

A Theoretical Model of Substance Use Based on Schema Therapy Concepts

An Empirical Test Among Recreational Substance Users

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Summary

Among individuals suffering from substance use disorders (SUD), personality pathology is highly prevalent. Unfortunately, patients suffering from comorbid personality pathology benefit significantly less from usual treatments for SUD. More effective appeared, e.g., dual focus schema therapy (DFST), in which SUD and personality pathology are treated in combination. Yet, research stressed the need for further improvement of DFST. Therefore, the aim of the current study was to critically test a conceptual model of SUD, in which associations between concepts from schema therapy and substance use behavior were proposed. In this cross-sectional study, substance use, maladaptive schemas, and schema modes were assessed among recreational substance users. Results suggest that emotional pain caused by maladaptive schemas in the Disconnection & Rejection domain lead to substance use and that this relation is mediated by avoidant coping modes. Treatment implications and directions for future research are discussed.

Introduction

Among individuals suffering from substance use disorders (SUD), personality pathology is highly prevalent (Hasin et al, 2011). De Jong, Van Den Brink, Harteveld, and Van Der Wielen (1993) examined the prevalence of personality disorders among individuals who were treated for SUD in a Dutch treatment center. They reported that 78% of the individuals treated for alcohol use disorder suffered from one or more personality disorders. Among people using several substances, this prevalence was 91% with an average of 4.0 personality disorders per patient. In addition to high comorbidity, clinical observation as well as preliminary evidence suggest that substance use has a functional nature within the dynamics of the personality pathology (Ball, 1998; Kersten, 2012). That is, substances appear to have functional psychotropic effects on several traits of the personality disorder; helping to intensify antisocial tendencies or to avoid anxiety for example (Ball, 1998; Kersten, 2012). While substance use may have functional effects in the short-term, it usually increases psychological problems and can lead to SUD in the long run (Ball, 1998; Khantzian, 1989).

In line with the hypothesis of functional SUD, research indicated that regular treatments, exclusively focusing on SUD, were less likely to be effective for individuals suffering from comorbid personality pathology (Ball, 1998). Reviews suggest that treatments with a dual focus (a focus on both pathologies at the same time) are useful, if not essential, when it comes to treating personality-disordered individuals for SUD (Van Den Bosch, Verheul, Schippers & Van Den Brink, 2004; Van Den Bosch & Verheul, 2007). An evidence based treatment for personality disorders (especially for cluster B and C) is schema therapy (Bamelis, Evers, Spinhoven & Arntz, 2014; Masley, Gillanders, Simpson & Taylor, 2012; Sempertegui, Karreman, Arntz & Bekker, 2013). Therefore, Ball (2005) developed a dual focused schema therapy (DFST). Although preliminary evidence suggested that DFST is more effective than regular mono-focused treatments, Van Den Bosch and Verheul (2007) concluded, based on their review, that all current dual focus treatments (including DFST) need improvement (Ball, 2007; Roper, Dickinson, Tinwell, Booth & McGuire, 2010; Shorey, Stuart, Anderson & Strong, 2013).

To foster the necessary improvement of these dual focused therapies, and specifically of DFST, it is important to gain a better understanding of the associations between traits of personality disorders and substance use (Roper et al., 2010; Shorey, Anderson & Stuart, 2011). Although previous studies examined the *presence* of different traits of personality disorders among substance users, hitherto the possible *functional associations* of substance use behavior with these traits have hardly been subjected to empirical research. Therefore, in this study, a theoretical model (based on concepts from schema therapy) of substance use was developed and empirically tested.

Functional analysis of substance use

Studies suggested that emotional problems are highly associated with substance use (Moitra, Anderson & Stein, 2013; Witkiewitz & Villarroel, 2009). In addition, studies indicated that negative affect is an important risk-factor for relapse

(Olson, Cooper, Nugent, & Reid, 2016). Based on an extensive review, Baker, Piper, McCarthy, Majeskie, and Fiore (2004) concluded that negative affect plays a central role in substance use behavior. Theorists have postulated that individuals use substances in order to regulate negative affect, and to cope with emotional problems (Khantzian, 1989; Newcomb & Bentler, 1988), which was supported by findings suggesting that coping mediates the relation between emotional problems and substance use (Bonn-Miller, Vujanovic, Feldner, Bernstein, & Zvolensky, 2007; Min, Farkas, Minnes, & Singer, 2007; Ullman, Relyea, Peter-Hagene, & Vasquez, 2013; Wills, Sandy, Shinar, & Yaeger, 1999).

In individuals suffering from personality pathology emotional problems are hypothesized to be caused by maladaptive schemas (Young, Klosko & Weishaar, 2003). These maladaptive schemas comprise memories, emotions, cognitions, and bodily sensations, and encompass broad, pervasive themes regarding oneself and one's relationship with others. Maladaptive schemas develop in individuals who grew up in an environment where their core emotional needs were not met, whilst experiencing abuse, hostility, neglect, and/or criticism. During adolescence these schemas elaborate and become increasingly dysfunctional. The experience of thoughts, feelings, and impulses associated with these schemas is distressing and dysfunctional attempts to cope with the distress might lead to substance use (Ball, 1998; Roper et al., 2010; Young et al., 2003).

Previous studies that examined the relation between maladaptive schemas and substance use suggested that almost all schemas were associated with substance use (Brotchie, Meyer, Copello, Kidney & Waller, 2004; Roper et al., 2010; Shorey et al., 2011). Brotchie and colleagues, for example, showed that substance users score significantly higher on 11 of the 15 maladaptive schemas than a non-clinical control group. However, the lack of a-priori hypotheses in these studies might have led to statistically rather than theoretically significant findings and only provide preliminary evidence for an assumed relationship between schemas and substance use. To be able to formulate a-priori predictions about which schemas are meaningfully related to substance use, identifying negative childhood experiences that appear to be involved in the development of adult substance use is key.

Several studies examined child developmental risk factors for adult substance. Reviews, for example, showed that children raised in high-conflict families were at greater risk of using illegal substances later in life (Hawkins, Catalano & Miller, 1992; Stone, Becker, Huber & Catalano, 2012). Furthermore, parent-child interactions characterized by lack of closeness and involvement as well as childhood experiences concerning maltreatment (physical, sexual and/or emotional abuse) have been shown to significantly increase the probability of substance use later in life (Afifi, Henriksen, Asmundson & Sareen, 2012; DeBellis, 2002; Hawkins, Catalano & Miller, 1992; Stone, Becker, Huber & Catalano, 2012). Abovementioned negative childhood experiences concerning abuse and neglect are supposed to lead to the development of maladaptive schemas in the *Disconnection & Rejection* domain¹ (DR-domain) (Young et al., 2003). It is therefore hypothesized that schemas in the DR-domain are associated with substance use, or more specific, that emotional pain caused by schemas in the DR-domain leads to substance use as a way of coping.

