# **Desire thinking: A new target for treatment**

# **of addictive behaviors?**

**Review Article**

Word count (all sections included): 5,584

Revision 1

Gabriele Caselli a,b,c,\* Marcantonio M. Spada b

a Studi Cognitivi, Modena, Italy

b Division of Psychology, School of Applied Sciences, London South Bank University, London, UK

c Sigmund Freud University, Milan, Italy

\* Correspondence should be addressed to: Gabriele Caselli, Studi Cognitivi, Cognitive Psychotherapy School, Viale Giardini 472/L, 41100 Modena, Italy, e-mail [g.caselli@studicognitivi.net](mailto:g.caselli@studicognitivi.net).

**Abstract**

Behavioural and cognitive therapies for addictive behaviors have shown clinical utility however many patients continue to experience residual symptoms particularly craving, a major precipitating factor in relapse. In the current paper we review the role of a desire-related cognitive elaboration, termed desire thinking, which has been found to play an important role in the perpetuation and escalation of both craving and addictive behaviors. We argue that novel treatment approaches, rooted in metacognitive therapy, may help to interrupt the perseveration of desire thinking and improve the well-being of populations suffering from addictive behaviors.

Key words: addictive behaviors; craving; desire thinking; metacognitions.

**1. Introduction**

Cognitive and behavioural therapies have been demonstrated to be effective in reducing addictive behaviors (e.g. APA, 2013; Carroll, 2000; McCrady, 2000; McGovern & Carroll, 2003) however many patients continue to experience residual symptoms of which craving, in particular, has consistently been found to be a predictor of relapse ([Anton, 1999](http://www.sciencedirect.com/science/article/pii/S0306460312001335#bb0020), [Breese et al., 2011](http://www.sciencedirect.com/science/article/pii/S0306460312001335#bb0065), [Drummond, 2001](http://www.sciencedirect.com/science/article/pii/S0306460312001335#bb0105), [Marlatt, 1978](http://www.sciencedirect.com/science/article/pii/S0306460312001335" \l "bb0205), [Shadel et al., 2011](http://www.sciencedirect.com/science/article/pii/S0306460312001335" \l "bb0275)). Targeting craving thus remains of central importance in the successful long-term treatment of addictive behaviors (O’malley, Krishnan-Sarin, Farren, Sinha & Kreek, 2002; Paille et al., 1995; Oei, Raylu & Casey, 2010).

For the purposes of the current paper, we define craving as the subjective experience of an urge or desire to seek out and achieve a target, or practice an activity, in order to reach its desired effects (Marlatt, 1978). Craving can manifest in multiple ways including as intrusive thoughts (Beck, Wright, Newman & Liese, 1993), a drive or motivation (Cox & Klinger, 2002), substance wanting (Robinson & Berridge, 1993), an emotional state (Tiffany & Wray, 2009), a physical sensation (Paulus, 2007), or a stress response (Sinha & Li, 2007).

From a neurobiological perspective craving is believed to be directly influenced by neural systems (Robinson & Berridge, 1993). From an affective perspective craving has been conceptualised as an epiphenomenon of addictive conditioning processes of two general classes: those that emphasize withdrawal and those that emphasize the addictive behaviour’s positive-incentive properties (Skinner & Aubin, 2010). From a cognitive perspective it has been suggested that higher-order cognitive functioning and information processing configurations are instrumental in activating and exacerbating craving as opposed to craving being an autonomic state or primal drive (Tiffany, 1999). These models have emphasized the role of expectancies (Goldman & Rather, 1993; Marlatt & Gordon, 1985; Stacy, 1997), propositional networks (Baker, Morse & Sherman, 1987) and problem-solving aspects of interrupted addictive sequences (Tiffany, 1999).

Another cognitive theory proposed an integrated model for the understanding of automatic (conditioned) and voluntary cognitive processes in the experience of desire. This theory, the Elaborated Intrusion (EI) theory of desire (May, Andrade, Panabokke & Kavanagh, 2004; Kavanagh, Andrade & May, 2005; Kavanagh, May & Andrade, 2009), suggests that a variety of external and internal triggers can lead to the activation of automatic associations that contain information about a desired target or activity (e.g. its positive consequences or a felt sense of deprivation). When these associations intrude into awareness they are perceived as spontaneous and activate an elaborative process which magnifies the initial intrusion through the activation of associative memory networks, especially in the form of sensory imagery that reminds the individual of the pleasure associated with what they desire (Bywaters, Andrade & Turpin, 2004; Witvliet & Vrana, 1995). This form of elaborative process has been conceptualized as a general desire-related cognitive process, not a peculiar feature of craving.

