

Using the Syndrome Model of Addiction: a Preliminary Consideration of Psychological States and Traits

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Abstract This article describes a collaborative research project between the Division on Addiction, Cambridge Health Alliance, a Harvard Medical School Teaching Hospital, and the Integrated Centre on Addiction Prevention and Treatment (ICAPT) of the Tung Wah Group of Hospitals (TWGHs) in Hong Kong. The goal of this research is to better understand the syndrome model of addiction by

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establishing an epidemiology of addiction treatment seekers across various expressions of addiction (e.g., alcohol and other psychoactive drugs, gambling, sexual behaviors, online gaming). This paper presents initial findings about the demographic and psychological characteristics of three groups of treatment seekers in TWGHs in Hong Kong: (1) a group seeking treatment for chemical expressions of addiction ($n = 35$); (2) a group seeking treatment for behavioral expressions of addiction ($n = 125$); and (3) a comparison group seeking services ($n = 18$) unrelated to addiction. The initial findings identified various common psychological vulnerabilities (i.e., trait anxiety, state anxiety, depression, using emotional support and venting as psychological coping, higher levels of attentional impulsiveness) shared among both the behavioral expression and chemical expression groups, and possible unique psychological characteristics associated with each expression of addiction (e.g., coping mechanisms). These findings provide support for conceptualizing addiction as a syndrome.

Keywords Syndrome model · Addiction · Treatment seekers · Hong Kong

The Syndrome Model of Addiction

Traditional addiction treatment models view different expressions of addiction as distinct disorders (e.g., opioid dependence, alcohol abuse, and pathological gambling) even though addictive behaviors are highly comorbid with each other, with associated mental health and medical problems (Druss and Walker 2011; Kessler et al. 2008; Kessler et al. 1996; Nelson et al. 2015; Regier et al. 1990; Shek et al. 2012). To address these multi-dimensional problems, clinicians often refer treatment-seeking individuals to various clinical services specific to each disorder. Consequently, the clinical experience of treatment seekers can be confusing and fragmented. One alternative contemporary view conceptualizes addiction—whether expressed as substance use (e.g., alcohol) or other behavior (e.g., gambling)—as a syndrome that shares common etiological roots. The hypothesis that there is a singular addiction with different expressions of addictive behaviors forms the theoretical basis of the syndrome model of addiction (Shaffer et al. 2004; Shaffer et al. 2012a, b; Shaffer and Shaffer 2016). This model conceptualizes various forms of addiction (i.e., chemical or behavioral) as the opportunistic outcomes of common distal and proximal biopsychosocial vulnerabilities. These common vulnerabilities and consequences are etiological and distinguish those suffering with addiction from those who are not. Different expressions of addiction also share overlapping biopsychosocial consequences that result from the addictive behaviors. Unlike the conventional view of addiction that conceptualizes the cause and consequences of addiction as results of substance-specific effects (e.g., nicotine addiction, alcohol addiction, and opioid addiction), the syndrome model emphasizes that addiction is a relationship disorder between a person and

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the focus of addiction. Subsequently, any object or activity—substance or behavior—can become the target of addiction.

Considering Behavioral and Chemical Expressions of Addiction

Many different activities can become excessive behavior patterns. Though the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders categorizes behavioral addiction disorders and substance use disorders within the same diagnostic class of substance-related and addictive disorders, gambling disorder is the only behavioral addiction currently included in the DSM-5 (DSM; American Psychiatric Association, 2013). This decision corresponds with a growing body of evidence that has revealed a variety of similarities between the correlates of gambling and psychoactive substance use, including personality traits (Blaszczynski et al. 1985; Eysenck 1997; MacLaren et al. 2011), neurocognitive functioning (Goudriaan et al. 2006; Lawrence et al. 2009; Leeman and Potenza 2012), neurobiological responses (Potenza 2008; Reuter et al. 2005), and psychiatric comorbidity (Kessler et al. 2008; Korn and Shaffer 1999; Langenbucher et al. 2001; LaPlante and Shaffer 2002; Nelson et al. 2015; Shaffer 1999, 2003).

Other examples of behaviors that can become intemperate include sexual activities, Internet use, eating, spending/shopping, and stealing. However, whether these expressions of addiction share similar vulnerabilities, as in the case of overlapping biopsychosocial problems between substance use disorders and gambling disorders, remains to be empirically and systematically studied. Improving the existing scientific understanding of addiction can inform and improve clinical services. In particular, the scientific inquiry of addiction and the addiction syndrome begins with an examination of the overlapping biopsychosocial problems that commonly emerge across addiction expressions. These problem areas are wide-ranging and can include various emotional states, obsessiveness, personality traits, coping styles, interpersonal functioning, neurocognitive competence, and general health status. There is a dearth of research that has examined multiple expressions of addiction within a single investigative framework. From a methodological perspective, this limits our current knowledge about the extent of shared variance across different expressions of addiction. From a clinical perspective, this perpetuates fragmented treatment programs that separate treatment seekers based on their specific expressions of addiction and overlook multi-morbidity of addiction expressions. Additionally, the few existing studies that examine multiple expressions of addiction (e.g., Dannon et al. 2004; Grant and Kim 2005; Lee et al. 2012; Raviv 1993; Yen et al. 2008; Zhou et al. 2014) typically have compared one relatively well-established expression of addiction (e.g., substance use or gambling disorder) with one relatively little studied expression (e.g., Internet use or excessive sexual activities). In one exception, Robbins and Clark (2015) reviewed similarities between gambling and other proposed behavioral expressions of addiction. For a summary of similarities within chemical expressions of addiction, the original syndrome model paper (Shaffer et al. 2004) provides ample detail. Similarly, Linden (2012) explores common driving forces between and within chemical and behavioral expressions of addiction.

