Drug and Alcohol Dependence 195 (2019) 132–139

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

journal homepage: www.elsevier.com/locate/drugalcdep

Full length article

The role of emotion dysregulation in the relation of childhood trauma to heroin craving in individuals with heroin dependence

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ARTICLE INFO

Keywords:
Childhood trauma
Heroin craving
Difficulties in emotion regulation
Individuals with heroin dependence

ABSTRACT

Objectives: Difficulties in emotion regulation (DER) may be important in heroin craving in individuals with heroin dependence who have experienced childhood trauma (CT). However, no research has been performed on DER in the context of heroin dependence. The aim of this study was to evaluate direct and indirect relations of CT to the subscales of heroin craving (i.e., heroin thoughts and interference, intention to use heroin and control of its consumption, and resistance to thoughts and decisions to use heroin) via DER dimensions in individuals with a DSM diagnosis of heroin dependence.

Methods: In a cross-sectional design, 330 males with heroin dependence completed the Childhood Trauma Questionnaire-Short Form (CTQ-SF), the Difficulties in Emotion Regulation Scale (DERS), the Obsessive-Compulsive Drug Use Scale-Form Heroin (OCDUS-Form Heroin), and the Depression Anxiety Stress Scales (DASS).

Results: The results revealed that CT had no direct relations to the subscales of heroin craving, but it indirectly was related to all three subscales of heroin craving via one of the DER dimensions named limited access to emotion regulation strategies (*Strategies*) after adjusting for demographic and clinical factors.

Conclusions: The findings suggest that *Strategies* may be related to heroin craving in individuals with heroin dependence who have CT. This proposes that treatment and prevention attempts focused on training the use of effective emotion regulation strategies may be useful to reduce heroin craving in individuals with heroin dependence who have experienced a history of CT.

1. Introduction

Craving as a multidimensional factor is a tendency or obsession to consume substance or alcohol over a long time (Franken et al., 2002; Franken, 2003). It is viewed as a diagnostic criterion or core characteristic of dependence for substance use disorders (SUDs) (American Psychiatric Association, 2013). Childhood trauma (CT) may be a significant factor related to heroin use. CT includes the aspects of childhood abuse and neglect such as emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect (Bernstein et al., 2003). In this regard, it has been found that CT is related to psychopathology (Khosravani et al., 2017a) such as heroin use (Li et al., 2012; Gerra et al., 2014) so that approximately 93% of individuals with heroin use show a history of CT (Schwaninger et al., 2017). Also, CT has been found to be higher in heroin users than normal controls (Gerra et al., 2014; Schwaninger et al., 2017), as well as, associated with heroin injection (Roy et al., 2003; Ompad et al., 2005; Quinn et al., 2016) and SUDs (Allem et al., 2015; Ross et al., 2015; Wardell et al., 2016; Banducci et al., 2017, 2018; Browne et al., 2018; Shin et al., 2018; Weiss et al., 2018; Kiburi et al., 2018). However, the mechanism through which CT influences substance use remains unclear (Edalati and Krank, 2016; Mason et al., 2017; Shin et al., 2018). In this regard, difficulties in emotion regulation (DER) are among possible mechanisms linking CT to later psychopathology (Jennissen et al., 2016) and presumably substance use.

As a concept developed by Gratz and Roemer (2004), DER is examined via the Difficulties in Emotion Regulation Scale (DERS; Gratz and Roemer, 2004). The DERS involves six dimensions related to non-adaptive emotion regulation (ER): non-acceptance of emotional responses (*Non-acceptance*), limited access to emotion regulation

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https://doi.org/10.1016/j.drugalcdep.2018.12.008
Received 3 November 2018; Received in revised form 2 December 2018; Accepted 11 December 2018
Available online 04 January 2019

strategies (*Strategies*), lack of emotional awareness (*Awareness*), impulse control difficulties (*Impulse*), lack of emotional clarity (*Clarity*), and difficulties engaging in goal-directed behaviors (*Goals*). The DER has been associated with addictive behaviors (Tull et al., 2012; Casale et al., 2016; Ghorbani et al., 2017; Lutz et al., 2018), smoking, and alcohol craving (Szasz et al., 2012; Khosravani et al., 2017b). Also, it has been shown that *Strategies* predict alcohol-related problems (Simons et al., 2017). Further, it has been found that individuals with a history of heroin dependence have low use of adaptive emotion regulation (Xin et al., 2014). In addition, Rogers et al. (2018) have shown the correlations of *Strategies* and *Goals* with smoking.