While these perspectives provide valuable explanations of individual components of desire or craving, they do not provide a framework for understanding the escalation and dysregulated perseveration of craving. Such framework may be provided by the metacognitive perspective (Wells, 2008; Spada, Caselli, Nikcevic & Wells, 2015). From this perspective, the escalation and persistence of craving is dependent on a specific and distinctive form of cognitive elaboration termed ‘desire thinking’ (Caselli & Spada, 2010) that is driven by metacognitive knowledge. Desire thinking has been shown to be pathological in nature, being directly linked to the intensification of the craving experience and associated behavioural dysregulation.

**2. Desire Thinking**

Desire thinking has been conceptualised as a conscious and voluntary cognitive process orienting to prefigure images, information and memories about positive target-related experience (Caselli & Spada, 2010). Evidence has demonstrated that desire thinking is bi-dimensional in nature, with imaginal prefiguration and verbal perseveration components (Caselli & Spada, 2011). Imaginal prefiguration refers to the allocation of attentional resources to target-related information and a multi-sensory elaboration in the form of anticipatory positive imagery or positive target-related memories recall. Verbal perseveration refers to prolonged self-talk regarding worthwhile reasons for engaging in target-related activities and their achievement.

Desire thinking thus involves the active and controlled processing of the pleasant consequences of achieving a desired target, reviewing good reasons for reaching it and mentally planning how to do so (Caselli & Spada, 2010; 2015). Generally controlled processes occur in three circumstances: (1) during the acquisition of any new skill; (2) in the presence of an unexpected obstacle which hinders a behavioural sequence goal directed sequence; and (3) during the monitoring and control (e.g. inhibition) of an activated automatized sequence (Schneider & Shiffrin, 1977). In view of this, the awareness of a preference (the experience of desire) may emerge because of: (1) an attempt to prepare a response when unexpected information about availability of the target have been provided by the environment; (2) an attempt to overcome obstacles to the completion of a well-known behavioural sequence; or (3) an attempt to prevent the execution of an automatized behavioural sequence (e.g. when individuals try to remain abstinent).

**3. Craving and Desire Thinking: Differences and Causal Relationships**

In view of the above a key question emerges: is there evidence that craving and desire thinking are separate constructs? Theoretically we have argued for this separation in that craving broadly describes an internal motivational experience and desire thinking can be conceptualized as conscious and intentional target-related form of information processing (Caselli & Spada, 2011).

In support of this view, research has shown that thinking about a desired target is closely linked to levels of craving (Green, Rogers & Elliman, 2000; Tiffany & Drobes, 1990) and induces physiological change similar to what is induced by direct experience (Bywaters, Andrade & Turpin, 2004; Witvliet &Vrana, 1995). Evidence has also emerged that desire thinking facets are active during a craving episode in individuals with alcohol abuse, nicotine dependence and problematic gambling (Caselli & Spada, 2010). In addition desire thinking has been found to: (1) have a significant effect on craving across a range of addictive behaviors in a community sample (Caselli, Soliani & Spada, 2013); (2) predict craving in alcohol abusers independently from level of alcohol use (Caselli & Spada, 2011); and (3) vary proportionally across the continuum of drinking and smoking behaviour controlling for gender, age, negative affect and craving (Caselli, Ferla, Mezzaluna, Rovetto, Spada, 2012; Caselli, Nikčević, Fiore, Mezzaluna & Spada, 2012). Desire thinking has also been shown to predict levels of problematic gambling in a clinical sample, independently from gender, negative affect and craving (Fernie, Caselli, Giustina, Donato, Marcotriggiani & Spada, 2014). On similar lines desire thinking predicts category membership as a problematic Internet user and levels of problematic Internet use controlling for weekly Internet use, negative affect and craving (Spada, Caselli, Slaifer, Nikčević & Sassaroli, 2014). Finally, a test on the possible structural overlap between desire thinking and craving measures showed that craving-related items loaded on a different factor compared to desire thinking factors, sustaining only a moderate correlation between these two constructs (Caselli & Spada, 2011). These findings support the distinction between craving and desire thinking in addition to highlighting the role of desire thinking in generating an escalation in frequency and intensity of craving.