The Present Study

The present study focuses on psychological constructs. People with addiction, for example, commonly experience depression and anxiety (Grant et al. 2004). Further, despite important

differences between addictive disorders and obsessive-compulsive disorders (Shaffer et al. 2004; Shaffer et al. 2012a, 2012b), certain overlaps between addiction and obsession have prompted suggestions that an underlying obsessiveness can stimulate addictive behaviors (Leedes 2001). Closer examination about obsessive thought processes (Taylor et al. 2006) might help to clarify the role of obsession in the etiology and experience of addiction. In terms of enduring personality characteristics, there has been debate about whether an “addictive personality” exists (Craig 1979; Gendreau and Gendreau 1971; Shaffer 2000). Although little empirical evidence supports a demoralizing personality description of addiction, there is substantial evidence that people with addiction are generally more impulsive, sensation seeking, and alexithymic (Cheng et al. 2015; Ersche et al. 2010; Robbins and Clark 2015; Thorberg et al. 2009; Zuckerman and Kuhlman 2000) than people without addiction. Different personality profiles reflect different styles of psychological coping (Carver and Connor-Smith 2010; Connor-Smith and Flachsbart 2007). Investigating how psychological constructs cut across various expressions of addiction will contribute to a better understanding of addiction and provide an evidence base to refine and specify elements of the syndrome model. Selecting the specific biopsychosocial constructs to examine the extent of shared variance across addiction expressions requires clinical wisdom and thoughtful consideration of the existing literature.

This research will contribute to clarifying the shared biopsychosocial manifestations associated with the addiction syndrome among treatment seekers and the unique experiences associated with specific addiction expressions. More specifically, this study examines whether and to what extent people seeking treatment for different expressions of addiction share common psychological factors and traits compared to treatment-seeking individuals who do not report a history of addiction. In keeping with the syndrome model, we hypothesize that the distributions of various measures of psychosocial processes and traits will be similar for groups of individuals manifesting different expressions of addiction. In addition, we hypothesize that the distributions for addiction treatment seekers will be significantly different from a comparison group of treatment seekers who do not present with addiction. This study will allow us to examine the feasibility of implementing such a research protocol in a busy treatment center. Our experience suggests that investigative data collection protocols are seldom used by addiction treatment settings, despite their potential for yielding valuable data that could be used to evaluate treatment efficacy and improve service delivery.

Methods

Research Setting: the Integrated Centre on Addiction Prevention and Treatment

The Integrated Centre on Addiction Prevention and Treatment (ICAPT) at the Tung Wah Group of Hospitals (TWGHs) in Hong Kong was established as a collaboration between TWGHs and the Division on Addiction at Cambridge Health Alliance, a Harvard Medical School Teaching Hospital, with the mission of providing comprehensive and integrated treatment services for individuals experiencing addiction problems based on contemporary treatment ideology following the syndrome model of addiction. The ICAPT provides comprehensive treatment packages to people with a range of addiction expressions and comorbid mental health problems and facilitates the science of addiction and frontline staff’s treatment competence by engaging in empirical research and professional training activities. The present

study rests upon an ongoing research protocol at the ICAPT to gather prospective data from treatment seekers to establish an epidemiology across various expressions of addiction.

Study Participants

This prospective study involves data collected from treatment seekers at three clinical addiction service locations in Hong Kong. For the purpose of this initial study, we included participants who sought treatment between 22 October 2015 and 4 July 2017. The main clinical service (i.e., the Integrated Centre for Addiction Prevention and Treatment; ICAPT) acts as a research hub, which coordinates this project. The ICAPT specializes in the treatment of multiple expressions of addiction. The other two partner centers are the Even Centre (EC), a treatment center for problem gambling, and the Alcohol Abuse Prevention and Treatment (AAPT) service, a treatment service for alcohol abuse. The TWGHs, the largest non-governmental organization in Hong Kong offering medical, social, and educational services, manages all three treatment centers.

Procedures

Due to limited staffing resources for the research project at the EC and AAPT, we recruited eligible treatment seekers who were assigned to three randomly determined therapists at these partner centers. These clinicians invited every eligible treatment seeker at ICAPT to participate in this study. Eligibility for this study is based on the following four inclusion criteria: (1) age between 18 and 65 years, (2) a reasonable level of literacy and expressive capacity deemed sufficient to participate in the study, (3) fluency in Cantonese Chinese, and (4) ability to understand the nature of the study and provide written informed consent. We excluded treatment seekers who presented with immediate suicidal risk or active psychotic symptoms. In such cases, the responsible therapist would trigger the established treatment protocol immediately. Based on the same inclusion criteria, we recruited a comparison group comprised of participants from other service units at the TWGHs. This group of participants received services such as interest classes and generic community support; they represent a comparison group who did not report a history of addiction or other mental health problems.

During the initial face-to-face contact with a treatment seeker (i.e., the “intake session”), a project-related therapist obtained clinical information about the treatment seeker’s presenting problems and psychosocial background using a standardized semi-structured interview format. A doctoral level clinical psychologist trained all therapists to conduct the semi-structured interview. The intake sessions took between 90 and 120 min to complete and were guided by a written assessment packet. Towards the end of the intake session, following a script detailed with study descriptions and procedures, the therapists invited eligible treatment seekers to participate in this study. Upon verbal consent for participation, research staff then arranged a separate session for research assessment, scheduled before the follow-up session with the therapist. Research staff provided participants with additional information about the study procedures. In addition to written informed consent, research staff asked participants to provide the name and contact of three people with whom they have kept contact with for the past 10 years. Research staff informed the participants that these people would be contacted only in case the participants could not be reached for long-term follow-up data collection. The comprehensive research assessment consisted of two parts: self-reported questionnaires that required approximately 60 min and a short battery of neuropsychological tests that required

about 20 min. Research staff members conducted the neuropsychological testing. A clinical psychologist trained the research staff members to prepare them to administer these measures properly and consistently.