Several studies have reported that DER mediates the association of CT or other psychological factors with substance use. For example, Wolff et al. (2016) have revealed that DER mediates the relation of CT to later substance dependence. Another study has shown that CT indirectly affects alcohol use severity and alcohol problems via DER in patients with posttraumatic stress disorder (Dutcher et al., 2017). Also, Mandavia et al. (2016) have revealed that DER mediates the link of CT to substance use. Likewise, Oshri et al. (2015) have indicated that CT has an indirect effect on substance use through *Impulse*. Further, Poole et al. (2017) have concluded that CT indirectly affects disordered gambling via DER. Moreover, Veilleux et al. (2014) have indicated that *Clarity* and *Strategies* mediate the association of negative affect with drinking to cope with negative affect. Furthermore, Khosravani et al. (2017b) have suggested that *Strategies* mediate the relations of positive affect and negative affect to alcohol craving in alcohol-dependent patients. In addition, Moody et al. (2017) have found that *Strategies* and *Impulse* mediate the link of gay-related discrimination to drug dependence.

It should be noted that all the above-mentioned studies were performed on samples with substance or alcohol use, except for heroin users. Also, these studies were performed on normal samples (e.g., Oshri et al., 2015), small samples (n = 105 for assessing mediating roles) (e.g., Wolff et al., 2016), or different predictive variables (i.e., positive and negative affect and gay-related discrimination), except for CT (e.g., Veilleux et al., 2014; Khosravani et al., 2017b; Moody et al., 2017). In addition, most of these studies (e.g., Wolff et al., 2016; Mandavia et al., 2016; Poole et al., 2017; Dutcher et al., 2017) considered total DER, but not distinct DER dimensions. In this regard, it has been shown that distinct DER dimensions may differentially link to substance use (Adams et al., 2012; Tull et al., 2016; Weiss et al., 2013) as well as psychopathology or psychological problems in the presence of CT (Berzenski, 2018). Hence, the examination of distinct DER dimensions in individuals with heroin dependence may determine specific DER dimensions associated with heroin craving. Accordingly, the current research as a novel research aimed to assess direct and indirect relations of CT to the subscales of heroin craving (i.e., heroin thoughts and interference, intention to use heroin and control of its consumption, and resistance to thoughts and decisions to use heroin) through DER dimensions.

According to the literature, we hypothesized that CT would relate to the subscales of heroin craving through specific DER dimensions in individuals with heroin dependence. Also, we assessed this hypothesis by adjusting for age, education, marital status, way of heroin use, age of onset of heroin use, duration of heroin use, depression, anxiety, and stress as covariates. In the same vein, CT has been found to associate with age of onset of heroin use (Li et al., 2012), depression, anxiety (Huh et al., 2017), and stress (Han et al., 2016). Also, DER has been shown to link to depression (Nickerson et al., 2015). Further, depression and anxiety have been found to relate to substance use (Goldner et al., 2014).

Table 1
Demographic and clinical characteristics in patients with heroin dependence (n = 330).

Characteristics/ variables	Mean ± SD or *n* (%)
Age, years	34.38 ± 9.59
Education, years	10.87 ± 7.26
Marital status	
Single	155 (47%)
Married	114 (34.5%)
Divorced	61 (18.5%)
Age of onset of heroin use, years	22.10 ± 6.42
Duration of heroin use, years	11.84 ± 7.59
Way of heroin use	
Smoking	179 (54.2%)
Injection	33 (10%)
Both smoking and injection	118 (35.8%)
History of psychological treatments	
Yes	101 (30.6%)
No	229 (69.4%)

Note. SD = standard deviations.