**4. Desire Thinking and Other Forms of Extended Thinking**

A further question that arises from the definition of desire thinking as a conscious and intentional target-related form of information processing is whether it differs, and if so how, from other forms extended thinking (rumination and worry). Desire thinking is a form of extended thinking and shares with both rumination and worry several facets. These include a self-focused attentional orientation, a perseverative nature, low levels of awareness about the voluntary nature of its activation (and consequently a low perception of control of it) and a negative impact on the down-regulation of emotional states.

However, despite these similarities, desire thinking possesses several distinctive features as a form of extended thinking. These include a greater proportion of imagery-based elaboration and a more concrete focus on decision-making and planning instrumental behaviour rather than engagement in abstract thinking. In addition, desire thinking appears to produce different emotional and behavioural outcomes from rumination and worry; namely craving versus the experience of anxiety or depression, and behavioural engagement versus behavioural avoidance. Finally, divergent validity with the related construct of extended thinking was demonstrated by desire thinking components correlating less than 0.3 with measures of rumination and worry (Caselli & Spada, 2011).

In addition, desire thinking appears to be similar to but conceptually different from other generic desire elaboration processes like sensory imagery. Firstly, desire thinking has been shown to be a verbal and perseverative form of reasoning about the desire experience itself, its meaning and decision to approach the target. Secondly it has been linked not only to craving but also to behavioural dysregulation. Thirdly, it has also been shown to discriminate between everyday desire and pathological craving (Caselli & Spada, 2015).

**5. The Possible Neurobiological Basis of Desire Thinking**

Desire thinking is a complex experience and its neuroanatomical basis, as emerging from clinical observation, brain-imaging, and laboratory data should be considered speculative. Desire-related information appears to be processed by the orbitofrontal cortex (OFC), anterior cingulate cortex (ACC) and nucleus accumbens (NAcc) in response to target-related cues. External context, negative internal states and other enteroceptive cues can modulate this processing through the activity of hippocampus, basolateral amygdala and insula. These are the primary brain sites where drugs of abuse can act and play a role along all three stages of addictive beahviour: binge/intoxication, withdrawal/negative affect, anticipation/craving (Koob & Volkow, 2010).

A further core brain region that appears to be involved the experience of craving is the dorsolateral prefrontal cortex (DLPC). The DLPC is stimulated by: (1) sensory information (e.g. substance related stimuli), from the frontal cortex; (2) affect (e.g. anger, stress, guilt, etc.) from the amygdala and nucleus accumbens; and (3) evaluative information about levels of risk and reward from the orbitofrontal cortex that exert control over behaviour. The DLPC sends information back to the nucleus accumbens that may become more sensitized to future substance cues (e.g. Kalivas, Cornish & Ghasemzadeh, 1998) and to basal ganglia that may maintain craving because of its role in repetitive thinking (Anton, Moak & Latham, 1995). The DLPC is widely believed to be crucial to addictive behaviour processes because of its dominating role in executive control, decision-making, planning of actions, delay of gratification and in representation of contingencies, outcomes, internal states and their evaluation. These are all activities that could be a part of the conscious process of desire thinking.

In support of this view, recent research unveiled the central role of DLPC hyperactivity on levels of craving that a smoker experienced when told that he would be able to smoke a cigarette (Hayashi, Ko, Strafella & Dagher, 2013). This condition increased levels of craving that were associated to the activity of DLPC. In addition, the use of transmagnetic stimulation to inactivate the DLPC during cue exposure showed that: (1) it prevents the increase in craving; and (2) this is achieved through the modulation of other brain regions like the OFC and ACC that appeared significantly attenuated when the DLPC was inactive. Findings thus showed how the hyperactivity of DLPC in response to target-related cues increases and prolongs craving through the modulation of other brain regions. Considering the key role of DLPC in decision making and planning activity, it could be possible to speculate that: (1) its activity would be the neurobiological counterpart of desire thinking; and (2) the engagement in desire thinking as a response to a target-related cue exposure may increase and prolong activity of primary addiction brain sites.

**6. Desire thinking and Self-regulation Failures**

Findings about the mutual relationship between desire thinking and craving and their relative impact on addictive behaviors gives rise to a further question: does desire thinking influence, and if so how, self-regulation failures? Addictive behaviors are characterised by the difficulties individuals encounter in attempting to resist the impulse to enact a behaviour which guarantees gratification or reward irrespective of the knowledge of its medium to longer term costs. This is a failure in the exercise of self-regulation.