We scheduled multiple research assessments: at the clinical intake session, after every 6 months during treatment, at treatment completion, and every 6 months post-treatment. Participants in the control group completed the same set of assessments at 6-month intervals. Participants received supermarket vouchers for completing each research assessment. The vouchers for the first assessment were worth HKD 200 (equivalent to USD 25.6), and afterwards, each voucher was worth HKD 100 more than the previous one (e.g., HKD 300 for the second assessment and HKD 400 for the third). The current study reports data collected only at the clinical intake session. Future research will examine and report the longitudinal results.

Research Ethics and Human Subjects Protection

The ICAPT research ethics committee, consisting of members who were not involved in the daily operation of the treatment centers, reviewed and approved this study and its procedures.

Measures

Demographic and Clinical Information from Intake Interview The semi-structured intake interview provided the setting to collect wide-ranging information including age, gender, years of formal education, sources of referral, addiction expressions and their ages of onset, psychiatric diagnoses, age of onset of comorbid mental health problems, trauma experience, prior addiction or mental health treatment experience, presence of significant or chronic physical health problems, age of onset of physical health problem, presence of addiction-related illegal behavior, and family history of addiction or mental health problem.

Based on the information obtained from the clinical intake interview, therapists rated participants' recent psychosocial functioning using the Personal and Social Performance scale (PSP; Morosini et al. 2000). This rating is based on four main areas of personal and social functioning: (1) socially useful activities, including work and study; (2) personal and social relationships; (3) self-care; and (4) disturbing and aggressive behaviors. The overall rating ranges from 1 to 100, with higher scores representing higher psychosocial functioning in daily life.

Depression The Beck Depression Inventory version II (BDI-II; Beck et al. 1996) is a 21-item self-report instrument for the assessment of depression. The total score ranges from 0 to 63. Previous research has translated the BDI-II into Chinese and demonstrated satisfactory internal consistency reliability ($\alpha = 0.94$) (Byrne et al. 2004).

State and Trait Anxiety We used the State-Trait Anxiety Inventory (STAI-Y; Spielberger 1983) to assess state and trait anxiety of participants. The trait scale taps the extent of anxiety that participants generally feel, whereas the state scale taps the extent of anxiety participants feel at the time completing the questionnaire. Each scale consists of 20 items that are rated on a 4-point Likert scale. Both the trait and the state scores range from 20 to 80, with a higher score indicating a higher anxiety level. Factor analysis conducted by Shek (1988) demonstrated validity of the measurement. Previous study also has reported satisfactory test-retest reliability with $\alpha = 0.87$ (Chau et al. 1998).

Psychological Coping The Brief COPE Inventory (BCI) (Carver 1997) is a shortened version of the COPE Inventory developed by Carver et al. (1989). The BCI consists of 28 items measuring coping response and strategies that people might use in various difficult situations. There is a total of 14 subscales with 3 subscales on problem-focused coping, 3 subscales on emotion-focused coping, 2 subscales on adaptive coping, and 6 subscales on maladaptive coping. Each subscale consists of 2 items and participants rated on each of the 28 items with a 4-point Likert scale. In Carver (1997), the Cronbach's alphas of subscale scores ranged from 0.50 to 0.90.

Obsessive Beliefs We used the Obsessive Beliefs Questionnaire-20 (OBD-20; Moulding et al. 2011) to measure the participants' obsessive cognitions. The questionnaire consists of 20 items rated on a 7-point Likert scale. The OBQ-20 has four subscales: Control of Thoughts, Perfectionism, Threat, and Responsibility. The total score is the sum of the ratings of all 20 items. In Fergus and Carmin (2014), Cronbach's alphas for the four subscales were all greater than 0.84.

Alexithymia We assessed the participants' degree of alexithymia with the 20-item Toronto Alexithymia Scale (TAS-20-C; Bagby et al. 1994; Zhu et al. 2007), which was rated on a 5-point Likert scale. Three subscales can be derived: difficulty identifying feelings, difficulty describing feelings, and externally oriented thinking. Previous study has shown the TAS-20-C to be a reliable and valid measure of alexithymia among Chinese clinical and community samples. Cronbach's alphas for the three subscales and the overall score were between 0.52 and 0.84 (Zhu et al. 2007).

Impulsivity We employed the Barratt's Impulsivity Scale Version 11 (BIS-11) (BIS-11; Patton and Stanford 1995; Zhu et al. 2007) to assess participants' personality construct of impulsiveness. The BIS-11 is a widely used instrument and is composed of 30 items describing common impulsive or non-impulsive behaviors and preferences on three subscales: attentional impulsiveness, motor impulsiveness, and non-planning impulsiveness. Each item is rated on a 4-point Likert scale. The BIS-11 has satisfactory internal reliability with a Cronbach's alpha of 0.80 and a test-retest reliability r of 0.70 and demonstrated external validity among the Chinese population (Zhu et al. 2007).

Sensation Seeking We used the 40-item Zuckerman Sensation Seeking Scale Form V (SSS; Zuckerman et al. 1978) to measure participants' sensation-seeking trait in four dimensions: thrill and adventure seeking, experience seeking, disinhibition, and boredom susceptibility. Previous research has demonstrated the SSS to be a valid measure among the Chinese population (Wang et al. 2000). However, a meta-analysis by Deditius-Island and Caruso (2002) examined the reliability of the scale across multiple studies and different populations and listed Cronbach's alphas as high as 0.89 but as low as 0.17.

Data Analyses

For all analyses reported in this article, we assigned participants to three different groups: (1) no addiction comparison, (2) chemical expression, and (3) behavioral expression. The comparison group included participants who volunteered for the study but were not seeking

treatment for addiction. The chemical expression group included participants who primarily sought treatment for substance addiction (e.g., drug, alcohol, or cigarette) whereas the behavioral expression group included participants who primarily sought treatment for behavioral addictions (e.g., gambling, sex, Internet use, or over-spending).

