Review
Ανασκόπηση

Cognitive theories of addiction: A narrative review

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Psychiatriki 2010, 21:315–323

Several theories have been developed in order to understand the phenomenon of addiction. From a science development perspective, it is important to examine theories with shared concepts within a common framework, generate and test new hypotheses. This paper reviews those theories and models that consider substance misuse as a decision making process involving conscious and unconscious cognitive processes including simple classical conditioning models, cue reactivity, expectancy theory, social learning theory, neuropsychological models and the new hierarchical PRIME theory. A synthetic approach has been used as to identify similarities and to promote the incremental value of the discussed theories.

Key words: addiction, theories, cognitions, behaviour

Introduction

Addiction is a socially defined concept and refers to a syndrome, the centre of which is impaired control over a reward-seeking behaviour; impaired control that is leading to significant harm. West (2006)[1] suggests that the definition should refer to a reward-seeking behaviour that has become out of control, which describes better the observed increase over time in drive to engage in the addictive behaviour. Addiction is a broad concept that includes any behaviour satisfying the above mentioned three criteria. One of such reward seeking behaviours is substance abuse. Substance abuse per se does not equal addiction unless there is loss of control and associated harm.

Over the years several theories aimed at understanding and explaining the above mentioned three components of the definition of substance abuse as an addiction. Most theories explore the phenomenon from a generic point of view and they focus on the behaviour involved rather than the specific substance used. The concepts of "theory" and "model" are usually used interchangeably. There is though a major difference between the two: A model is a representation of a system or an object or set of events.

It does not need to explain anything. A theory seeks to explain and predict by proposing the existence or operation of entities that have not been observed.

Kuhn (1962)[2] argued that different theories cannot be compared in terms of a system of common measure and cannot reject each other. According to Kuhn, a theory should change from within when there is an accumulation of a significant number of observational anomalies that make the new theory more useful. In science and philosophy, though, it is considered important that phenomena are understood within the framework of a single theory, because fewer axioms have to be accepted as true, concepts can be shared and testable hypotheses can be generated.[2,3] This statement does not negate the importance of pluralism, but puts emphasis on synthesis and construction, rather than deconstruction of knowledge. This is not an easy achievement in social sciences, in which phenomena usually have a relative definition that scientists have to agree about and measure in a valid and reliable way.

This paper aims at providing a narrative review of those theories concerning addiction that consider substance abuse behaviour as the result of decision making process and include concepts, which are either conscious (expectancies, attitudes) or could become conscious and modified. A synthetic approach will be used in order to explore the incremental value of each theory.

Simple conditioning models and cue reactivity

According to classical conditioning theory, a specific stimulus produces a known response. Classical conditioning models have been applied to explain compulsive use of substances and have an automatic process. These models emphasize either the experience of withdrawal symptoms or the positive-incentive properties of drugs. An important application of classical conditioning in addiction is the cue reactivity paradigm as a means of understanding the nature of alcohol dependence, as predictor of relapse and as a method of studying treatment effects.

Cue reactivity paradigm involves cue exposure to a cue or set of cues and observation and measurement of response. Cues can be external (such as smell, sight and taste) or internal (moods, cognitions or priming doses). An important aspect of cues is their temporal relationship with drug consumption with proximal cues producing greater reactivity than distal cues. Cues can also be interconnected with one cue increasing the likelihood and the reactivity effect of another cue. Drummond,[4] in a review of cue reactivity in addiction research, discusses three types of responses: (i) symbolic expressive, e.g. craving, which is measured with questionnaires; (ii) physiological, which in the case of alcohol research have been often measured in terms of changes in heart rate, skin conductance, skin temperature and salivation or neuroimaging methods; and (iii) behavioural, which can be measured in terms of latency to drinking and speed of drinking. Cue reactivity has major limitations, such as (i) a modest relationship between subjective report of cravings and subsequent substance use;[5] and (ii) that physiological changes are not mediators of instrumental behaviour themselves, but an index of a central nervous system state, which may be a mediator of behaviour[6] or epiphenomenal.[7]