Much evidence regarding self-regulatory failures fits a model of strength depletion (Baumeister, Heatherton & Tice, 1994; Muraven, Tice & Baumeister, 1998) according to which a consecutive exertions of self-regulation were characterized by deteriorating performance, even though the exertions involved seemingly unrelated spheres. For example, resisting craving for a desired target or activity can produce a psychic cost that hinder following self-regulatory attempts, even for unrelated task (e.g. perseveration in frustrating task). These findings suggest that exertions of self-control deplete some limited resource. An exertion of this strength temporarily exhausts it but it also presumably recovers after a period of rest and can be implemented with practice like a muscle (Muraven, Tice & Baumeister, 1998).

The process of self-regulatory strength depletion is a common experience of human being and does not explain individual differences in levels of craving and inclination to long-term relapse. One implication of the notion of increasing strength is that people may become better at practicing effective self-regulation over time through practice, but a great proportion of individuals with addictive related problems tend to experience chronic inclination to relapse after previously failed quit attempt (e.g. Zhou, Nonnemaker, Sherrill, Gilsenan, Coste & West, 2009).

A possible additional hypothesis is that the self-regulatory strength depletion process may be influenced by maladaptive self-regulatory strategy selection. For example, it is possible that different responses to temptations (or target related intrusions) may consume less or more energy for a second self-regulatory attempt. Strategy selection can affect strength depletion in two ways: (1) by increasing levels of craving (e.g. through the cognitive process of desire thinking); and (2) by increasing the levels of effort over the threshold that is needed to resist craving (e.g. through the attempt to suppress even the awareness of desire and target-related intrusions or to stifle unpleasant emotions, unnecessary for an effective self-regulation).

Following this consideration, desire thinking can be considered as a form of sustained misregulation strategy. The concept of misregulation (e.g., Carver and Scheier, 1981) involves the exertion of control over oneself, but this control is done in counterproductive fashion, and so the desired result is not achieved. The function of desire thinking may thus be that of helping to regulate, in the short-term, discrepancies between actual and ideal states related to internal experiences (e.g. low mood) and target related cues by allowing for a shifting of attention onto the elaboration of a desired target with resultant anticipation of pleasant states and relief from emotional distress (Caselli & Spada, 2011). However, in the longer term, the perseveration of desire thinking does not eliminate discomfort and tends to exacerbate awareness of deficit. This may generate a vicious circle of desire thinking where: (1) emotional response is increasingly amplified; (2) the rewarding consequences of desire thinking are soon overcome by a growing sense of deprivation; (3) down-regulation of arousal is hindered by the continuous allocation of attentional resources on internal target-related information (images, thoughts, memories); (4) cognitive performance on other tasks is impaired by the concurrent activity of desire thinking itself; and (5) target achievement come to be perceived as the only and increasingly urgent way to relief from distress (Caselli & Spada, 2011).

**7. The Activation and Perseveration of Desire Thinking**

Desire thinking can, in certain circumstances, increase motivation and facilitate planning to achieve long term goals in spite of short-term obstacles. So when does desire thinking become a rigid misregulation strategy or, in other words, maladaptive, perseverative and poorly regulated? This is likely to occur when desire thinking is activated (1) in order to achieve self-regulation, (2) in response to unrealistic and/or unachievable targets or (3) in response to targets whose achievement conflicts with other personal goals. An example of the latter is the activation of desire thinking about using alcohol when one’s personal goal is the abandonment of the activity.

In view of the above a further fundamental question to address is ‘What makes desire thinking become maladaptive, perseverative and poorly regulated?’ Spada, Caselli and Wells (Caselli & Spada, 2011, 2013; Spada, Caselli & Wells, 2012; 2013) purport that metacognitions play a central role in both the activation and perseveration of desire thinking. Metacognitions refer to knowledge or beliefs about one’s own cognitive system and factors that affect its functioning and regulation (Wells, 2000). According to Wells metacognitions can be usefully divided into two broad sets: (1) positive metacognitions about control strategies that impact on inner events such as “Rumination will help me get things sorted out in my mind” or “If I worry I will be prepared”; and (2) negative metacognitions concerning the significance, controllability and danger of inner events, such as “It is bad to have certain thoughts” or “I cannot stop ruminating”. Metacognitions have been found to be associated with a wide array of psychological and behavioural problems (for a full review see Wells, 2009; 2013) including addictive behaviors such as alcohol use, gambling, nicotine use and problematic Internet use (for a full review see Spada, Caselli, Nikčević & Wells, 2015).