For data analyses, first, we examined participants' demographic and clinical background information that we collected during the semi-structured assessment interview. For each categorical variable, such as gender and source of referral, we counted the number within each category and identified the number of cases within each treatment group and the whole sample. For each continuous demographic variable, such as age and years of education, we calculated the mean and standard deviation for all participants and for each subgroup. Next, after this descriptive analysis, we conducted Levene's test for homogeneity of variance with a Bonferroni adjustment to manage type I errors that can become inflated by multiple comparisons. In the absence of any statistically significant differences, we conducted a one-way analysis of variance (ANOVA) to test for the presence of significant difference among the three groups of participants. For categorical variables, such as gender and source of referral, we conducted chi-square analyses to test for the presence of statistically significant differences among the three subgroups of participants. Finally, we conducted a one-way analysis of covariance (ANCOVA), with age and gender as the covariates, to test for participant group main effects. For ANCOVA results revealing main effects associated with the participant groups, we then conducted post-hoc Fisher's least significant difference (LSD) test to examine pairwise comparisons. Because of the exploratory nature of the present study, we established alpha at $p < 0.05$ for all statistical tests. We computed all analyses using the Statistical Package for Social Sciences (SPSS, version 22.0; IBM 2013).

Results

Among the eligible individuals, 160 treatment seekers and 18 healthy comparison cases consented to participate in this research. This represents a consent rate of 65.35%. Among the treatment seekers, we classified 35 participants (21.9%) as evidencing a chemical-related expression of addiction and 125 participants (78.1%) a behavioral expression of addiction group. Of the 35 participants in the chemical expression group, 5 participants (14.3%) primarily sought treatment for stimulant abuse, 1 participant (2.9%) for sedative abuse, 26 participants (74.3%) for alcohol abuse, and 3 participants (8.6%) for nicotine abuse. Of the 125 participants in the behavioral expression group, 48 participants (38.4%) primarily sought treatment for gambling disorder, 39 participants (31.2%) for sexual addiction, 1 participant (0.8%) for excessive Internet use and gaming, 14 participants (11.2%) for over-spending, 8 participants (6.4%) for over-eating, and 15 participants (12.0%) for other behavioral addiction problems (e.g., stealing).

Participant Demographics and Clinical Backgrounds

As we mentioned earlier, to obtain an overview of participants' demographic and clinical background information, we computed descriptive statistics using the information derived from the semi-structured intake interviews with the treatment seekers. Because the control participants did not participate in a clinical interview, they provided demographic and psychosocial background information by completing a questionnaire. Table 1 summarizes these results.

Table 1 Participant demographics and clinical backgrounds by primary expression of addiction

Characteristics	Sample (n)	Total	Primary expression of addiction		
			Comparison (n = 18)	Chemical (n = 35)	Behavioral (n = 125)
Age***					
Mean (S.D.)	178	40.0 (11.3)	49.7 (8.44)	39.4 (8.9)	38.9 (11.6)
Gender**					
Male	138	77.5%	100.0%	88.6%	71.2%
Female	40	22.5%	0.0%	11.4%	28.8%
Years of education					
Mean (S.D.)	166	13.2 (3.9)	12.6 (3.9)	12.2 (3.9)	13.5 (3.9)
Source of referral***					
Self-referral	84	54.9%	–	30.3%	61.7%
By family or friends	33	21.6%	–	18.2%	22.5%
By professional	36	23.5%	–	51.5%	15.8%
Age of onset of primary addiction expression					
Mean (S.D.)	157	28.2 (11.0)	–	29.2 (9.4)	27.9 (11.4)
Presence of multiple addiction problems***					
Single	120	75%	–	48.6%	82.4%
Multiple	40	25%	–	51.4%	17.6%
Received addiction treatment in the past					
No	129	72.5%	–	60.0%	72.0%
Yes	49	27.5%	–	40.0%	28.0%
Presence of mental health diagnosis*					
No	130	73.0%	100.0%	65.7%	71.2%
Yes	48	27.0%	0.0%	34.3%	28.8%
Age of onset of first mental health problem					
Mean (S.D.)	47	30.9 (13.9)	–	27.9 (12.7)	31.9 (14.4)
Received non-addiction mental health treatment in the past*					
No	123	69.1%	100.0%	65.7%	65.6%
Yes	55	30.9%	0.0%	34.3%	34.4%
Had past trauma experience					
No	141	79.2%	94.4%	82.9%	76.0%
Yes	37	20.8%	5.6%	17.1%	24.0%
Past or current self-harm					
Absence	86	54.1%	–	62.9%	51.6%
Presence	73	45.9%	–	37.1%	48.4%
Major or chronic physical health problem					
Absence	131	73.6%	88.9%	65.7%	73.6%
Presence	47	26.4%	11.1%	34.3%	26.4%
Age of onset of first major or chronic physical health problem					
Mean (S.D.)	40	33.4 (16.4)	–	30.56 (15.8)	34.0 (16.9)
Engaged in illegal actions related to addictive behavior					
No	98	61.6%	–	57.1%	62.9%
Yes	61	38.4%	–	42.9%	37.1%
Engaged in illegal actions related to addictive behavior that had been prosecuted or sentenced					
No	121	76.1%	–	65.7%	79.0%
Yes	38	23.9%	–	34.3%	21.0%
Known family history of addiction*					
Absence	119	66.9%	94.4%	60.0%	64.8%
Presence	59	33.1%	5.6%	40.0%	35.2%
Known family history of mental health problem*					
Absence	142	81.1%	94.4%	94.1%	75.6%
Presence	33	18.9%	5.6%	5.9%	24.4%
Personal and social performance					
Mean (S.D.)	157	68.7 (13.0)	–	69.8 (10.9)	68.4 (13.6)

p* value < 0.05*p* value < 0.01****p* value < 0.001

Participants in the comparison group tended to be older ($F(2,175) = 7.99, p < 0.001$), male ($\chi^2(2) = 10.54, p = 0.005$), without mental health diagnosis ($\chi^2(2) = 7.81, p = 0.020$), without non-addiction mental health treatment in the past ($\chi^2(2) = 8.95, p = 0.011$), and without known family history of addiction ($\chi^2(2) = 7.16, p = 0.03$) and family history of mental health problems ($\chi^2(2) = 8.28, p = 0.016$). Compared to the chemical expression group, participants in the behavioral expression group were more likely to be self-referred ($\chi^2(2) = 18.87, p < 0.001$) and seek treatment for a single addiction problem ($\chi^2(1) = 16.69, p < 0.001$).