¹ *Abandonment & Instability, Mistrust & Abuse, Emotional Deprivation, Defectiveness & Shame, and Social Isolation & Alienation*

Because it is posed that coping mediates the relation between maladaptive schemas and substance use, it is important to conceptualize this coping behavior in more detail. Young and colleagues (2003) distinguished three ways individuals can cope with maladaptive schemas; overcompensation, avoidance, and surrender. When someone is overcompensating, he or she fights the schema by thinking, feeling, behaving, and relating as though the opposite of the schema was true. When avoiding, the person arranges his or her life in such ways that the schema is never activated. When surrendering, one accepts that the schema is true and feels the emotional pain of the schema directly. At any given moment the predominant emotional and behavioral state of an individual, called a 'mode' in schema therapy, is influenced by the currently activated schemas and coping styles. Young and colleague's (2003) described four categories of modes: child modes, maladaptive coping modes, dysfunctional parent modes, and the healthy adult mode. The healthy adult mode is characterized by the absence of maladaptive schemas and coping styles. The child and dysfunctional parent modes are characterized by a surrendering coping style, while the maladaptive coping modes are characterized by either a overcompensating or an avoidant coping style.

According to Kersten (2012) substance use appears to serve the function of intensifying maladaptive coping modes. According to this theory, psychotropic effects of the substances help to intensify the avoidant coping modes², in order to avoid emotional pain, or help to intensify the overcompensating coping modes³ and thus serve to intensify narcissistic or antisocial affect and behavior. According to Kersten's theory, individual differences in dominantly present coping modes should predict differences in the type of substances individuals use and eventually might become addicted to. Kersten's theory is in line with the self-medication hypothesis, which states that the use of a certain substance is rarely at random and rather the result of an interaction between the psychotropic effect of a substance and the affective state an individual struggles with (Khantzian, 1989). In accordance with this hypothesis of coping-congruent substance use, Milkman and Frosch (1973) found that opiates strengthen the dominant defensive strategy of heroin-users to withdraw and isolate themselves, while amphetamines inflate the sense of self-worth in amphetamine users, which in turn strengthens their dominant defensive strategy of active confrontation. The authors concluded that the psychological effect of used substances is congruent with the dominant defensive strategy (or in schema theoretical terms: the coping style).

Substances that have psychotropic effects congruent with the psychological state of avoidant coping and, as proposed by Kersten (2012), may have the function of intensifying avoidant coping modes, should induce feelings of stability or rest and help an individual to avoid feelings of abandonment, assault, abuse, or grief. According to Kersten and also Unity (a Dutch drugs information institute; 2011), these psychotropic effects can be induced by the use of cannabis, opiates, sedatives, and ketamine. Substances that have psychotropic effects that are congruent with (and may intensify) overcompensating coping modes, should induce feelings of power and help an individual to commit violent or sexual offenses, to intimidate or attack others, or to cheat without moral dilemma (Kersten, 2012). According to Kersten and Unity substances that have these effects are (meth)amphetamines, cocaine, and ecstasy. Other

² *the Detached Self-Soother and the Detached Protector mode*

³ *the Self-Aggrandizer and the Bully and Attack mode*

substances, e.g., alcohol or GHB, can cause effects congruent with both coping styles, depending on the dose or mix with other substances (Unity, 2011).

It is postulated that the functional nature of substance use becomes increasingly maladaptive and eventually results in the development of SUD (Khantzian, 1989). It is proposed that schemas in the *Impaired Limits* domain (IL-domain), *Insufficient Self-Control* and *Entitlement*, play a role in the development of SUD (Ball, 1998). The schemas in the IL-domain are characterized by a deficiency in internal limits, responsibility to others, or long-term goal-orientation (Young et al., 2003). In contrast to other maladaptive schemas, the schemas in the IL-domain are related to externalizing rather than internalizing symptoms (Van Vlierberghe, Braet, Bosmans, Rosseel & Bögels, 2010). Studies have shown that externalizing behavior (as well as factors associated with this behavior such as low frustration tolerance, emotional-behavioral difficulties, impulsivity, or transgressive, deviant behavior) are linked to development of SUD (Giancola & Parker, 2001; McMahon & Luthar, 2010; Moeller, & Dougherty, 2002; Windle, 1990). Moreover, research has shown that the absence of externalizing symptoms protected against SUD, even when emotional problems were present (Colder et al., 2012). Therefore, in the current hypothetical model of substance use, it is hypothesized that the schemas in the IL-domain serve as moderators in the relation between schemas in the DR-domain and substance use.

The current study aimed to examine the theoretical model displayed in *Figure 1*. In the model an association between schemas in the DR-domain and substance use was hypothesized. This hypothesized association between schemas in the DR-domain and substance use was expected to be mediated by maladaptive coping modes. Furthermore, the strength of the association between schemas in the DR-domain and substance use was hypothesized to be moderated by the schemas in the IL-domain. Lastly, an association was expected between the maladaptive coping modes and the type of substances used; the overcompensating coping modes were postulated to be associated with the use of amphetamines, cocaine, and ecstasy, whereas the avoidant coping modes were postulated to be related to the use of cannabis, benzodiazepines, ketamine, and opiates

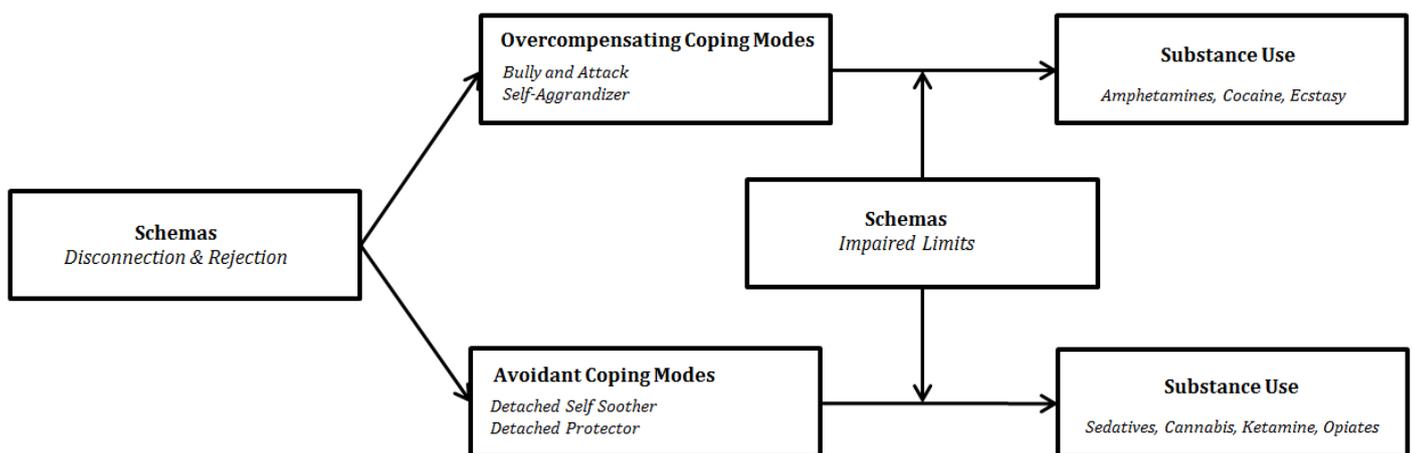


Figure 1. The moderated mediation model of schemas, coping modes and substance abuse

Methods

Participants

In order to provide a first test of the model, recreational substance users ($N = 158$) were invited to participate in this study (see procedure). Individuals were eligible for this study if they had been using substances at least once in the last 12 months. The sample consisted of 77 men (48.7%) and 81 women (51.3%) with a mean age of 25 years ($SD = 6.1$; Range = 17 - 56). Half of the participants (50.6%) met the criteria for substance dependency. Descriptive statistics are displayed in Table 1.