2. Methods

2.1. Participants

Three hundred and thirty male treatment-seeking patients (age range = 15–65 years, mean age = 34.38 years) diagnosed with heroin dependence according to the DSM-IV diagnostic criteria were selected for inclusion in the present study. Interviews with heroin users were performed after the detoxification period, i.e., 2–3 weeks after the last day of heroin use. Exclusion criteria were physical and neurological illnesses as well as psychotic symptoms. The sample of this research only included males because during the research period just nine female patients with heroin dependence referred to the hospital, so we decided to exclude them from the study since it might lead to bias. All participants were taking medications at the time of assessment, 30.6% of participants had a previous history of psychological treatments, but they did not receive any additional treatment or psychotherapy during detoxification. This study was approved by the Medical Ethics Committee of Shahid Beheshti University of Medical Sciences (Code of Medical Ethics: IR.SBMU.RETECH.REC.1396.415).

2.2. Assessments

2.2.1. The DERS (Gratz and Roemer, 2004)

The DERS as a 36-item self-report instrument examined six dimensions of emotion regulation problems including *Non-acceptance*, *Goals*, *Impulse*, *Awareness*, *Strategies*, and *Clarity*. It is rated on a five-point Likert scale from 1 to 5. The Persian version of the DERS (Mazaheri, 2015) was used in this study. Also, the Cronbach's alphas for the total scale and its dimensions including *Non-acceptance*, *Goals*, *Impulse*, *Awareness*, *Strategies*, and *Clarity* were .81, .68, .78, .75, .61, .72, and .70 respectively in the present study.

2.2.2. The childhood trauma questionnaire-short form (CTQ-SF; Bernstein et al., 2003)

The CTQ-SF is a 28-item self-report instrument to evaluate five subscales including sexual abuse, physical abuse, emotional abuse, physical neglect, and emotional neglect. The CTQ-SF is rated on a five-point Likert scale from 1 (never true) to 5 (very often true). In the present research, the Persian version of the CTQ-SF developed by Garrusi and Nakhaee (2009) was used. The Cronbach's alphas for the total scale and its subscales such as sexual abuse, physical abuse, emotional abuse, physical neglect, and emotional neglect were .89, .84, .79, .74, .80, and .75 respectively in this study.

Table 2
Means, standard deviations, and zero-order correlations for DER dimensions, depression, anxiety, stress, CT, and heroin craving in patients with heroin dependence (n = 330).

	1	2	3	4	5	6	7	8	9	10	11	12	13
DER subscales													
1- Strategies	–												
2- Non-acceptance	.55**	–											
3- Goals	.54**	.51**	–										
4- Impulse	.61**	.55**	.61**	–									
5- Awareness	.18**	.26**	.11*	.20**	–								
6- Clarity	.34**	.27**	.27**	.44**	.38 **	–							
7- Depression	.49**	.34**	.36**	.47**	.24**	.39**	–						
8- Anxiety	.48**	.27**	.34**	.46**	.22**	.37**	.64**	–					
9- Stress	.56**	.35**	.44**	.47**	.20**	.31**	.64**	.65**	–				
Heroin craving subscales													
10- Heroin thoughts and interference	.30**	.11*	.21**	.25**	.12*	.20**	.26**	.15**	.29**	–			
11- Intention to use heroin and control of its consumption	.36**	.22**	.19**	.29**	.13*	.25**	.30**	.11*	.27**	.24**	–		
12- Resistance to thoughts and decisions to use heroin	.26**	.11*	.22**	.20**	.12*	.19**	.17**	.13*	.23**	.21**	.23**	–	
13- CT	.25**	.22**	.14**	.29**	.31**	.40**	.08	.27**	.15**	.23**	.38**	.22**	–
M	22.11	16.51	14.74	16.74	18.97	14.00	10.85	10.18	10.65	9.45	7.07	2.71	67.24
SD	5.58	4.70	3.42	4.07	4.50	3.43	4.11	4.19	4.03	4.78	3.39	1.97	15.62