Recent research has also suggested that metacognitions may indeed play a role in desire thinking (Caselli & Spada, 2010; Caselli & Spada, 2013). Positive metacognitions about desire thinking concern the usefulness of desire thinking in distracting from negative thoughts and emotions (e.g. “it helps not to be overwhelmed by my worries”), and in improve executive control over decisions and behaviours (e.g. “It helps to avoid bad decisions”, “It helps to have a greater control over my decisions”). These metacognitions are believed to be involved in the initiation of desire thinking when a target-related thought intrude into awareness. Negative metacognitions about desire thinking concern the uncontrollability of target-related thoughts (e.g. “I cannot stop thinking about my desires”) and loss of control over behaviour (e.g. “Thinking too much about my desires make me lose control”). These metacognitions are believed to play a role in propagating perception of low control once a desire thinking episode has started which may possibly lead to an escalation of desire thinking and craving.

Caselli and Spada (2015) tested a metacognitive model aimed at investigating the inter-relationships between metacognitions about desire thinking and craving across four different addictive behaviors: alcohol, gambling, Internet and tobacco. Results broadly supported, across all groups, the hypothesised structure where positive metacognitions about desire thinking were associated with desire thinking which in turn was associated with negative metacognitions about desire thinking and craving. These findings suggest that desire thinking, and metacognitions associated to its activation and perseveration, may be a core process that can discriminate experience of desire/deprivation from excessive craving.

**8. Targeting Desire Thinking and related Metacognitions in Treatment**

What does the evidence presented in this article imply for the treatment of addictive behaviors? Firstly, that desire-related intrusions (e.g. sense of deprivation or positive expectancies) may not be the crucial problem, but rather the way individuals cognitively react to them in the form of desire thinking, is. Secondly, that desire thinking, as a cognitive response, may be detrimental if applied to targets we don’t want to achieve (e.g. engaging in an addictive behaviour) or states we want to control (e.g. negative affect or sense of deprivation). Thirdly, that metacognitive knowledge about desire related intrusions and desire thinking may be responsible for the maladaptive activation and perseveration of desire thinking. Following this line of reasoning, a number of novel clinical implications that are based on Metacognitive Therapy framework (MCT, Wells, 2009) can be hypothesized for the assessment, conceptualisation and treatment of craving. This therapeutic framework possesses several distinctive features in comparison to both behavioural and cognitive interventions, mainly because it focuses on the modification of metacognitive knowledge and related cognitive processes rather than modification of content of thinking (e.g. sensory imagery).

In terms of assessment, information should be gathered not only in relation to the content of target-related thoughts or craving, but also to desire thinking and associated metacognitions. Daily diary or rating scale methods can be employed to obtain this information. The Desire Thinking Questionnaire (Caselli & Spada, 2011) and Metacognitions about Desire Thinking Questionnaire (Caselli & Spada, 2013) can assess these risk factors. Other idiosyncratic methods, such as an adapted version of the metacognitive profiling interview (Wells & Matthews, 1994; Caselli & Spada, 2010), may also be valuable for identifying desire thinking, metacognitions, aims and stop signals for this form of extended thinking. Metacognitive conceptualisations of the pre-engagement phase in addictive behaviors have been developed (e.g. Caselli & Spada 2014; Spada, Caselli, Nikčević & Wells, 2014; Spada, Caselli & Wells, 2012; 2013) and can be used as a basis for conceptualising and sharing information on the role of desire thinking and related metacognition on craving experience. In particular, questions to profile metacognition (Wells, 2009) may focus on: (1) differentiating sense of deprivation from desire thinking (e.g. “which was the first thought, sensation or symptoms about the target that you were aware of?”); (2) identifying the desire thinking process (e.g. “what did you think after you noticed this initial trigger?); (3) highlighting consequences of desire thinking (e.g. “which was the impact on your emotions and craving in engaging in desire-related thinking?”); and (4) identifying positive metacognitions (e.g. “Was there any advantage in following your thoughts in this way?”) or negative metacognitions (e.g. “Did you think you could reduce your thinking by doing so?”) about desire thinking.