Table 1
Descriptive Statistics for Variables in the Sample

		%	M	SD
Age			24.82	6.10
Sex	Male	48.7		
	Female	51.3		
Educational level	High School	10.8		
	Vocational Studies	15.1		
	College	36.1		
	University	38.0		
Dysfunctionality of substance use (0-11)			3.15	2.80
Type of substances used	Cannabis	62.7		
	Opiates	7.0		
	Sedatives	17.7		
	Ketamine	28.5		
	Amphetamines	43.0		
	Cocaine	26.6		
	MDMA	65.3		
Schema modes	<i>Detached Protector</i>		1.14	0.80
	<i>Detached Self-Soother</i>		1.60	0.96
	<i>Self-Aggrandizer</i>		1.56	0.67
	<i>Bully and Attack</i>		0.71	0.62
Maladaptive schemas	<i>Emotional Deprivation</i>		0.95	1.05
	<i>Abandonment & Instability</i>		0.89	0.71
	<i>Mistrust & Abuse</i>		1.13	0.85
	<i>Social Isolation & Alienation</i>		1.36	1.05
	<i>Defectiveness & Shame</i>		0.86	0.85
	<i>Entitlement</i>		1.41	0.75
	<i>Insufficient Self-Control</i>		1.81	0.95

Note. $N = 158$

Procedure

Participants were recruited using two different methods, that is a) by advertising in substance user fora and Facebook-groups, and b) by *snowball sampling* (chain referral sampling). In the advertisement individuals were asked to take part in an online survey concerning substance use. Participants were explicitly informed that the study was confidential.

Measurements

Next to demographic data (age, sex, and educational level) substance use, schemas, and schema modes were assessed.

Assessment of Substance Use

Substance use, the outcome variable in most analyses, was operationalized as the degree of dysfunctionality of the substance use. For this measure of dysfunctionality, participants had to rate 11 statements as true or false. These statements were derived from the *Dependency & Abuse* dimension of the *Measurements in the Addictions for Triage and Evaluation* (MATE), a semi-structured clinical interview for assessment in addiction care (Schippers, Broekman & Buchholz). Scores ranged from 0 to 11 and a higher score reflected more dysfunctional use. In addition (only for the hypothesis concerning coping-congruent substance use), information was needed about which substances are used. For this purpose, an additional measure was constructed in which participants were asked to report a) what substances they used in the last 12 months, and b) how frequent they used these substances in the last 12 months on a 5-point scale, ranging from *not at all* to *more than 35 times*.

Young Schema Questionnaire– Dutch Version

The Young Schema Questionnaire (YSQ) (Young, 2005) is a self-report questionnaire indexing 16 maladaptive schemas. Items are rated on a six-point Likert scale, ranging from 1 (completely untrue) to 6 (describes me perfectly). A higher score reflects greater endorsement of dysfunctional beliefs. Examination of the psychometric properties of the Dutch YSQ suggested that the factor-structure was robust among clinical and non-clinical samples, the scales had high power to discriminate between both samples, and had sufficient to good reliability (Rijkeboer, Van Den Bergh, & Van Den Bout, 2005; Rijkeboer & Van Den Bergh, 2006). In order to limit the time needed to finish the survey, only items assessing the schemas in the DR-domain and the IL-domain were administered (95 items in total).

Schema Mode Inventory - Dutch Version

The Schema Mode Inventory (SMI) is a self-report questionnaire that can be used to assess the 14 different schema modes (Lobbestael, Van Vreeswijk, Spinhoven, Schouten & Arntz, 2010). On a six-point Likert scale, ranging from 1 (never true) to 6 (always true) one has to rate how frequently a statement describes him or her accurately. A higher score reflects greater dysfunctionality. Examination of the psychometric properties showed that this questionnaire has adequate internal consistency (Cronbach's α ranging from .79 to .96) and construct validity (Lobbestael, Van Vreeswijk, Spinhoven, Schouten, & Arntz, 2010). Only items assessing the maladaptive coping modes were administered (32 items in total).

Data analysis

Statistical analyses were conducted using SPSS (version 24). Before each analysis, assumptions were checked. When assumptions were violated, appropriate measures were taken (for a description see Results). The proposed relation between schemas in the DR-domain and substance use was examined using correlation and multiple regression analysis. For the examination of the mediation as well as the moderation hypothesis multiple regression analyses were conducted. For the hypothesis concerning coping-congruent substance use, correlation and logistic regression analyses were conducted.

Results

Hypothesis 1: Relation between schemas in the DR-domain and substance use

To assess the size and direction of the linear relationship between schemas and the dysfunctionality of substance use, correlation coefficients were computed. Since the assumption of homoscedasticity was violated, Spearman's ρ correlation was computed. In line with the expectations, analysis indicated significant positive correlations between each of the schemas in the DR-domain and substance use (Table 2).

Table 2
Spearman's Rho Correlation Coefficients for the Association Between Schemas and Substance Use

Schema	<i>R</i>	<i>p</i>
<i>Emotional Deprivation</i>	.25	<.001
<i>Abandonment & Instability</i>	.27	<.001
<i>Mistrust & Abuse</i>	.21	.01
<i>Social Isolation & Alienation</i>	.32	<.001
<i>Defectiveness & Shame</i>	.28	<.001

Note. *N* = 158

Next, standard multiple regression analysis was conducted to estimate the proportion of variance in the dysfunctionality of substance use that is accounted for by the schemas in the DR-domain. Each schema was a predictor in the analysis, and all predictors were entered into the regression equation simultaneously. The outcome variable was the sum-score on the dysfunctionality of substance use measure (score ranging from 0-11). Problems concerning heteroscedasticity were dealt with by using weighted least squares regression. After controlling for heteroscedasticity there were seven cases in which the Mahalanobis distance-scores exceeded the critical χ^2 -value for *df* = 5 (at α = .01) of 15.09. There were no valid reasons to exclude data from analysis; the deviations might exist in the general population as well⁴. The regression analysis showed that, together, the schemas accounted for a significant 16,6% of

⁴ These data were multivariate outliers due to inconsistencies in the height of the scores on the schemas in the DR-domain (some very high, some very low). In the current data sample, scores on the DR-schemas were generally very low and showed much consistency. Therefore, the cases with inconsistencies produced high Mahalanobis distance-scores. All of the scores fell within the possible range and there were no indications that they did not reflect true scores.

the variance in substance use ($R^2 = .17$, $F(5, 152) = 6.06$, $p < .001$). Examination of the individual predictors in the model showed that only the predictor *Social Isolation & Alienation* accounted for a significant proportion of unique variance ($t(152) = 2.98$, $p = .01$), the other schemas in the DR-domain did not (Table 3).