Note. M = means; SD = standard deviations; DER = difficulties in emotion regulation; strategies = limited access to emotion regulation strategies; non-acceptance = non-acceptance of emotional responses; goals = difficulties engaging in goal-directed behaviors; impulse = impulse control difficulties; awareness = lack of emotional awareness; clarity = lack of emotional clarity; CT = childhood trauma.

* $p < .05$.

** $p < .01$.

2.2.3. Obsessive compulsive drug use scale-form heroin(OCDUS- form heroin; Franken et al., 2002)

This scale is a 12-item self-report tool based on the Obsessive Compulsive Drinking Scale (OCDS) (Anton et al., 1996) to measure heroin dependence and heroin craving given obsessive thoughts during the past week (Franken et al., 2002). It assesses three subscales including heroin thoughts and interference (6 items), intention to use heroin and control of its consumption (4 items), and resistance to thoughts and decisions to use heroin (2 items). The OCDUS-Form Heroin ranges from 0 to 4. In the present research, the Persian version of the OCDUS-Form Heroin (Hassani-Abharian et al., 2016) was used. The Cronbach's alphas for the total scale and its subscales including heroin thoughts and interference, intention to use heroin and control of its consumption, and resistance to thoughts and decisions to use heroin were .83, .72, .62, and .61 respectively in the current study.

2.2.4. Depression anxiety and stress scales (DASS-21; Lovibond and Lovibond, 1995)

The DASS-21 is a 21-item self-report scale designed by Lovibond and Lovibond (1995) which measures depression (7 items), anxiety (7 items), and stress (7 items). Each participant responds to each item from 0 (at all) to 3 (completely correct). We used the Persian version of the DASS-21 designed by Asghari et al. (2008) in the present study. The Cronbach's alphas for the total scale and its subscales of depression, anxiety, and stress were .86, .67, .69, and .66 respectively in the current research.

2.3. Statistical analysis

Pearson's correlation was used to assess the relationships among the variables. Also, we used a structural equation modeling (SEM) using LISREL 8.8 (Jöreskog and Sörbom, 1996) to examine the roles of DER dimensions in the associations between CT and the subscales of heroin craving by adjusting for the mentioned covariates. The model fit was evaluated by χ^2/df, the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the adjusted goodness-of-fit index (AGFI). $\chi^2/df < 3$, CFI > .85, GFI > .90, AGFI > .85, and RMSEA < .10 indicate an acceptable fit (Schermelleh-Engel et al., 2003; Kline, 2015).

Also, Preacher and Hayes' macro PROCESS (Hayes, 2013) via using bootstrapping with 5000 resamples in SPSS-22 for Windows (IBM Corporation, Armonk, NY, USA) was used to assess possible significant direct and indirect relations of CT to the subscales of heroin craving through DER dimensions by adjusting for the mentioned covariates. If the 95% confidence interval (*CI*) does not include zero, this will reveal significant direct and indirect relations (Hayes, 2013).

3. Results

Participant demographic and clinical factors are presented in Table 1. Also, the means, standard deviations, and correlations are reported in Table 2. The results of Pearson's correlation showed significant positive associations of CT, all DER dimensions, depression, anxiety, and stress with all three subscales of heroin craving ($p < .01$) (see Table 2 for more details).