In terms of interventions, the primary therapeutic target of metacognitive therapy would be interrupting desire thinking and modifying associated metacognitions. In summary patients may attain benefits by learning how to: (1) recognise desire thinking; (2) control it; and (3) increase flexible control over their attention focus; and (4) modify metacognitions about desire thinking. This could be achieved, as Wells argues (2009), by shifting to a metacognitive mode of processing, gaining a flexible control over attention and thinking style, modifying metacognitions and developing new plans of processing. For example techniques of detached mindfulness, which involve encouraging the patient to observe their craving, images, memories and thoughts without trying to control or change them, would feature prominently as would the use of techniques aimed at the postponement of desire thinking. In addition, Attention Training Technique (ATT) and Situational Attentional Refocusing (SAR) (Wells, 2000), which are strategies aimed at improving an individual’s executive control over the allocation of attention and prioritisation of processing, may also be employed. Metacognitions about desire thinking could be modified using verbal re-attributional techniques and behavioural experiments. Positive metacognitions may be questioned through advantages-disadvantages analysis, exploration of better methods for achieving the advantages highlighted, and the exploration of the effectiveness of the chosen strategy in achieving a goal (e.g. cognitive-affective regulation). Negative metacognitions could be questioned through de-catastrophisation of their significance or through experiments which directly interrupt desire thinking, as in the extended thinking postponement exercise (Wells, 2000).

**9. Conclusions**

In conclusion, the findings from the literature support the role of desire thinking as a form of cognitive elaboration of target-related information, memories and plans of action. Desire thinking appears to be a voluntary and conscious thinking style with two main components: imaginal prefiguration and verbal perseveration. Desire thinking has been shown to be distinct from craving and play a role in generating the escalation in frequency and intensity of craving. In addition, desire thinking appears to possess transdiagnostic features. Desire thinking can play a role in self-regulation failures by increasing levels of craving and subsequent effort to resist temptations. For this reason it can be considered a residual symptom that may facilitate relapse and hinder an effective exertion of self-regulation. The perseveration and apparently uncontrolled activation of desire thinking can be generated by a specific set of knowledge in the form of positive metacognitions about its utility and negative metacognitions about its uncontrollability and consequences.

Taken together, these observations and findings suggest that targeting desire thinking in the treatment of addictive behaviors may be a valuable add-on option to reduce the experience of craving and self-regulation failures. It may also be possible to identify individuals at risk of relapse on the basis of their metacognitive profile related to desire thinking.

Future research is needed especially in: (1) unveiling and testing the neurobiological basis of desire thinking; (2) exploring the prospective impact of desire thinking and related metacognitions on risk of relapse and severity of addictive behaviour presentations; and (3) testing the potential efficacy of metacognitive therapy for addiction (MCT, Wells, 2009).

**References**

American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders (Fifth Edition).

Anton, R., 1999. What is craving: models and implications for treatment. *Alcohol Research & Health, 23*, 165-173.

Anton, R., Moak, D. & Latham, P. (1995). The Obsessive Compulsive Drinking Scale (OCDS): a new method of assessing outcome in alcoholism treatment studies. *Archives of General Psychiatry 53*, 225-231.

Baker, T. B., Morse, E. & Shermann, J. E. (1987). The motivation to use drugs: A psychobiological analysis of urges. In C. Rivers (Ed.), *The Nebraska Symposium on Motivation: Alcohol Use and Abuse*. Lincoln, USA: University of Nebraska Press. pp. 257-323.

Baumeister, R. F., Heatherton, T. F. & Tice, D. M. (1993). When ego threats lead to self-regulation failure: negative consequences of high self-esteem. *Journal of Personality and Social Psychology, 64*, 141-156.

Beck, A. T., Wright, F. D., Newman, C. F. & Liese, B. S. (1993). *Cognitive*

*Therapy of Substance Abuse.* New York, USA: Guildford Press.

Breese G. R., Sinha, R. & Heilig, M. (2011). Chronic alcohol neuroadaptation and stress contribute to susceptibility for alcohol craving and relapse. *Pharmacology and Therapuatics, 129*, 149-171.

Bywaters, M., Andrade, J. & Turpin, G. (2004). Intrusive and non-intrusive memories in a non-clinical sample: the effects of mood and affect on imagery vividness*. Memory, 12*, 467-478.

Carroll, K. M. (2000). Implications of recent research for program quality in cocaine dependence treatment. *Substance Use & Misuse, 35*, 2011-2030

Carver, C. S. & Scheier, M. F. (1981). *Attention and self-regulation: A control-theory*

*approach to human behavior.* NewYork, USA: Springer-Verlag.

Caselli, G., Ferla, M., Mezzaluna, C., Rovetto, F. & Spada, M. M. (2012). Desire thinking across the continuum of drinking behaviour. *European Addiction Research*, *18,* 64-69.

Caselli, G., Nikčević, A., Fiore, F., Mezzaluna, C. & Spada, M. M. (2012). Desire thinking across the continuum of nicotine dependence, *Addiction Research and Theory, 20*, 382-388.

Caselli, G., Soliani, M. & Spada, M. M. (2013). The effect of desire thinking on craving: an experimental investigation. *Psychology of Addictive behaviors, 27*, 301-6.