Table 3
Unstandardized and Standardized Regression Coefficients and p-values for each Predictor in a Regression Equation Predicting Substance Use

Schema	<i>B</i>	β	<i>P</i>
<i>Emotional Deprivation</i>	-.04	-.13	.30
<i>Abandonment & Instability</i>	.01	.04	.75
<i>Mistrust & Abuse</i>	< .001	< .001	.98
<i>Social Isolation & Alienation</i>	.01**	.37**	< .001
<i>Defectiveness & Shame</i>	.03	.14	.30

Note. $N = 158$ * $p < .05$ ** $p < .01$

Hypothesis 2: Mediation by coping

To examine the hypothesized mediating role of coping, several multiple regression analyses were conducted using the PROCESS-macro in SPSS (Hayes, 2013). For each of the five schemas in the DR-domain a mediation analysis was conducted. Bias corrected bootstrapping was used (5000 bootstrapping resamples, as recommended by Preacher & Hayes (2008)), so concerns regarding heteroscedasticity were dealt with. There were, however, concerns regarding outliers. Careful inspection showed that these cases were outliers due to high scores on the maladaptive schemas, coping modes or both. Outliers were not excluded because there were no indications that these cases were the result of erroneous measurement.

Before examining the proposed mediation model, associations between coping modes and substance use were examined, since not all coping modes might be significantly associated with substance use. Analysis showed that, in contrast to the expectations, only the avoidant coping modes significantly accounted for unique variance in substance use (*Detached Self-Soother*, $t(153) = 2.27$, $p = .025$, *Detached Protector*, $t(153) = 3.2$, $p < .001$). Overcompensating coping modes did not (*Bully and Attack*, $t(153) = -.01$, $p = .96$, *Self-Aggrandizer*, $t(153) = .09$, $p = .35$) and mediating properties of these coping modes were therefore not expected. Hence, only the mediating properties of avoidant coping were examined in the subsequent mediation analyses.

Emotional Deprivation

The first schema in the DR-domain that was examined in the proposed mediation model was *Emotional Deprivation*. Analysis of the association between this maladaptive schema and substance use (*pathway c*) showed that they were positively related, $F(1, 156) = 15.95$, $p < .001$, $R^2 = .09$ ($B = .09$, $\beta = .36$, $t(156) = 3.99$, $p < .001$). Examination of the relation between *Emotional Deprivation* and avoidant coping (*pathway a*) also showed a positive association, $F(1, 156) = 113.79$, $p < .001$, $R^2 = .42$ ($B = .66$, $t(156) = 10.67$, $p < .001$). Analysis of the simultaneous influence of predictor and mediator (*pathway b and c'*) showed that, together, they accounted for a significant 19% of the variance in

substance use ($F(2, 155) = 18.26, p < .001$). Examination of the individual predictors showed that avoidant coping significantly accounted for a proportion of unique variance (*pathway b*: $B = .12, t(155) = 4.33, p < .001$) while *Emotional Deprivation* did not (*pathway c'*: $B = .01, t(155) = .39, p = .69$), which suggested full mediation. The Sobel test showed that the standardized beta weight of *Emotional Deprivation* decreased significantly when coping was added to the model, $Z = 4.00, p < .001$. This supported the suggestion that coping fully mediated the relation between *Emotional Deprivation* and substance use. Results of this mediation analysis are displayed in *Figure 2*.

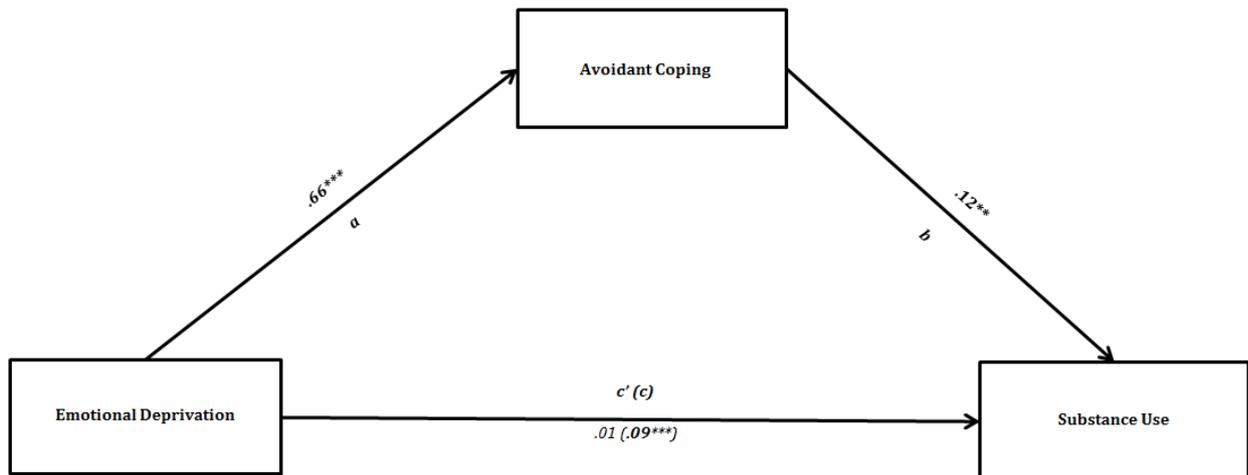


Figure 2. Direct and Indirect Effect of the Schema *Emotional Deprivation*, the Mediating Effect of Avoidant Coping

Note: * $p < .05$ ** $p < .01$ *** $p < .001$

Abandonment & Instability

The next mediation analysis examined the associations between *Abandonment & Instability*, avoidant coping and substance use. Analysis showed that *Abandonment & Instability* was positively related to substance use ($F(1, 156) = 18.57, p < .001, R^2 = .11$ ($B = .07, t(156) = 4.31, p < .001$)) as well as avoidant coping ($F(1, 156) = 114.15, p < .001, R^2 = .42$ ($B = .49, t(156) = 10.68, p < .001$)). Analysis of the regression model where *Abandonment & Instability* and avoidant coping both predicted substance use showed that they accounted for a significant 19% of the variance in substance use ($F(2, 155) = 18.55, p < .001$). Examination of the individual predictors in this regression model showed that avoidant coping accounted for a proportion of unique variance ($B = .11, t(155) = 4.08, p < .001$) while *Abandonment & Instability* did not ($B = .02, t(155) = .78, p = .44$). This suggested that avoidant coping fully mediated the relation between *Abandonment & Instability* and substance use. The Sobel test supported this suggestion ($Z = 3.80, p < .001$). Results of this mediation analysis are displayed in *Figure 3*.