Fig. 1 shows the roles of DER dimensions in the relationships between CT and the subscales of heroin craving by adjusting for the mentioned covariates. The fit indices for the model showed an acceptable fit. The fit indices for the model were $\chi^2 = 1471.19$, $df = 700$, $\chi^2/df = 2.1$, CFI = .87, GFI = .96, AGFI = .93, RMSEA = .081, 90% CI = 0.078–0.084. The findings showed that CT had no direct relations to the subscales of heroin craving. CT significantly predicted all DER dimensions such as *Strategies* ($\beta = .29$, $p < .001$), *Non-acceptance* ($\beta = .22$, $p < .01$), *Impulse* ($\beta = .29$, $p < .001$), *Awareness* ($\beta = .31$, $p < .001$), and *Clarity* ($\beta = .40$, $p < .001$), except for *Goals* ($\beta = .08$, $p > .05$). Also, among DER dimensions, only *Strategies* significantly predicted all subscales of heroin craving including heroin thoughts and interference ($\beta = .35$, $p < .001$), intention to use heroin and control of its consumption ($\beta = .40$, $p < .001$), and resistance to thoughts and decisions to use heroin ($\beta = .34$, $p < .001$). Among covariates, age of onset of heroin use ($p < .01$), duration of heroin use ($p < .01$), way of heroin use ($p < .01$), depression ($p < .01$), and stress ($p < .05$) were significantly related to the subscales of heroin craving. These findings suggested that CT was not directly associated with the subscales of heroin craving, but it was indirectly related to the subscales of heroin craving through *Strategies*.

In the current study, the 95% CI for direct and indirect associations of CT to the subscales of heroin craving via DER dimensions by adjusting for covariates were assessed through Preacher and Hayes' macro PROCESS by using bootstrapping with 5000 resamples. The results