As the syndrome model of addiction suggests, between the chemical and behavioral expression groups, there was no significant difference in years of education ($F(2,163) = 1.60, p = 0.21$), personal and social performance ($F(1,155) = 0.33, p = 0.57$), presence of addiction treatment history ($\chi^2(1) = 1.33, p = 0.25$), history of committing illegal actions related to addictive behavior ($\chi^2(1) = 0.38, p = 0.54$), trauma history ($\chi^2(2) = 3.60, p = 0.17$), self-harm ($\chi^2(1) = 1.39, p = 0.24$), or presence of major or chronic health problem ($\chi^2(2) = 3.29, p = 0.19$). There was also no significant difference in age of onset of primary addiction problem ($F(1,155) = 0.38, p = 0.54$), age of onset of first diagnosed mental health problem ($F(1,45) = 0.71, p = 0.40$) or age of onset of first major or chronic physical health problem ($F(2,37) = 0.23, p = 0.80$) between chemical and behavioral expression groups.

As a result of statistically significant demographic differences across groups, we statistically controlled for the potential confounding effect of age and gender by conducting ANCOVA, using age and gender as covariates during the subsequent analyses of participants' psychological processes. Table 2 and Table 3 respectively summarize the results of these ANCOVA. As we mentioned earlier, we performed Levene's tests with Bonferroni adjustments as a test for homogeneity of variance. We observed that the variances for scores within the three groups were not statistically significant. We will discuss the corresponding post hoc analyses in the next sections.

Psychological States and Traits

Depression and Anxiety As Table 2 shows, there was a statistically significant difference in levels of depression ($F(2,169) = 5.96, p = 0.003$), state anxiety ($F(2,170) = 8.32, p < 0.001$), and trait anxiety ($F(2,167) = 19.45, p < 0.001$) between the control group and both addiction expression groups. Compared to the control group, the chemical expression group evidenced a significantly greater level of depression ($p = 0.007$) and trait anxiety ($p < 0.001$) (see Table 3). The behavioral expression group also evidenced a significantly greater level of depression ($p = 0.001$), state anxiety ($p < 0.001$), and trait anxiety ($p < 0.001$) than the control group. While the behavioral expression group had significantly greater levels of state anxiety ($p = 0.02$) than the chemical expression group, there was no statistical difference in levels of depression ($p = 0.57$) and trait anxiety ($p = 0.05$) between the chemical and behavioral expression groups.

Psychological Coping As assessed by BCI, among the coping strategies, only self-distraction ($F(2, 172) = 5.40, p = 0.005$), substance use ($F(2,173) = 32.12, p < 0.001$), use of emotional support ($F(2,171) = 3.35, p = 0.04$), and venting ($F(2,173) = 3.30, p = 0.04$) were statistically significantly different between the control and both expressions of addiction groups (see Table 2). As Table 3 shows, we observed statistically significant self-distraction and substance use differences between the behavioral and chemical expression groups. We observed that the behavioral expression group used self-distraction as a coping strategy significantly more often than the chemical expression group ($p = 0.002$). There was no

Table 2 Estimated mean, standard deviation, and main effect of participant subgroup for the psychological states and traits of comparison group participants and addiction treatment seekers

	Comparison (<i>n</i> = 18)		Chemical (<i>n</i> = 35)		Behavioral (<i>n</i> = 125)		<i>p</i> value
	Mean ^a	SE	Mean ^a	SE	Mean ^a	SE	
State anxiety (STAI-State)	40.93	3.11	47.97	2.08	53.46	1.11	< 0.001***
Trait anxiety (STAI-Trait)	38.07	2.57	51.44	1.62	55.06	0.87	< 0.001***
Depression (BDI-II)	9.74	2.93	19.37	2.04	20.68	1.08	0.003**
Psychological coping (BCI)							
Self-distraction	5.35	0.37	5.01	0.25	5.93	0.14	0.005**
Active coping	5.55	0.32	5.80	0.22	6.12	0.12	0.15
Denial	3.35	0.38	3.57	0.26	3.80	0.14	0.48
Substance use	2.53	0.45	5.96	0.31	3.42	0.16	< 0.001**
Using emotional support	4.42	0.39	5.60	0.27	5.44	0.15	0.04*
Using instrumental support	4.62	0.39	5.64	0.27	5.47	0.14	0.09
Behavioral disengagement	3.81	0.41	4.82	0.28	4.60	0.15	0.12
Venting	4.26	0.34	5.18	0.23	5.17	0.12	0.04**
Positive reframing	5.95	0.37	5.58	0.25	5.70	0.13	0.70
Planning	5.61	0.30	5.83	0.20	6.10	0.11	0.21
Humor	5.03	0.38	4.46	0.26	4.56	0.14	0.43
Acceptance	6.13	0.37	5.34	0.25	5.72	0.14	0.19
Religion	4.50	0.49	4.70	0.33	4.84	0.18	0.80
Self-Blame	4.87	0.65	6.55	0.44	6.40	0.24	0.07
Obsessive beliefs (OBQ-20)							
Responsibility	23.29	1.47	22.68	1.00	22.39	0.53	0.84
Perfectionism	19.86	1.38	22.60	0.96	21.66	0.50	0.26
Control of thoughts	17.53	1.45	18.99	1.00	19.92	0.53	0.27
Threat	17.50	1.43	19.57	0.98	20.30	0.52	0.19
Alexithymia (TAS-20-C)							
Difficulty identifying feelings	17.75	1.37	20.61	0.95	21.99	0.50	0.014*
Difficulty describing feelings	14.36	0.98	16.09	0.68	16.16	0.36	0.23
Externally oriented thinking	21.24	0.97	21.50	0.67	21.60	0.35	0.94
Impulsivity (BIS-11)							
Attentional impulsiveness	15.32	0.93	17.90	0.62	18.24	0.33	0.015*
Motor impulsiveness	24.14	1.07	24.28	0.73	24.83	0.38	0.71
Non-planning impulsiveness	25.62	1.20	28.06	0.82	28.50	0.44	0.089
Sensation seeking (SSS)							
Thrill seeking	4.70	0.70	4.36	0.48	4.71	0.26	0.81
Experience seeking	4.38	0.49	4.53	0.34	4.09	0.18	0.48
Disinhibition	3.59	0.53	4.50	0.37	3.83	0.19	0.21
Boredom	2.43	0.43	2.35	0.29	2.66	0.16	0.63