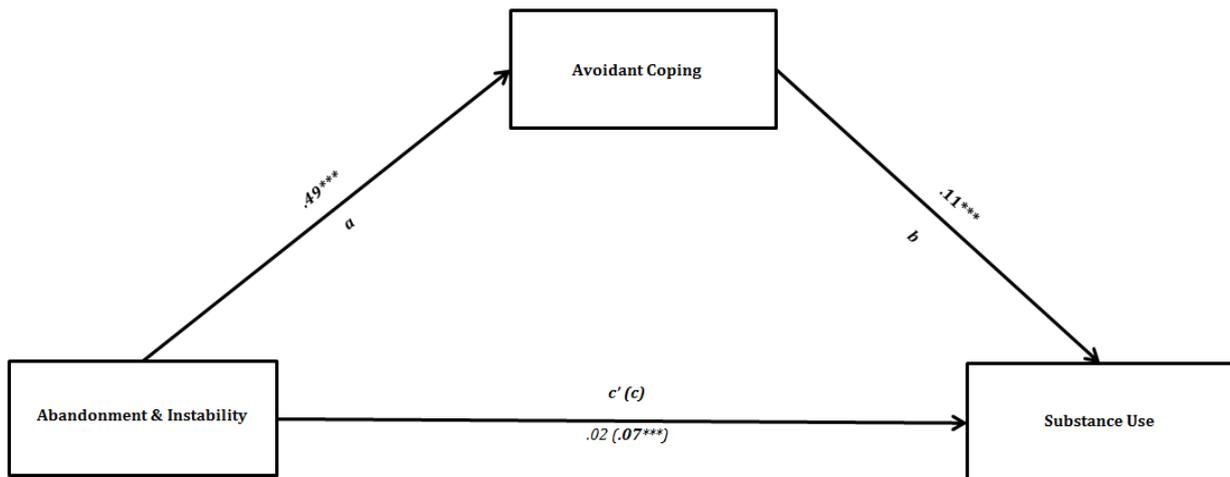


Figure 3. Direct and Indirect Effect of the Schema *Abandonment & Instability*, the Mediating Effect of Avoidant Coping

Note: * $p < .05$ ** $p < .01$ *** $p < .001$

Mistrust & Abuse

Analysis of the associations between *Mistrust & Abuse*, avoidant coping, and substance use showed that *Mistrust & Abuse* was significantly positively associated with substance use ($F(1, 156) = 21.61, p < .001, R^2 = .12 (B = .07, t(156) = 4.64, p < .001)$) as well as avoidant coping ($F(1, 156) = 121.03, p < .001, R^2 = .44, B = .44, t(156) = 11.00, p < .001$). Analysis of the simultaneous influence of predictor and mediator showed that they together accounted for a significant 20% of the variance in substance use ($F(2, 155) = 18.95, p < .001$). Examination of the individual predictors showed that only avoidant coping significantly accounted for a proportion of unique variance ($B = .11, t(155) = 3.80, p < .001$). *Mistrust & Abuse* did not account for a significant proportion of variance if avoidant coping was added to the model ($B = .02, t(155) = 1.12, p = .26$). This suggested that the relation between this maladaptive schema and substance use was fully mediated by avoidant coping. The Sobel test supported this suggestion of full mediation ($Z = 3.58, p < .001$). Results of this mediation analysis are displayed in Figure 4.

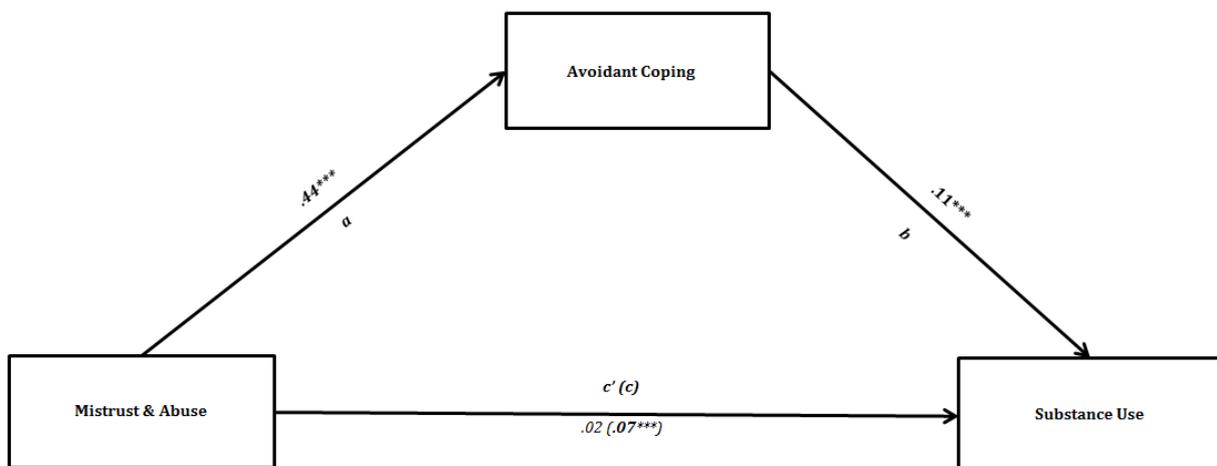


Figure 4. Direct and Indirect Effect of the Schema *Mistrust & Abuse*, the Mediating Effect of Avoidant Coping

Note: * $p < .05$ ** $p < .01$ *** $p < .001$

Social Isolation & Alienation

As for the schema *Social Isolation & Alienation*, analysis showed that this schema was positively associated with substance use ($F(1, 156) = 36.58, p < .001, R^2 = .19, (B = .12, t(156) = 6.05, p < .001)$) as well as avoidant coping ($F(1, 156) = 187.41, p < .001, R^2 = .55 (B = .67, t(156) = 13.69, p < .001)$). Analysis of the simultaneous influence of predictor and mediator showed that they accounted for a significant 22% of the variance in substance use ($F(2, 155) = 21.66, p < .001$). Examination of the individual predictors showed that avoidant coping and *Social Isolation & Alienation* both significantly accounted for a proportion of unique variance (respectively; $B = .07, t(155) = 2.37, p = .02, B = .07, t(155) = 2.38, p = .02$), which suggested partial mediation by avoidant coping. The Sobel test supported the suggestion that (partial) mediation had occurred ($Z = 2.34, p = .02$). Results of this mediation analysis are displayed in *Figure 5*.