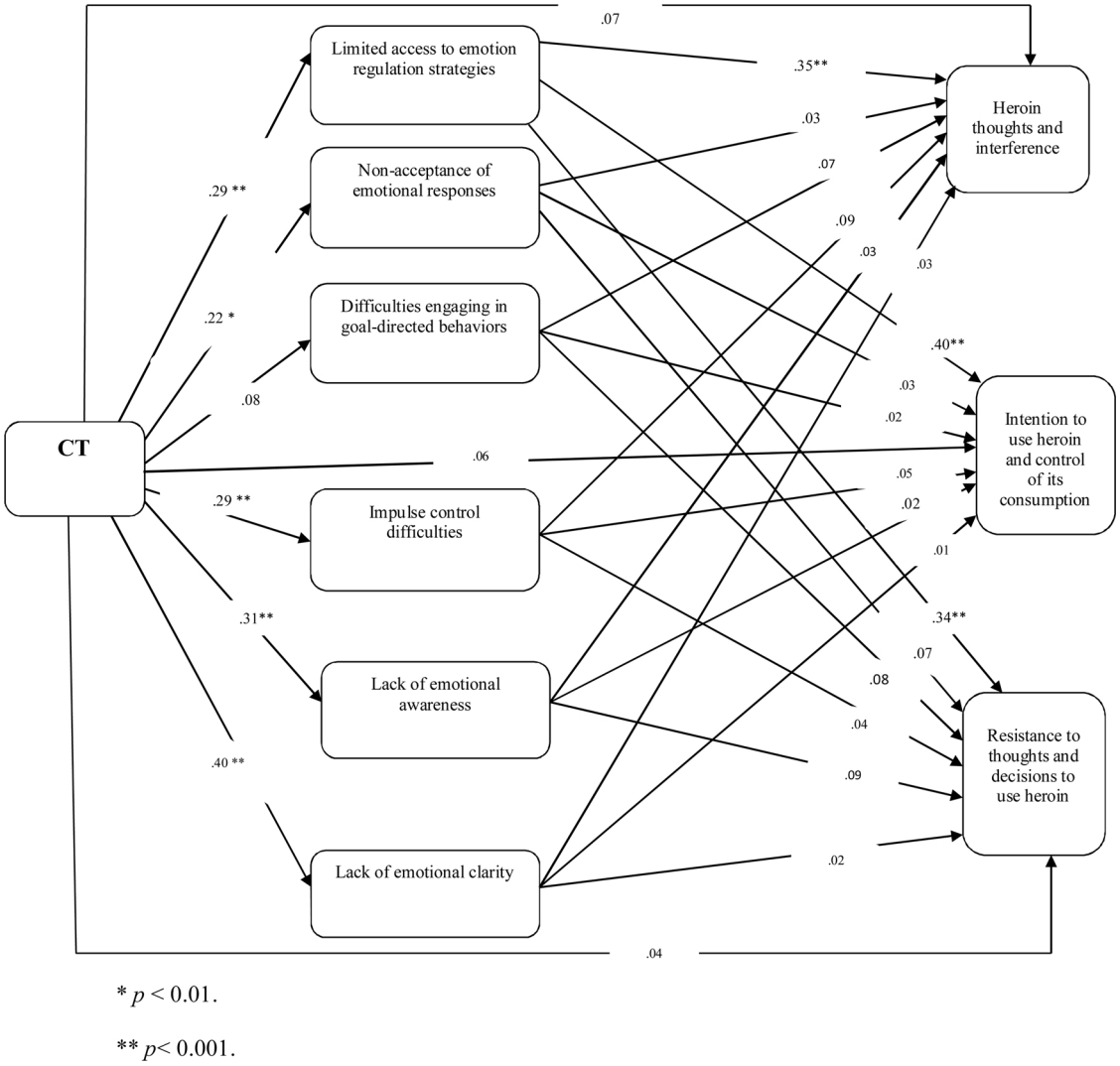

Fig. 1. Standardized regression weights for the roles of DER dimensions in the relations of CT to the subscales of heroin craving. Age, education, marital status, way of heroin use, age of onset of heroin use, duration of heroin use, depression, anxiety, and stress were included as covariates on heroin craving subscales, with effects not pictured, but described in text.
DER = difficulties in emotion regulation; CT = childhood trauma.
* p < 0.01.
** p < 0.001.

showed that CT had no direct relations to the three subscales of heroin craving. CT had indirect relations to all subscales of heroin craving including heroin thoughts and interference (β = .10, bootstrap *SE* = .01, 95% *CI* = .05–.16), intention to use heroin and control of its consumption (β = .16, bootstrap *SE* = .04, 95% *CI* = .12–.30), and resistance to thoughts and decisions to use heroin (β = .09, bootstrap *SE* = .01, 95% *CI* = .04–.12) through *Strategies* (Table 3). According to the findings, the hypothesis of this study was confirmed in the level of indirect relations of CT to the subscales of heroin craving via *Strategies*.

4. Discussion

This study examined direct and indirect relations of CT to the subscales of heroin craving through DER dimensions in individuals with heroin dependence. The results of the current research showed that CT was not directly related to the subscales of heroin craving but was indirectly related to all three subscales of heroin craving via *Strategies* after adjusting for clinical and socio-demographic factors. Similar to the present study, a history of CT has been found to associate with heroin use, injection drug use, and other substance use (Roy et al., 2003; Ompad et al., 2005; Gerra et al., 2014; Quinn et al., 2016; Schwaninger et al., 2017; Cohen et al., 2017; Mason et al., 2017; Banducci et al., 2017, 2018). Further, research has shown that *Strategies* are associated with substance/alcohol use and its related problems and affect them (Veilleux et al., 2014; Khosravani et al., 2017b; Simons et al., 2017; Moody et al., 2017; Rogers et al., 2018;). In addition, it has been shown that CT is indirectly related to substance use disorders via total DER (Oshri et al., 2015; Wolff et al., 2016; Mandavia et al., 2016; Dutcher et al., 2017; Poole et al., 2017).

In a longitudinal study, Kim and Cicchetti (2010) have found that CT is related to DER. They have also emphasized that ER may be a risk factor or a protective mechanism in the relation of CT to later psychopathology. This may indicate that CT is indirectly related to heroin craving through inhibiting the use of effective ER strategies in the present research. A possible interpretation is that individuals who experience neglect and abuse during childhood could not learn from their caregivers how to successfully modulate emotions. As a result, these difficulties in ER continue into adulthood and hurt coping with psychological distress and consequently result in psychopathology. Therefore, individuals with heroin dependence who have experienced

Table 3
Direct and indirect relations of CT to the subscales of heroin craving through DER dimensions.