Opponent process theory

The Opponent Process theory[8] explains the escalation of reward seeking behaviour and suggests the existence of opponent processes with homeostatic function that upset the drug reward process activated by the repetitive drug use. The opponent processes lead to a reduction of the substance and withdrawal symptoms effect (tolerance) during abstinence. The theory is based on classical conditioning principles and proposed that continuous drug use results in an increased reward threshold (tolerance), which in turn results in compulsive drug use. According to this theory there are five temporal states: peak of primary hedonic process, period of hedonic adaptation although stimulus intensity is maintained, steady level of hedonic process lasting as long as the stimulus is maintained, peak of affective after-reaction that follows termination of stimulus and finally decay of after-state. The proposed states, though, cannot explain the fast reinstatement of tolerance following even long periods of abstinence.

Operant conditioning models

Operant conditioning takes into account the environment in which the organism operates and argues that behaviour is modified by its consequences. The association between the stimulus, the response and the consequences is learned by the subject, and the response is repeated with greater or lesser frequency, depending on the type of consequence, which is called reinforcement. Secondary/Conditioned Reinforcements can increase the frequency of the behaviour by enhancing or adding a pleasant experience (positive reinforcement), or by removing or diminishing an unpleasant one (negative reinforcement).[9] A well known negative reinforcement model is the "self-medication theory". This model proposes that individuals intentionally use substances to treat psychological symptoms from which they suffer (negative reinforcement).

Rational addiction model

Becker and Murphy[10] have proposed the economic model of Rational Addiction. It is based on the concept of rationality, which is defined as a "consistent plan to maximise utility over time". Central concept in this model is the concept of utility. The authors suggest that addiction is an increased consumption of a "good" as a result of past consumption. Therefore, addicted individuals are rational consumers who behave in a way that maximises preferences.

Extension of classical and operant conditioning models

It is evident though that motivation to take drugs (drug wanting) is not always directly attributable to the subjective pleasurable effects of drugs (drug liking, positive reinforcement), and it is possible this is especially true in addicted individuals. On the other hand even after the prolonged cessation of drug use, during which time withdrawal symptoms decay, relapse to drug use and reinstatement is common. According to the Incentive-Sensitisation model[11] there are at least two distinct psychological processes involved in reward: (a) subjective pleasure ("liking") and (b) incentive salience attribution ("wanting"), which are mediated by different neural systems. The neural system involved specifically in incentive salience attribution is sensitised by addictive drugs. With the development of an addiction, drugs become pathologically wanted ("craved"), which can occur even if drugs are liked less and less.

The Hedonic Homeostatic Dysregulation model[12] provides an approach to identifying the neurobiological factors that produce vulnerability to addiction and to relapse in individuals with a history of addiction and provides a bridge between findings from animal and social studies and a synthesis between biological and psychological models. Addiction is presented as a cycle of spiralling dysregulation of brain reward systems that progressively increases, resulting in compulsive drug use and a loss of control over drug-taking. Neurobiological mechanisms, such as the mesolimbic dopamine system, opioid peptidergic systems, brain and hormonal stress systems, as well as social psychology concepts, such as sensitization and counter-adaptation, are hypothesised to contribute to this hedonic homeostatic dysregulation.

The Inhibition Dysregulation model[13] attempts to bring together findings from neuroimaging and neurophysiology involving neuro-adaptation and sensitisation of the dopamine rewards system with findings from cue exposure research and findings regarding the malfunction of the inhibitory system. The model suggests that addiction involves a progressive dysregulation of ability to inhibit a behaviour that is rewarded and that aspects of decision-making processes are compromised in perhaps either a direct way (i.e. dysfunctional inhibitory system) or indirectly via a dysfunctional reward system.

Social learning theory

Social learning theory[14] is a generic theory of human behaviour, which is conceptualised as the result of a process of interactions between the individual and the social environment with a major emphasis on environmental or situational factors. Behaviour is regarded as the result of a continuous interaction between personal and environmental variables: personal variables include cognitive factors (competencies, intellectual abilities), cognitive strategies (ways of attending to and organising information), expectations (about consequences of behaviour), values, self-imposed standards, rules, morals, etc.