SE standard error, *State/Trait STAI-Y* State/Trait Anxiety Inventory, *BDI-II* Beck Depression Inventory version II, *BCI* Brief COPE Inventory, *OBQ-20* Obsessive Beliefs Questionnaire-20, *TAS-20-C* Toronto Alexithymia Scale, *BIS-11* Barratt's Impulsivity Scale, *SSS* Zuckerman's Sensation Seeking Scale

**p* value < 0.05

***p* value < 0.01

****p* value < 0.001

^a Estimated mean

statistically significant difference in self-distraction between the control and behavioral expression groups ($p = 0.15$), or between the control and chemical expression groups ($p = 0.46$). For substance use, the chemical expression group used this coping strategy significantly more often than both the behavioral expression group ($p < 0.001$) and the control group ($p < 0.001$).

Table 3 Post hoc pairwise comparisons and estimated mean difference for variables with significant main effect of participant subgroup

	Comparison vs. chemical		Comparison vs. behavioral		Chemical vs. behavioral	
	<i>p</i> value	Between-group difference (95% CI)	<i>p</i> value	Between-group difference (95% CI)	<i>p</i> value	Between-group difference (95% CI)
State anxiety (STAI-State)	0.060	-7.04 (-14.4, 0.3)	<0.001***	-12.53 (-19.1, -5.9)	0.02*	-5.49 (-10.2, -0.8)
Trait anxiety (STAI-Trait)	<0.001***	-13.37 (-19.3, -7.4)	<0.001***	-16.99 (-22.4, -11.6)	0.05	-3.62 (-7.3, 0.3)
Depression (BDI-II)	0.007**	-9.63 (-16.6, -2.6)	0.001**	-10.95 (-17.2, -4.7)	0.57	-1.32 (-5.9, 3.3)
Psychological coping (BCI)						
Self-distraction	0.46	0.33 (-0.55, 1.21)	0.15	-0.58 (-1.38, 0.21)	0.002**	-0.92 (-1.49, -0.35)
Substance use	<0.001***	-3.43 (-4.50, -2.37)	0.067	-0.89 (-1.85, 0.06)	<0.001***	2.54 (1.85, 3.23)
Using emotional support	0.014**	-1.18 (-2.12, -0.24)	0.018**	-1.02 (-1.86, -0.18)	0.60	0.16 (-0.45, 0.77)
Venting	0.024**	-0.92 (-1.72, -0.12)	0.013*	-0.91 (-1.63, -0.20)	0.97	0.01 (-0.51, 0.53)
Alexithymia (TAS-20-C)						
Difficulty identifying feelings	0.086	-2.86 (-6.12, 0.41)	0.005**	-4.24 (-7.15, -1.32)	0.20	-1.38 (-3.50, 0.74)
Impulsivity (BIS-11)						
Attentional impulsiveness	0.021*	-2.58 (-4.76, -0.40)	0.004**	-2.93 (-4.89, -0.96)	0.62	-0.35 (-1.74, 1.04)

State/Trait STAI-Y State/Trait Anxiety Inventory, BDI-II Beck Depression Inventory version II, BCI Brief COPE Inventory, TAS-20-C Toronto Alexithymia Scale, BIS-11 Barratt's Impulsivity Scale

**p* value < 0.05

***p* value < 0.01

****p* value < 0.001

We did not observe a significant substance using difference between the behavioral expression and control groups ($p = 0.067$).

For using emotional support, we observed that the control group used this coping strategy significantly more often than both the chemical ($p = 0.014$) and behavioral expression groups ($p = 0.018$); however, there was no significant difference for the use of emotional support between the chemical and behavioral expression groups ($p = 0.60$). The control group used venting as a coping strategy significantly more often than both the chemical ($p = 0.024$) and behavioral expression groups ($p = 0.013$); we did not observe any significant difference in venting between the chemical and behavioral expression groups ($p = 0.97$).

Alexithymia As Table 2 shows, we did not observe statistically significant differences on the TAS-20-C among the control and two addiction expression groups except on the “difficulty identifying feelings” subscale ($F(2,172) = 4.41$, $p = 0.014$). The behavioral expression group evidenced significantly greater difficulty identifying feelings compared to the control group ($p = 0.005$). There was no significant difference in difficulty identifying feelings between the control and chemical expression groups ($p = 0.086$) or the behavioral and chemical expression groups ($p = 0.20$).