		Effect	SE_{boot}	BC 95% bootstrapped CI	
				Lower	Upper
CT [a]	Direct effect	.03	.02	−.01	.03
	Total indirect effect	.13*	.01	.10	.25
	Limited access to emotion regulation strategies	.10*	.01	.05	.16
	Non-acceptance of emotional responses	.01	.01	−.02	.001
	Difficulties engaging in goal-directed behaviors	.002	.002	−.02	.01
	Impulse control difficulties	.02	.01	−.0001	.03
	Lack of emotional awareness	.001	.01	−.01	.02
	Lack of emotional clarity	.001	.01	−.02	.02
CT [b]	Direct effect	.03	.02	−.03	.05
	Total indirect effect	.18*	.01	.15	.38
	Limited access to emotion regulation strategies	.16*	.04	.12	.30
	Non-acceptance of emotional responses	.001	.003	−.01	.01
	Difficulties engaging in goal-directed behaviors	.001	.002	−.01	.003
	Impulse control difficulties	.003	.01	−.01	.01
	Lack of emotional awareness	.01	.01	−.001	.02
	Lack of emotional clarity	.0001	.01	−.01	.01
CT [c]	Direct effect	.02	.01	−.03	.002
	Total indirect effect	.11*	.03	.06	.16
	Limited access to emotion regulation strategies	.09*	.01	.04	.12
	Non-acceptance of emotional responses	.003	.002	−.01	.0002
	Difficulties engaging in goal-directed behaviors	.003	.002	−.01	.0003
	Impulse control difficulties	.002	.003	−.01	.01
	Lack of emotional awareness	.004	.003	−.002	.01
	Lack of emotional clarity	.001	.004	−.01	.01

Note. BC = bias corrected. CI = confidence interval; DER = difficulties in emotion regulation; CT = childhood trauma.
* Confidence intervals not including zero.
[a] Direct and indirect relations of CT to heroin thoughts and interference through DER dimensions.
[b] Direct and indirect relations of CT to intention to use heroin and control of its consumption through DER dimensions.
[c] Direct and indirect relations of CT to resistance to thoughts and decisions to use heroin through DER dimensions.

CT may have maladaptive behaviors such as heroin craving as a strategy to relieve or regulate unpleasant emotions and thoughts stemmed from CT due to limited access to effective ER strategies. In line with these assumptions, Holl et al. (2017) have suggested that individuals with CT use substance as a coping strategy to cope with the shame resulted from CT. Also, it has been reported that smoking and drinking may be considered as emotion dysregulation strategies to decrease negative affect or enhance positive affect (Carter et al., 2008; Simons et al., 2017). Further, Dragan (2015) and Veilleux et al. (2014) have revealed that alcohol use may be a strategy to cope with unpleasant negative affect due to limited access to effective strategies. In addition, it has been shown that *Strategies* associate with elevated experiential avoidance, willing to avoid or escape from unpleasant internal experiences (Fergus et al., 2013; Gratz and Roemer, 2004), and low distress tolerance (Bardeen et al., 2015; McHugh et al., 2013). Therefore, heroin craving or heroin use may be a maladaptive strategy to cope with unbearably unpleasant affect derived from childhood trauma.