Caselli, G. & Spada, M. M. (2010). Metacognitions in desire thinking: a preliminary investigation. *Behavioural and Cognitive Psychotherapy, 38,* 629-637.

Caselli, G., & Spada, M. M. (2011). The Desire Thinking Questionnaire: Development and psychometric properties. *Addictive Behaviors*, *36*, 1061-1067.

Caselli, G. & Spada, M. M. (2013). The Metacognitions about Desire Thinking Questionnaire: Development and psychometric properties. *Journal of Clinical Psychology*, *69*,1284-98*.*

Caselli, G. & Spada, M. M. (2015). Desire thinking: What is it and what drives it? *Addictive Behaviors*, *44,* 71-79.

Cox, W. M., & Klinger, E. (2002), Motivational structure. Relationships with substance use and processes of change. *Addictive Behaviors, 27*,925-940.

Drummond, D. C. (2001). Theories of drug craving, ancient and modern. *Addiction,  96*, 33-46.

Fernie, B. A., Caselli, G., Giustina, L., Donato, G., Marcotriggiani, A. & Spada, M. M. (2014). Desire Thinking as a predictor of gambling. *Addictive behaviors, 39,* 793-796.

Goldman, M. S. & Rather, B. C. (1993). Substance use disorders: cognitive models and architecture. In K. S. Dobson & P. C. Kendall (Eds.), *Psychopathology and Cognition.* San Diego, USA: Academic Press. pp. 246-292.

Green, M., Rogers, P., & Elliman, N. (2000). Dietary restraint and addictive behaviour: The generalisability of Tyffany’s cue reactivity model. *International Journal of Eating Disorder, 27*, 419-427.

Hayashi, T., Ko, J. H., Strafella, A. P. & Dagher, A. (2013) Dorsolateral pre-frontal and

orbitofrontal cortex interactions during self-control of cigarette craving. *Proceedings of the National Academy of Sciences, 110*, 4422-4427.

Kalivas, P., Cornish, J.& Ghasemzadeh, M. (1998). Cocaine craving and paranoia: a combination of pharmacology and learning. *Psychiatric Annals 28*, 562-574.

Kavanagh, D. J., Andrade, J. & May, J. (2004). Beating the urge: Implications of research into substance-related desires. *Addictive behaviors, 29*, 1399-1372.

Kavanagh, D. J., Andrade, J. & May, J. (2005). Imaginary Relish and Exquisite Torture: The Elaborated Intrusion Theory of Desire*. Psychological Review, 112*, 446-467.

Kavanagh, D. J., May, J. & Andrade, J. (2009). Tests of the elaborated intrusion theory of craving and desire: Feature of alcohol craving during treatment for an alcohol disorder. *British Journal of Clinical Psychology, 48*, 241-254.

Koob, G. F. & Volkow, N. D. (2010). Neurocircuitry of Addiction. *Neuropharmacology, 35*, 217-238.

Marlatt, G. A. & Gordon, J. (1985). *Relapse prevention: Maintenance strategies in the treatment of addictive behaviors*. New York, USA: The Guildford Press.

Marlatt, G. A. (1978). Craving for alcohol, loss of control, and relapse: A cognitive-behavioral analysis. In: P. E. Nathan, G. A. Marlatt & T. Loberg (Eds.), *Alcoholism: New directions in research and treatment*. New Yor, USA: Plenum Press. pp. 271-314.

May, J., Andrade, J., Panabokke, N. & Kavanagh, D. J. (2004). Images of desire: cognitive models of craving. *Memory, 12,* 447-461*.*

McCrady, B. S. (2000). Alcohol use disorders and the Division 12 Task Force of the American Psychological Association. *Psychology of Addictive behaviors, 14*, 267- 276.

McGovern, M. P. & Carroll, K. M. (2003). Evidence-based practices for substance use disorders. *Psychiatric Clinics of North America, 26*, 991– 1010.

Muraven, M., Tice, D. M. & Baumeister, R. F. (1998). Self-control as limited resource:

regulatory depletion patterns. *Journal of Personality and Social Psychology, 73*, 774-

789.

O’Malley S. S., Krishnan-Sarin S., Farren C., Sinha R. & Kreek J. (2002). Naltrexone decreases craving and alcohol self-administration in alcohol-dependent subjects and activates the hypothalamo–pituitary–adrenocortical axis. *Psychopharmacology,160*, 19-29.