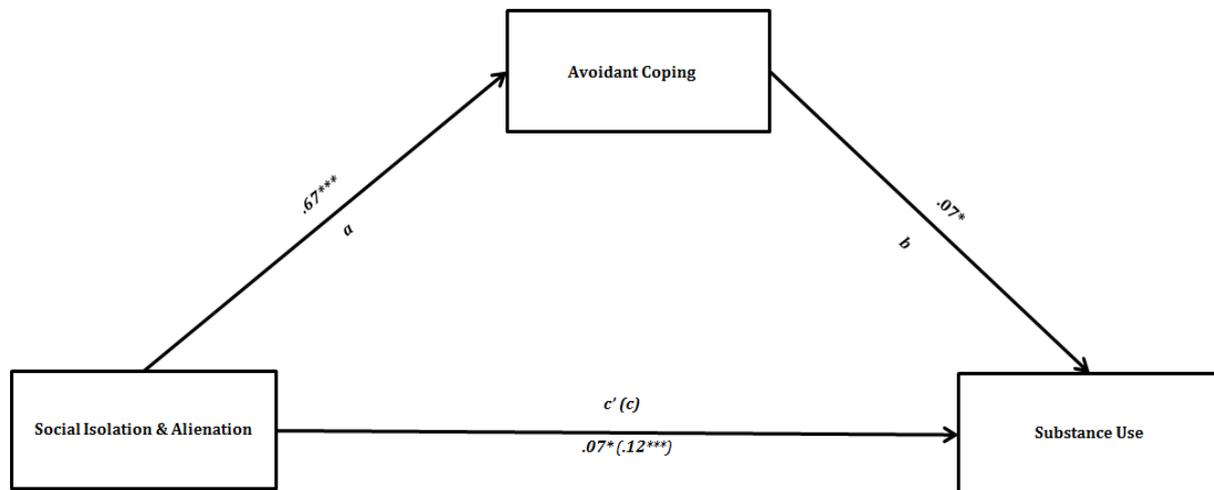


Figure 5. Direct and Indirect Effect of the Schema *Social Isolation & Alienation*, the Mediating Effect of Avoidant Coping

Note: * $p < .05$ ** $p < .01$ *** $p < .001$

Defectiveness & Shame

The last mediation analysis examined the associations between *Defectiveness & Shame*, avoidant coping and substance use. Examination of the relation between *Defectiveness & Shame* and substance use showed that they were positively associated, $F(1, 156) = 27.23, p < .001, R^2 = .15 (B = .08, t(156) = 5.22, p < .001)$. Examination of the association between *Defectiveness & Shame* and avoidant coping also indicated a positive association ($F(1, 156) = 186.19, p < .001, R^2 = .54 (B = .55, t(156) = 13.65, p < .001)$). Analysis of the simultaneous influence of predictor and mediator showed that they accounted for a significant 20% of the variance in substance use ($F(2, 155) = 19.24, p < .001$). Examination

of the individual predictors showed that avoidant coping significantly accounted for a proportion of unique variance ($B = .10, t(155) = 3.12, p = .002$). *Defectiveness & Shame* did not account for unique variance if avoidant coping was added to the regression equation ($B = .03, t(155) = 1.32, p = .19$). The Sobel test showed that the standardized beta weight of *Defectiveness & Shame* decreased significantly when coping was added to the model ($Z = 3.03, p = .002$) which suggested that coping fully mediated the relation between *Defectiveness & Shame* and substance use. Results of this mediation analysis are displayed in *Figure 6*.

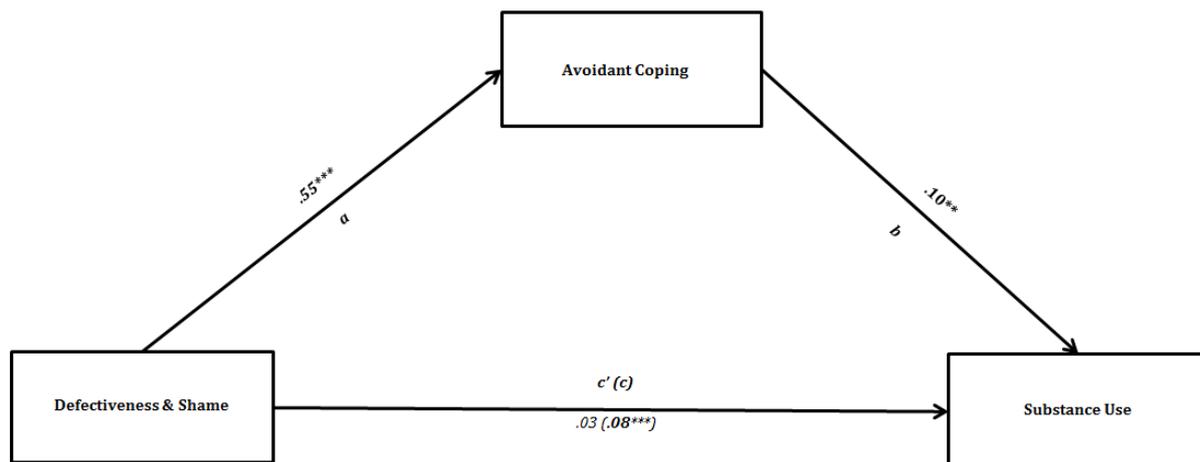


Figure 6. Direct and Indirect Effect of the Schema *Defectiveness & Shame*, the Mediating Effect of Avoidant Coping
 Note: * $p < .05$ ** $p < .01$ *** $p < .001$

Hypothesis 3: Moderation by schemas in the Impaired Limits domain

To examine the proposed moderation-model (*Figure 7*), two separate multiple regression analyses were conducted. Before conducting regression analyses, all independent variables were centered by subtracting the mean from the variable score. To test for moderation, the independent variables were entered into the regression equation first (step 1), the interaction variable second (step 2).

The proposed moderating effect of *Entitlement* was analyzed first. The assumption of homoscedasticity was violated, so weighted least squares regression was conducted. After controlling for heteroscedasticity there were six outliers; cases where the Mahalanobis distance-scores exceeded the critical χ^2 for $df = 3$ (at $\alpha = .01$) of 11.34. After careful inspection of the outliers there were no valid reasons to exclude data from analysis; the deviations might exist in the

population as well⁵. Analysis showed that schemas and *Entitlement* significantly predicted substance use, $F(2, 155) = 14.36, p < .001, R^2 = .16$. Adding the interaction term into the model did not result in a significant increase in the variance accounted for by the model ($\Delta F(1, 154) = .007, p = .94$). These results were indicative of no moderation effect of *Entitlement* on the relation between schemas and substance use.

The second moderation-analysis examined the proposed moderating effect of *Insufficient Self-Control*. Again weighted least squares regression was conducted because of violation of the assumption of homoscedasticity. After controlling for heteroscedasticity there were five outliers; cases where the Mahalanobis distance-scores exceeded the critical χ^2 for $df = 3$ (at $\alpha = .01$) of 11.34. After careful inspection of the outliers there were, again, no valid reasons to exclude data from analysis⁶. Analysis showed that schemas in the DR-domain and *Insufficient Self-Control* significantly predicted substance use ($R^2 = .18, F(2, 155) = 16.58, p < .001$). Adding the interaction term into the model did not result in a significant increase in the variance accounted for by the model ($\Delta F(1, 154) = .007, p = .26$). These results were indicative of no moderation effect of *Insufficient Self-Control* on schemas and substance use. A summary of the examination of both proposed moderators is presented in Table 4.