Impulsivity Only the attentional impulsiveness subscale in BIS-11 revealed significant differences among the control and two addiction expression groups ($F(2,172) = 4.32$, $p = 0.015$). The control group evidenced significantly lower levels of attentional impulsiveness compared to the behavioral ($p = 0.004$) and chemical expression groups ($p = 0.021$). There was no statistically significant difference in attentional impulsiveness between the chemical and behavioral expression groups ($p = 0.62$).

Obsessive Beliefs and Sensation Seeking No significant difference was observed on any of the subscales of OBQ-20 among the control and two addiction expression groups. Additionally, no significant differences were observed among the control and addiction expression groups on any of the subscales of the SSS.

Discussion

The initial data from this prospective study reveals demographic profiles of Hong Kong-based addiction treatment seekers and the distinct psychological correlates of chemical and behavioral expressions of addiction. These findings provide preliminary support for a syndrome approach to addiction treatment seekers and important information that can help to guide future service planning.

The demographic background of treatment seekers revealed a variety of complicated profiles. Many of these profiles contained details relevant to optimal treatment planning. Consistent with the evidence about intergenerational continuity of addiction (Berg et al. 2016; Sher et al. 1997), this study observed that a high proportion of treatment seekers (33.1%) had experienced a family history of addiction. Addiction treatment seekers (27%) in the study also were more likely than the comparison group to report prior psychiatric diagnoses. In general, addiction is well known for its high rate of comorbidity with other mental health problems (e.g., Hasin et al. 2007; Kessler et al. 2008; Nelson et al. 2015; Petry

et al. 2005; Shek et al. 2012). However, this Hong Kong estimate is far short of estimates reported previously. For example, using a representative national sample from the USA (Kessler et al. 2008), one study estimated a 75% psychiatric comorbidity rate among individuals with gambling disorder. However, we would expect a high estimate from this study because Kessler et al. conducted comprehensive diagnostic interviews with a representative sample of community participants to evaluate their mental health problems. Our study relied on participants' self-report of psychiatric diagnoses. Additionally, the relatively low comorbidity rate that we identified in this study might reflect a lack of access to mental health services among treatment seekers in our population, or a disinclination of treatment seekers with established psychiatric comorbidity to participate in this research project.

Previous findings show that trauma is related to addiction (Corrigan et al. 2013; Felitti et al. 1998; Hughes et al. 2017; Ilie et al. 2014; Miller et al. 2013). While the addiction treatment seekers in this study did not endorse trauma history significantly more than members of the comparison group, this circumstance might be due to the limited sample size of the comparison group. Furthermore, we collected information about trauma history in the present study at intake, allowing for the possibility that treatment seekers might have been uncomfortable about disclosing a trauma experience early in the course of treatment; if so, the current data represents an underestimate of participants' trauma-related experiences.

Treatment Seekers and Comparison Cases

As the syndrome model of addiction hypothesizes, addiction treatment seekers differ from their addiction-free comparison counterparts on a number of psychological variables. Compared to the comparison group, we identified that participants in the chemical expression and behavioral expression groups scored significantly higher on trait anxiety, state anxiety, depression, and attentional impulsiveness while scoring significantly lower on using emotional support and venting as psychological coping. Consistent with the syndrome model, these differences suggest that common psychosocial vulnerabilities across these two addiction-presenting groups are not shared with a non-addiction treatment-seeking group. The greater levels of depression and anxiety observed in both treatment groups are consistent with previous literature revealing positive associations between substance use disorders and mood and anxiety disorders (B. F. Grant et al. 2004). It is reasonable to expect that more intense levels of guilt and shame are associated with the experience of addiction. Internally, people with addiction might form and maintain an identity based on the belief that their addiction problems are rooted in personal and moralistic failure, as suggested by a traditional though outdated understanding of people with substance dependence disorder (Albanese and Shaffer 2012). Trait impulsivity also has been observed previously to be elevated among substance-dependent individuals (Ersche et al. 2010), providing support for our current finding that attentional impulsivity was higher among individuals experiencing both chemical and behavioral expressions of addiction. The finding that the comparison group scored higher on measures of using emotional support and venting as psychological coping strategies compared to both behavioral and chemical addiction treatment seekers suggests that addictive behavior can serve as a maladaptive form of coping with emotional distress and mental health problems. The experience of addiction is functional: regardless of expression, addiction seems to serve a containing function (e.g., self-medication) (Albanese 2003; Khantzian 1985, 1997; Khantzian and Albanese 2008) that limits both coping and suffering.

Behavioral and Chemical Expressions

In addition to shared experiences before and after addiction, the syndrome model recognizes the existence of unique experiences associated with each expression of addiction. The present findings reveal that, although individuals with both chemical and behavioral expressions of addiction experience greater trait anxiety compared to those without addiction, state anxiety appears to be elevated uniquely for those suffering from behavioral expressions of addiction compared to those with chemical expressions of addiction. A possible explanation for this observation is differentially stigmatizing public perceptions of behavioral addiction compared with chemical expressions of addiction (Konkolý Thege et al. 2015). With higher levels of stigma limiting social support, the process of confronting behavioral expressions of addiction can be especially difficult and anxiety-provoking. Previous literature has suggested higher prevalence of alexithymia among substance use disorder populations (Morie et al. 2016). Interestingly, in the present study, while the behavioral expression group endorsed significantly greater difficulty identifying feelings compared with the comparison group, individuals in the chemical expression group were not significantly different from either the behavioral or comparison groups on any aspect of alexithymia. More research is needed to determine whether this finding represents a unique experience associated with behavioral expressions of addiction, or is an anomaly associated with this sample or the relatively small sample size of the chemical expression groups.

