be best achieved by communication strategies distributing positive stories about persons struggling with addictions (Livingston et al., 2012). These authors also recommend the utilization of motivational interviewing approaches with significant target groups as landlords or employers, and the employment of interventions targeting the implicit-automatic processes leading to subconscious biases that underlie stigma.

Beyond the general contrast between substances and behaviors, our analyses also demonstrated that the general public made finer-grained distinctions along the dimensions examined across the individual addictive behaviors. This was especially true for perceived addiction liability (e.g., alcohol versus cocaine misuse), and the etiologic roles of genetics (e.g., problematic alcohol versus marijuana use) and traumatic experiences (e.g., gambling versus problematic sexual behavior). The large within-group differences both among behavioral and substance-related addictive behaviors suggest that between-group differences found in the social judgment of behavioral versus substance-related addictions should be interpreted with caution.

A further important implication of the individual behavior-level analyses is that the (Canadian) general public seems to appreciate the complex bio-psycho-social etiology underlying the development of addictive behaviors: the mean score of five of the six etiologic factors examined was above the theoretical mean of the scale measuring the perceived importance of the given causal agent. Interestingly, despite the numerous mass media reports on the relevance of genetic factors in the development of addictions (BBC NEWS 2010, 2013;

Roberts, 2010), this etiologic factor was the one perceived by our respondents as the least relevant in the etiology of addictions.

The results of the present study should be seen in the light of some limitations. First, the response rate was relatively low in our survey, which weakens the generalizability of the findings although the sample was weighted to reflect the general population in terms of demographic characteristics. Further, validity of the wording of the explanations given to respondents to help them interpret the addiction-related items is also uncertain. Our aim was to provide a brief description of each behavior that emphasized impairment and to avoid the use of terms with negative connotations (such as addiction, for instance). Since it has not been examined how respondents conceive of these descriptions, it is possible that in some instances impairment was understood in other ways than intended. For example, 'having sex in a way that creates problems in life' can be interpreted not only as preoccupation with sexuality being a core characteristic of sex addiction but also as paraphilic behavior, which would not necessarily have addictive features.

Despite its limitations, the present study provides a preliminary overview on how the general public approaches the newly defined behavioral class of addictions as compared to traditional substance-related addictions and what lay people believe about the etiology of these addictive behaviors. Our results provide an important counterpoint to the vibrant professional dialogue on the appropriate classification of this group of problem behaviors (Mihordin, 2012; Mudry et al., 2011) and can also help better shape the interventions aiming to reduce the stigma and rejection attached to addictive disorders and to the individuals struggling with them.

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Table 1. Sociodemographic characteristics of the sample (N = 4,000)

	N (%)	
	Unweighted	Weighted
Sex		
Male	1,426 (35.7)	2,000 (50.0)
Female	2,574 (64.3)	2,000 (50.0)
Age group		
≤34	942 (23.8)	1,305 (32.9)
35-54	1,845 (46.5)	1,592 (40.1)
≥55	1,180 (29.7)	1,071 (27.0)
Educational level		
Grade 9 or less	18 (0.5)	24 (0.6)
Some high school	184 (4.6)	177 (4.4)
High school diploma	658 (16.5)	645 (16.1)
Some university, college or post-secondary trades/technical	936 (23.4)	958 (24.0)
College or post-secondary trades/technical diploma	1,052 (26.3)	1,034 (25.8)
Completed university undergraduate degree	771 (19.3)	776 (19.4)
Completed university graduate or professional degree	381 (9.5)	386 (9.7)
Marital status		

Married/common law	2,687 (67.7)	2,597 (65.4)
Separated/divorced	500 (12.6)	450 (11.3)
Widowed	119 (3.0)	106 (2.7)
Single/never married	664 (16.7)	817 (20.6)

Employment status

Employed 30 hours a week or more	2,046 (51.5)	2,173 (54.7)
Employed less than 30 hours per week	467 (11.8)	424 (10.7)
Unemployed	273 (6.9)	269 (6.8)
Student	115 (2.9)	161 (4.0)
Retired	601 (15.1)	542 (13.6)
Not working due to disability	198 (5.0)	174 (4.4)
Other	273 (6.9)	231 (5.8)

Yearly household income before taxes

Under \$20,000	166 (5.1)	181 (5.4)
\$20,000-\$29,999	190 (5.8)	198 (5.9)
\$30,000-\$39,999	259 (7.9)	280 (8.4)
\$40,000-\$49,999	312 (9.5)	313 (9.4)
\$50,000-\$59,999	355 (10.9)	356 (10.7)
\$60,000-\$69,999	273 (8.4)	281 (8.4)
\$70,000-\$79,999	266 (8.1)	281 (8.4)
\$80,000-\$89,999	252 (7.7)	256 (7.7)