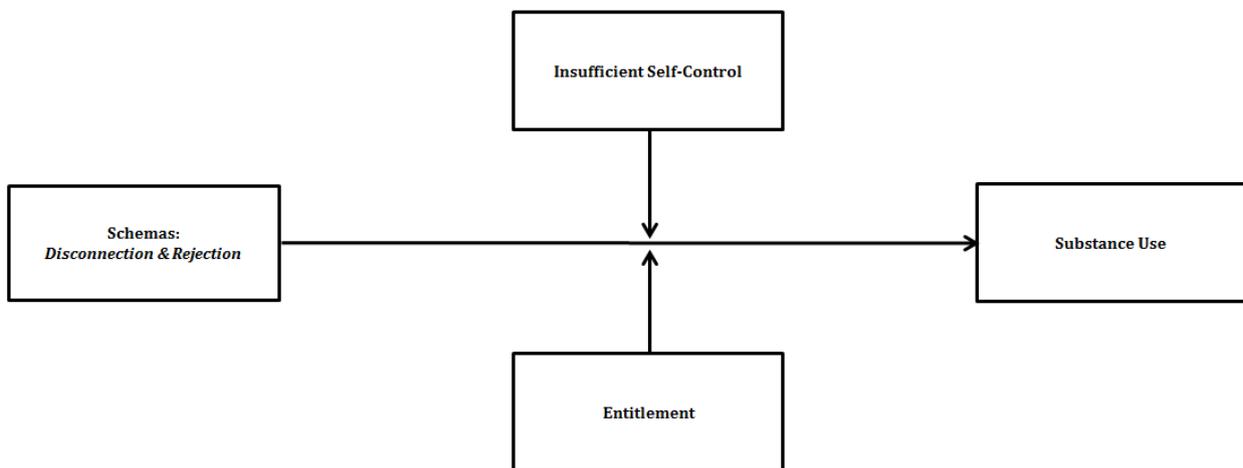


Figure 7. Proposed Moderating Effect of *Insufficient Self-Control* and *Entitlement* of the Relation between Schemas within the *Disconnection & Rejection* Domain and Substance Use

⁵ Three cases were outliers due to a very high score on *Entitlement*, resulting in extreme scores on the interaction variable. Two cases were outliers due to low scores on *Entitlement* in combination with extremely high scores on schemas in the DR-domain, also resulting in extreme values on the interaction variable. One case was an outlier because of very low scores on substance use, schemas in the DR-domain, and *Entitlement* in combination with an average score on the interaction variable. None of the scores fell outside the possible range, and there were no indications to assume that they did not reflect true scores.

⁶ In four cases the high Mahalanobis distance scores were due to a high score on *Insufficient Self-Control* as well as on schemas in the DR-domain, resulting in extremely high values in the interaction variable. One case was an outlier due to an extremely low score on *Insufficient Self-Control* as well as on the schemas in the DR-domain. All of the scores fell within the possible range and there were no indications that they did not reflect true scores.

Table 4

Results of the Examination of the Proposed Moderators in the Relation Between Schemas and Substance Use

		Model 1		Model 2	
		β	t-value	β	t-value
Analysis 1 Entitlement	Schemas Disconnection & Rejection	.26***	2.67***	.26**	2.52**
	Entitlement	.18	1.89	.18	1.89
	Schemas Disconnection & Rejection x Entitlement	x	x	-.01	-.08
<i>Model Summary</i>	F-Value	14.36***		9.51***	
	R ²	.16		.16	
	Δ F-Value	x		.01	
	Δ R ²	x		.00	
Analysis 2 Insufficient Self-Control	Schemas Disconnection & Rejection	.16	1.59	.12	1.09
	Insufficient Self-Control	.29	2.79	.18	2.61
	Schemas Disconnection & Rejection x Insufficient Self-Control	x	x	.10	1.13
	<i>Model Summary</i>	F-Value	16.58***		11.50***
	R ²	.18		.18	
	Δ F-Value	x		1.27	
	Δ R ²	x		.00	

Note. N = 158 *p < .05 ** p < .01 *** p < .001

Hypothesis 4: Coping-congruent substance use

To examine the associations between coping modes and type of substances used, correlation was computed. Because the scores on all variables (except *Detached Self-Soother*) were not normally distributed (skewness statistics⁷ ranging from moderate to high), bivariate Spearman's ρ correlation coefficients were computed to examine the relation between the use of substances and coping modes. Examination of the correlation coefficients showed that the *Detached Protector* mode correlated significantly with three of the seven substances; with Cannabis ($r(156) = .27, p < .01$), Sedatives ($r(156) = .22, p < .01$) and Amphetamines ($r(156) = .24, p < .01$). The *Detached Self-Soother* mode on the other hand did not correlate significantly with the use of any of the substances. As for the overcompensation coping modes, both significantly positively correlated with the use of Opiates (*Bully and Attack*, $r(156) = .23, p < .01$, *Self-Aggrandizer*, $r(156) = .18, p < .05$). All correlation coefficients are presented in Table 5⁸.

Each significant association between coping modes and use of a certain substance was examined more closely using logistic regression analyses (one for each significant association). For this analysis a new (dependent) variable was computed, the use of a substance on a dichotomous scale (user versus non-user). Examination of the statistically significant associations showed that every increase in the *Detached Protector*-score increased the odds of Cannabis

⁷Skewness statistics: Substance use (1.02), Bully and Attack (1.54), Self-Aggrandizer (.75), Detached Self-Soother (.38), Detached Protector (1.00)

⁸ Significant correlation coefficients are bold, the background of expected associations is highlighted

use with factor 1.94 ($R^2_N = .07$, $\chi^2(1) = 8.51$, $p = .004$), the use of Sedatives with factor 2.0 ($R^2_N = .08$, $\chi^2(1) = 7.95$, $p = .005$) and the use of Amphetamine with factor 1.75 ($R^2_N = .06$, $\chi^2(1) = 7.32$, $p = .007$). As for the other significant associations, every increase in the *Bully and Attack*-score increased the odds of Opiate use with factor 2.65 ($R^2_N = .07$, $\chi^2(1) = 8.51$, $p = .004$), the *Self-Aggrandizer* showed not to be a significant predictor of the use of Opiates based on the logistic regression analysis ($\chi^2(1) = 3.81$, $p = .051$).

Table 5
Spearman's rho Correlation Coefficients for Coping Modes and Substances

		CAN	OPI	SED	KET	AMP	COC	MDM
Coping mode	Bully and Attack	.04	.23**	.13	-.02	-.03	-.10	<-.001
	Self-Aggrandizer	.02	.18**	.10	-.01	.11	.05	-.01
	Detached Self-Soother	.12	.04	.10	-.02	.14	-.03	.11
	Detached Protector	.27**	.06	.22**	.11	.24**	.08	.05

CAN = Cannabis, OPI = Opiates, SED = Sedatives, KET = Ketamine, AMP = Amphetamines, COC = Cocaine, MDM = MDMA
Note. $N = 158$ * $p < .05$ ** $p < .01$

Discussion

A theoretical model of substance use was developed and empirically tested. In this model it was hypothesized that schemas in the *Disconnection & Rejection* domain are related to substance use, that this relation is mediated by coping and that the schemas in the *Impaired Limits* domain moderate the strength of the relation between schemas in the DR-domain and substance use. In addition, a relation between coping modes and types of used substances was expected.