The finding that the use of substances as a coping mechanism was significantly more common among the chemical expression of addiction treatment seekers compared to both the behavioral expression treatment seekers and comparison groups might appear to be tautological. However, we also can understand this finding through the lens of coping theory (Lazarus 1993; Lazarus and Folkman 1984; O'Driscoll 2013) which suggests that substance use is a form of self-medication (Khantzian 1985, 1997; Khantzian and Albanese 2008). The use of psychoactive substances to cope might distinguish those who use substances and those who eventually develop addiction to substances.

Compared with the chemical group, the behavioral expression of addiction group used self-distraction as a psychological coping strategy significantly more; however, there was no difference observed between the comparison group and either of the addiction treatment-seeking groups. This finding might indicate that individuals in the chemical and behavioral groups represent different places along the typical range of this coping strategy. It could be that individuals experiencing behavioral expressions of addiction self-distract by engaging with their object of addiction; alternatively, perhaps those with chemical expressions use psychoactive substances to cope directly instead and, consequently, do not need to use self-distraction frequently. A previous study with Chinese adolescents suggests that maladaptive self-distraction is a mediator of problematic Internet use (Mai et al. 2012). In the context of substance use, however, self-distraction is often viewed as an adaptive coping mechanism. Use of self-distraction was negatively associated with marijuana use in an American college student population (Weiss et al. 2017) and has been employed as a technique in treatment of substance use disorders (Ashe et al. 2015). Further investigation and replication of this observation is needed to clarify this phenomenon.

Project Feasibility

Finally, this study demonstrated that integrating a research protocol with clinical practice is both feasible and useful for generating treatment-relevant data that staff can use to improve the

delivery of clinical services within a mental health treatment setting. Often, intake and other data is available for such use in clinical settings, but never gets considered for research activities because of time constraints and other conflicting commitments. This project shows that clinicians can collect and evaluate key psychosocial measures during a busy clinical practice.

Limitations

This study is limited by the relatively small sample size of both treatment-seeking and comparison groups. This circumstance only allowed a restricted analysis of chemical or behavioral addiction. This study could not address the extent to which different specific expressions of addiction (e.g., alcohol or other substance use disorder, sexual addiction, and gambling disorder) differ or share similarities on psychological processes. However, despite the small sample size, the statistically significant characteristics identified by this study warrant clinical attention.

Next, in Hong Kong, individuals who suffer from drug addiction tend to seek help from drug-specific treatment services. We collected the data in this study from three addiction treatment centers: two of these centers offer treatment for specific expressions of addiction (i.e., alcohol and gambling) and one offers treatment for the full range of addiction expressions, including co-occurring expressions. This situation likely contributed to an over-representation of these treatment program-associated expressions in the present data. Further, the observation that the behavioral group was significantly less likely to endorse multiple objects of addiction compared to individuals in the chemical expression group warrants further inquiry to explore whether individuals in the chemical expression group endorsing multiple addictions are experiencing behavioral expressions of addiction in addition to the presenting chemical or polysubstance expressions of addiction.

It is noteworthy that our study sample consists of a group of treatment seekers whose presenting addiction problem varied in terms of severity. The current data does not allow us to examine whether the severity of addiction problems at intake influences our results. Moreover, regarding psychological processes, the present analysis only includes baseline data from the larger ongoing longitudinal study that includes important additional data about the various domains of functioning. Although we found that chemical and behavioral expression groups scored higher than comparison cases on common psychosocial vulnerabilities, the current findings cannot establish any causal or temporal relationships between these variables and addiction treatment seeking. Future research utilizing longitudinal study designs will shed more light on whether these psychosocial vulnerabilities are antecedent or consequent to addictive behaviors. Additionally, investigating the domains of social/interpersonal or neurocognitive functioning and general health regarding these treatment seekers can yield more valuable insights about the syndrome model of addiction.

We should note that some observers might consider our choice of $\alpha = 0.05$ as a threshold for statistical significance to be a limitation. However, we intended these analyses to be exploratory. Consequently, we selected the significance level of 0.05 to identify potential findings that other clinicians and researchers can examine or verify with their own populations of interest. Others might regard the concerns about the forced choice format and reliability of Zuckerman's Sensation Seeking Scale as a limitation (Gray and Wilson 2007; Ridgeway and Russell 1980). Future studies should include additional investigation of its reliability and/or development of another scale that measures a similar construct.

Implications

The differences observed in this study between the comparison group and both groups of addiction treatment seekers lend further support to the syndrome model of addiction by suggesting common underlying psychological vulnerabilities among individuals with addiction regardless of expression—chemical or behavioral. From a clinical perspective, this contemporary conceptualization of an addiction syndrome provides valuable insights for improving treatment and advancing the scientific understanding of addiction. These common underlying psychological vulnerabilities can manifest as “shadow syndromes” (e.g., Boudreau et al. 2009) when these features do not reach the magnitude of a clinical disorder. The presence of shadow syndromes suggests that addiction treatment seekers might benefit from care by helping professionals who can assess and treat other mental health problems in addition to addiction. Moreover, in this study, the differences observed between the chemical and behavioral expression groups can serve as important starting points to continue exploring the unique experiences associated with each object of addiction.

Conclusions

This study is among the first to incorporate a large-scale, prospective, and systematic research protocol into the day-to-day operation of a Hong Kong-located cutting-edge addiction syndrome-guided treatment service that targets a range of expressions of addiction. The findings of this study provide evidence that the syndrome model of addiction has a central role in guiding research and practice. The initial findings of this study support the (1) practicality of utilizing a scientist-practitioner model of clinical practice, (2) feasibility of incorporating a longitudinal research protocol into the day-to-day functioning of an addiction treatment clinic, (3) clinical benefits for using an addiction syndrome mentality to conceptualize different expressions of an underlying addiction, and (4) view that addictive behaviors are functional and serve common underlying protective functions (e.g., self-medication).

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Conflict of Interest The authors declare that they have no conflicts of interest.

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