Oei, T. P., Raylu, N. & Casey, L. M. (2010). Effectiveness of group and individual formats of a combined motivational interviewing and cognitive behavioral treatment program for problem gambling: a randomised controlled trial. *Behavioral and Cognitive Psychotherapy, 38*, 233-238.

Paille F. M., Guelfi J. D., Perkins A. C., Royer R. J., Stern L., & Parot P. (1995). Double-blind randomised multicentre trial of acamprosate in maintaining abstinence from alcohol. *Alcohol and Alcoholism, 30*, 239-247.

Paulus, M. P. (2007). Neural basis of reward and craving-a homeostatic point of view. *Dialogues Clinical Neuroscience, 9*,379-387.

Robinson, T. E. & Berridge, K. C. (1993). The neural basis of craving: an incentive-sensitisation theory of addiction. *Brain Research Review, 18,* 247-291.

Robinson, T. E. & Berridge, K. C. (2003). Addiction. *Annual Review of Psychology, 54,* 25-53.

Schneider, W. & Shiffrin, R. M. (1977). Controlled and automatic human information processing: I. Detection, search, and attention. *Psychological Review, 84*, 1-66.

Shadel, W. G., Martino, S. C., Setodji, C., Cervone, D., Witkiewitz, K., Beckjord, E. B. & Shih, R. (2011). Lapse-induced surges in craving influence relapse in adult smokers: An experimental investigation. *Health Psychology, 30*, 588-596.

Sinha, R. & Li, C. S. (2007). Imaging stress- and cue-induced drug and alcohol craving: association with relapse and clinical implications. *Drug Alcohol Review, 26*, 25-31.

Skinner, M. D. & Aubin, H. J. (2010). Craving’s place in addiction theory: Contributions of the major models. *Neuroscience and Biobehavioral Reviews, 34*, 606-623.

Spada, M. M., Caselli, G., Nikčević, A. & Wells, A. (2015). Metacognition in addictive behaviors. *Addictive Behaviors, 44,* 9-15.

Spada, M. M., Caselli, G. & Wells, A. (2012). The metacognitive therapy approach to problem drinking. In S. Hayes & M. Levin (Eds.), *Mindfulness and Acceptance for Addictive Behaviors: Applying Contextual CBT to Substance Abuse and Behavioral Addictions*. New York, USA: New Harbringer

Spada, M. M., Caselli, G. & Wells, A. (2013). A triphasic metacognitive formulation of problem drinking. *Clinical Psychology & Psychotherapy, 20*, 494-500.

Spada, M. M., Caselli, G., Slaifer, M., Nikčević, A. & Sassaroli, S. (2014). Desire Thinking as a predictor of problematic Internet use. *Social Science Computer Review, 32,* 474-483.

Stacy, A. W. (1997). Memory activation and expectancy as prospective predictors of alcohol and marujana use. *Journal of Abnormal Psychology, 106*, 61-73.

Tiffany, S. T. & Wray, J. (2009). The continuing conundrum of craving. *Addiction, 104*, 1618-1619.

Tiffany, S. T. (1999). Cognitive concepts of craving. *Alcohol Research and Health, 23*, 215-224.

Tiffany, S. T. & Drobes, D. J. (1990). Imagery and smoking urges: the manipulation of affective content. *Addictive behaviors, 15,* 531-539.

Volkow, N. D, Wang, G. J., Telang, F., Fowler, J. S., Logan, J., Childress, A. R & Wong, C. (2006).Cocaine cues and dopamine in dorsal striatum: mechanism of craving in cocaine addiction. *Journal of Neuroscience, 26*, 6583-6588.

Wells, A. (2000). *Emotional Disorders and Metacognition: Innovative Cognitive Therapy*. Chichester, UK: Wiley.

Wells, A. (2009). *Metacognitive Therapy for Anxiety and Depression*. New York, USA: Guilford Press.

Wells, A. (2013). Advances in Metacognitive Therapy. *International Journal of Cognitive Therapy, 6*, 186-201.

Wells, A. & Matthews, G. (1994). *Attention and Emotion*. A Clinical Perspective. Hove, UK: Erlbaum.

Witvliet, C. V. & Vrana, S. R. (1995). Psychophysiological responses to indices of affective dimensions, *Psychophysiology, 32,* 436-443.

Zhou, X., Nonnemaker, J., Sherrill, B., Gilsenan, A. W., Coste, F. & West, R. (2009). Attempts to quit smoking and relapse: Factors associated with success or failure from the ATTEMPT cohort study. *Addictive Behaviors, 34*, 365-373.