The data supported the hypothesis that schemas in the DR-domain are related to substance use. This is in line with previous findings that suggested that maladaptive schemas play an important role within the dynamics of substance use (Ball, 2007; Brotchie et al., 2004). Moreover, this is consistent with theories that suggest that schema in the DR-domain are important internal triggers for substance use (Ball, 1998; Roper et al., 2010). The cross sectional design of this study however limits statements regarding causality. Analysis of the mediation model suggested that coping modes largely mediated the relationship between schemas in the DR-domain and substance use. The data suggested that only the avoidant coping modes mediated this relationship. The support for mediation by avoidant coping nicely corroborates with the theory that substance use may have the function of avoiding emotional pain and anxiety, which is how substance use is traditionally conceptualized in the schema mode model (Young et al., 2003).

An additional interesting finding was that one of the schemas in the DR-domain, *Social Isolation & Alienation*, explained unique variance in substance use. This suggested that the nature of the relationship between this schema and substance use differed from the nature of the relationship between the other schemas in the DR-domain and

substance use. Results from the mediation analysis also corroborate with this finding. While avoidant coping fully explained the relationship between most schemas in the DR-domain and substance use, the relationship between *Social Isolation & Alienation* and substance use was only partially explained by avoidant coping. *Social Isolation & Alienation*, which comprises the feeling that one is isolated from the rest of the world and one is not part of any community (Young et al., 2003), also seemed to be directly related to substance use. This is in line with previous research which suggested that social factors play an important role in substance use; extensive reviews established that social factors such as isolation, loneliness, social exclusion, and alienation play a key role in (the etiology of) substance use disorders (Hawkins et al., 1992; Tarter, 2002). These additional findings suggest that SUD-patients may benefit from interventions addressing social risk-factors and, in light of dual focus schema therapy (DFST), from interventions specifically targeting the schema *Social Isolation & Alienation*.

Contrary to the expectations, results did not support the hypothesis regarding the mediating role of overcompensating coping in the relation between schemas in the DR-domain and substance use. There were no significant associations between the overcompensating coping modes and substance use. Hence, the results seemed to suggest that the overcompensating coping modes do not play a role in substance use. However, results indicated that overcompensating coping modes were not highly prevalent among recreational users. It is important to note that the generally low scores on overcompensating coping modes, and therefore low variance, limited the possibility to detect a 'true effect'. That is, due to low variance, there might not have been enough statistical power to detect associations between the overcompensating coping modes and substance use. Examination of this hypothesized association in a sample of individuals suffering from personality pathology and/or SUD (where scores on maladaptive schemas and coping modes presumably show more variance) might result in alternative findings.

Also no support was found for the proposed moderating properties of the schemas in the IL-domain. That is, the schemas within the IL-domain did not significantly affect the strength or direction of the association between schemas in the DR-domain and substance use. *Entitlement* seemed not to be related to substance use in any way. This is in line with the findings from a study by Brotchie and colleagues (2004), which showed that *Entitlement* was one of the maladaptive schemas that was not significantly higher among substance users compared to non-clinical individuals. The current study also ruled out moderating properties of this maladaptive schema. As for the moderating properties of the maladaptive schema *Insufficient Self-Control*, current findings also did not support the theory that this schema affects the strength or direction of the relation between schemas in the DR-domain and substance use. However, contrary to *Entitlement*, the *Insufficient Self-Control* schema seemed to be strongly related to substance use, which corroborates with previous research findings (Brotchie et al., 2004; Shorey et al. 2013).

Lastly, current findings only partially supported the hypothesis of coping-congruent substance use. The *Detached Protector* mode seemed to be related to Cannabis and Sedative use (not with the other expected substances; Opiates and Ketamine) and, contrary to the expectations, also to Amphetamine use. These findings suggested that Cannabis, Sedatives, and Amphetamines may be used when individuals attempt to cut off strong feelings. In addition, these

findings suggested that these substances may be used in a mental state in which the individual feels bored, empty or depersonalized. However, due to the cross-sectional design of this study, it is not possible to conclude whether these substances are indeed used in the *Detached Protector* mode or if the association between the *Detached Protector* mode and the use of these substances should be explained otherwise. Furthermore, the *Bully and Attack* mode seemed to be related to opiate use, which was not hypothesized. This suggests that opiates may be used when individuals attempt to put themselves in a dominant position by threatening and intimidating in order to prevent being hurt by others. Again, due to the cross sectional design, it is not possible to conclude if opiates are indeed used in the *Bully and Attack* mode or whether this reflects an association that should be explained otherwise. The *Detached Self-Soother* mode, although related to substance use in general, seemed not to be significantly associated with the use of one or more specific substances. The *Self-Aggrandizer* mode seemed not to be associated with substance use in general. Again, it is important to note that the low variance of scores on coping modes limited the possibility to detect associations (i.e., not enough statistical power). In addition, concerning functional substance use, it is important to note that general inferences about the function(s) of a substance should be made with caution. As stated by Bon-Miller and colleagues (2007), individuals might use the same substance for a different reason or a different substance for a same reason. In each individual patient the function of the use of a substance must be carefully examined.

A limitation of this study was the cross-sectional nature of the design, which limited statements about causality. Furthermore, findings have to be interpreted cautiously because of outliers. These outliers (which were not the result of erroneous data) show once more that individuals can differ greatly from the general population. It is important to acknowledge the heterogeneous nature of substance use (Grella, Hser, Joshi & Rounds-Bryant, 2001; Merikangas et al., 1998). The most important limitation is that a sample of recreational drug users was used instead of personality-disordered individuals in treatment for SUD. As mentioned, the sampling of recreational drugs users resulted in low variance of scores on measures of psychopathology (maladaptive schemas, coping modes), limiting the statistical power to detect associations. In addition, it remains questionable to which extent the current findings can be generalized to personality disordered individuals suffering from SUD. With regard to these limitations, this study should be seen as a first test of associations between substance use, schemas, and schema modes. Future research should examine relevant associations between substance use, schemas, and schema modes using a clinical sample.

In conclusion, this first empirical test of associations between schema related concepts and substance supports the suggestion that the use of substances has a functional nature. That is, substance use seems to enhance attempts to cope with (or rather avoid) emotional pain. Although more research is needed, the current findings give a first hint that SUD-treatment (for individuals suffering from comorbid personality pathology) should target maladaptive schemas in the DR-domain and facilitate more adaptive coping behavior. In this study, associations were found despite low statistical power due to low variance in scores. This means that the weak and moderate positive associations that were found in this study may, in fact, be strong associations when examined in a clinical sample. Moreover, the currently non-significant associations might prove to be significant when examined in a clinical sample. Future research in a clinical sample has to show whether this is indeed the case.

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