Substance-dependent individuals with CT have shown unpleasant trauma-relevant emotions (Holl et al., 2012). Also, CT has shown to be indirectly related to depressive symptoms via *Strategies* (Nickerson et al., 2015). Therefore, the results of the current study proposed that individuals with heroin dependence may have unfavorable CT-related emotions and have not access to effective ER strategies to regulate these emotions and consequently negative affect (e.g., depression, anxiety, and stress which were tested in our study) develop in these individuals. The DERS items examining *Strategies* are closely connected to depression (e.g., “when I'm upset, I believe that I'll end up feeling very depressed”). So, these individuals may have high heroin craving or use as a strategy to cope with negative affect stemmed from distressing trauma-related emotions as well as *Strategies*. It has been concluded that individuals with CT have increased negative affect which mediates the associations of CT with heavy drinking and drug use (Weiss et al., 2018). Also, heroin use or other addictive behaviors may be non-adaptive coping strategies aimed to self-medicate, regulate or release unpleasant affect (Hodgins et al., 2010). Other studies have suggested that CT is indirectly related to various psychiatric disorders through DER (Hopfinger et al., 2016; Michopoulos et al., 2015; Stevens et al., 2013; Nickerson et al., 2015; Peh et al., 2017; Gordon et al., 2016; Miles et al., 2015; Gaher et al., 2013). Therefore, based on these studies and the current research, DER especially *Strategies* may be a linking mechanism in the relation of CT to heroin craving in individuals with heroin dependence.

This study may have some implications. Theoretically, contrary to several studies that have assessed direct and indirect relations of CT to substance/alcohol use and other addictive behaviors via total DER (Wolff et al., 2016; Dutcher et al., 2017; Poole et al., 2017; Mandavia et al., 2016), the present study suggested that among six DER dimensions, *Strategies* affect the indirect relations of CT to the subscales of heroin craving in individuals with heroin dependence. This finding proposes that distinctive patterns of DER may be differently associated with various SUDs such as heroin in the presence of CT experiences. Similar to our findings, it has been found that in individuals who experienced CT, various DER dimensions are differently related to psychopathology (Berzenski, 2018). Also, Nickerson et al. (2015) have found that distinctive dimensions of DER are related to different psychological problems.

Clinically, training the use of effective emotion regulation strategies may be helpful to prevent heroin craving in individuals with heroin dependence. Therefore, emotion-focused cognitive therapeutic interventions such as the integrative training of emotional competencies (ITEC; Berking, 2008) that trains the use of ER strategies and also the skills training in affective and interpersonal regulation (STAIR, Cloitre et al., 2002) that targets ER and interpersonal deficits of victims of childhood abuse may be effective. Also, acceptance and commitment therapy (Hayes et al., 1999) may be helpful in reducing trauma-related emotions (Görg et al., 2017) and CT severity in individuals with a history of CT (Spidel et al., 2018a, 2018b) as well as enhancing the

ability to modulate emotional reactions.

This research has numerous limitations. First, this study was a cross-sectional design which did not allow for any causal conclusions. Thus, longitudinal studies are needed to support the findings of this study. Second, the use of self-report instruments may lead to bias in participant responses. Third, the findings rely on a sample of treatment-seeking outpatients and may not be generalized to other individuals with heroin dependence. Fourth, all individuals with heroin dependence were males. So, these findings cannot be generalized to females with heroin dependence. Fifth, comorbid psychiatric disorders which are important in substance use (Daigre et al., 2015) were not controlled. Finally, the sample of this study was very homogeneous which limited the generalizability of results, and there was no comparison group to clarify whether these relationships were specific to individuals with heroin dependence. Therefore, a comparison between individuals with heroin dependence and other clinical and nonclinical samples concerning DER dimensions and CERSs are needed in future studies.

5. Conclusions

The results of this study support that *Strategies* may lead to heroin craving in heroin users with childhood trauma. The findings suggest that training the use of effective emotion regulation strategies may prevent heroin craving in individuals with heroin dependence that have experienced a history of CT.

Contributors

All authors were involved in the statistical analyses and data collection of the study. All authors contributed and have approved the final manuscript.

Funding

This research has been extracted from a research project supported by Shahid Beheshti University of Medical Sciences, Tehran, Iran (Grant number: 11959).

Conflict of interest

No conflict declared.

Acknowledgements

The authors would like to thank the Clinical Research Development Unit (CRDU) of Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran for their support, cooperation, and assistance throughout the period of study.

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