\$90,000-\$99,999	290 (8.9)	287 (8.6)
\$100,000 or more	905 (27.7)	909 (27.2)

Table 2. Definitions of problem behaviors provided to respondents

Problem behavior	Definition
Alcohol	An ‘alcohol problem’ means misuse of beer, wine, and/or hard liquor.
Tobacco	A ‘tobacco problem’ means misuse of cigarettes, cigars, chew, cigarillos, and any other tobacco products.
Marijuana	A ‘marijuana problem’ means misuse of cannabis, hashish, hash oil, weed, grass or pot.
Cocaine	A ‘cocaine problem’ means misuse of crack, powder cocaine, blow, snow, or snort.
Gambling	A ‘gambling problem’ means playing slot machines, online gambling, casino games, lotteries, scratch tickets, and any other betting for money that creates problems in life.
Eating	An ‘eating problem’ means any problems related to eating, whether it is too much or too little.
Shopping	A ‘shopping problem’ means shopping in a way that creates problems in life.
Sex	A ‘problem with sex’ means having sex in a way that creates problems in life, and/or inappropriate use of pornography, whether online or offline.
Video Gaming	A ‘video gaming problem’ means playing video games such as X-Box, Wii, Playstation, and other online or offline video games in a way that creates problems in life.
Work	A ‘problem with work’ means working in a way that creates problems in life.

Table 3. Descriptive statistics and bivariate comparisons of the substance-related versus behavioral addiction groups across the dimensions investigated

	Substance-related addictions			Behavioral addictions			Mann-Whitney	Effect
	N	Mean	SD	N	Mean	SD	U	size (r)
Addiction liability	1,544	4.03	1.10	2,246	3.27	1.09	1,077,881.0***	-0.33
Character flaw	1,503	3.10	1.18	2,238	3.35	1.12	1,477,989.0***	-0.11
Chemical imbalance in the brain	1,444	3.24	1.17	2,187	3.35	1.14	1,493,786.5***	-0.04
Genetic or inherited problems	1,495	2.99	1.28	2,230	2.97	1.18	1,653,799.0 ^{NS}	-0.01
Childhood upbringing	1,533	3.66	1.13	2,308	3.81	1.05	1,650,975.5***	-0.06
Childhood trauma	1,495	3.28	1.19	2,210	3.22	1.20	1,596,260.5 [†]	-0.03
Current stressful circumstances	1,547	4.08	0.91	2,315	4.13	0.90	1,723,043.5*	-0.03
Accuracy of prevalence estimation	1,286	-23.29	20.27	1,893	-18.86	21.15	1,043,641.0***	-0.12

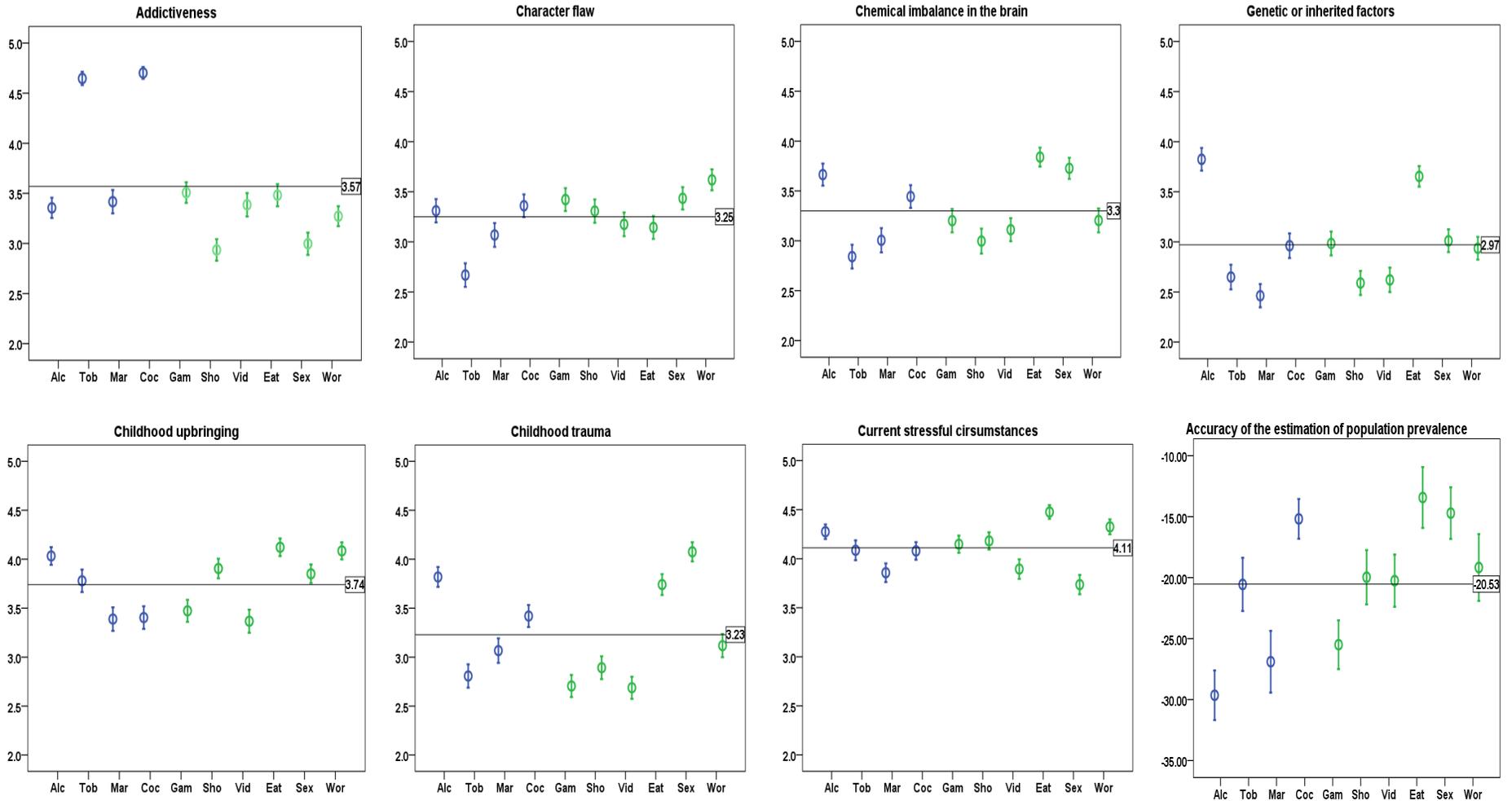
^{NS}non-significant, [†]p<.1, *p<.05, ***p<.001. All variables rated on a 1-5 Likert scale.

Table 4. Discriminative power for each predictor in distinguishing between the behavioral versus substance-related class of addictions (pooled within-groups correlations with the standardized canonical discriminant function)

	Total sample (N = 2,780)	Respondents with prior personal history with the evaluated problem (n = 1,764)	Respondents without prior personal history with the evaluated problem (n = 1,016)
Addiction liability	0.869	0.739	0.891
Character flaw	-0.304	-0.435	-0.137
Chemical imbalance in the brain	-0.176	-0.204	-0.141
Genetic or inherited factors	-0.038	-0.062	-0.098
Childhood upbringing	-0.175	-0.196	-0.230
Childhood trauma	0.096	0.178	-0.007
Current stressful circumstances	-0.102	-0.277	-0.037
Accuracy of estimation for prevalence	-0.269	-0.258	-0.036
Classification accuracy			
Overall	67.4%	61.5%	78.9%
Substance addictions	49.3%	54.3%	53.0%
Behavioral addictions	79.8%	67.8%	89.9%

Note. Values above the conventional cut-off value of 0.30 are highlighted in bold.

Figure 1. Lay perceptions of the addiction liability, etiology, and occurrence of 10 substances and behaviors (error bars representing means with 95% confidence intervals for each behavior)



Note. Alc: problematic alcohol use, Tob: tobacco use problems, Mar: problems with marijuana use, Coc: problematic cocaine use, Gam: gambling problems, Eat: problematic eating, Sho: excessive shopping, Vid: problematic video gaming, Wor: excessive work. Horizontal reference lines represent composite means for the ten behaviors combined. Substance-related addictions are displayed in blue / dark, behavioral addictions in green / bright.

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Contributors

Ian Colman, Nady el-Guebaly, David C. Hodgins, Scott Patten, Don Schopflocher, Jody Wolfe, and T. Cameron Wild designed the study and wrote the protocol. Barna Konkoly Thege conducted the literature searches and provided summaries of previous research studies. Barna Konkoly Thege, Jody Wolfe, and T. Cameron Wild conducted the statistical analysis. Barna Konkoly Thege wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of interest

The authors declare no conflicts of interest.