Environmental variables include effects of other people, interaction between individuals and situations. Theory proposes two kinds of expectations about self: (i) outcome expectations, which are "the person's estimate that a given behaviour will lead to certain outcomes" and (ii) efficacy expectations (or self-efficacy), which refers to a person's belief "that one can successfully execute the behaviour required to produce outcomes".[14]

Self-efficacy regulates human functioning through four main processes: cognitive and motivational, which refer to purposive behaviour related to above hypotheses, affective (stress and depression experienced in difficult situations) and selection (of environment and avoidance of activities believed to exceed coping capabilities).[15] Self-efficacy is relevant to all stages and aspects of human development (family environment, school, career development and pursuits, health-promoting behaviour).

The theory was expanded to the Social Cognitive Theory[16] and the need to shift the paradigm of psychological theories was made in order to conceive the person as an agent of change that affects the person and the social environment. The main agentic features proposed are:

i. Intentionality, which is defined as a representation of a future course of action to be performed. "These actions are performed with the belief that they bring desired outcomes" (outcome expectancies). "Some of these actions, though, actually produce outcomes that were neither intended nor wanted".

ii. Forethought, with the exercise of which people motivate themselves and guide their actions in anticipation of future events. When projected over a longer period of time, on matters of value, a forethought perspective provides direction, coherence and meaning to one's life". The role of outcome expectancies is central in the exercise of forethought.

iii. Self-reactiveness, which refers to the concept that an agent has to be not only a planner and forethinker, but a motivator and self-regulator as well.

iv. Self-reflectiveness, which refers to the metacognitive capability for the person to reflect upon oneself, adequacy of one's thoughts and actions. Self-efficacy is the foundation concept of this feature.

Theory of reasoned action and theory of planned behaviour

The Theory of Reasoned Action and the theory of Planned Behaviour are related and take into account the effect of the environment in individual's substance use behaviour. The theory of Reasoned Action proposes that for volitional behaviour, a person's intention to perform (or not to perform) a behaviour is the immediate determinant of that action. Barring unforeseen events, people are expected to act in accordance with their intentions. However, intentions can change over time. Intention to act is a function of two basic determinants: (i) the individual's attitudes towards the behaviour (personal factor based on positive or negative evaluation of performing the behaviour, which is affected by expectancies beliefs regarding the outcome of the behaviour); and (ii) subjective norm (individual's perception of the social pressures put on him to perform or not perform the behaviour).[17]

The theory of Planned Behaviour is an expansion of the previous theory in order to understand those behaviours that a person has limited control upon. The theory makes the distinction that intentions can only be expected to predict a person's attempt to perform a behaviour and not its actual performance. The theory proposes that perceived control is the third basic determinant of the behaviour.[17]

Self-regulation theory

Another theory that seeks to explain how reward seeking behaviour becomes out of control is the Self-Regulation theory, which argues that individuals self-consciously exercise their will in order to achieve health related goals. Self-regulation involves higher processes overriding lower processes.[18] Self-regulation failure occurs when lower order processes win through. Self-regulation theory allows for the possible effects of drugs of dependence on self-regulation and it also examines the effect of short-term influences, such as tiredness, emotional state and environmental stimuli on self-regulation.

Identity shift theory

A recently proposed theory explores loss of control over rewarding behaviour from a different perspective. It is argued that what appears to be lack of control over substance use behaviour is in reality a manifestation of a fundamental feature of human motivation, the instability of preferences. In other words, addicted people change their minds depending on internal and external circumstances.[19] Based on the same principles, Identity Shift theory[20] takes into account the principle of unstable preferences and proposes that increasing distress caused by behaviours results to value conflict. This prompts to a small step towards behaviour change, which if successful begins to lead to an identity shift. Increased self-awareness and self-confidence then fuel continued change. At the core of the model is the ongoing evaluation of benefits and costs and the build-up of dissatisfaction with the current situation. Then a trigger, small or major, results in an immediate and unplanned step of change that initiates the process of behaviour change.

Expectancy theory

Expectancy theory was first proposed as a theory of human motivation relating to work and job satisfaction.[21] The theory proposes that behavior results from conscious choices among alternatives whose purpose is to maximize pleasure and minimize pain. The theory proposed that the 'force' with which the individual will pursue his work is the product of two sets of beliefs: valence and expectancy. Valence refers to the emotional orientations people hold with respect to rewards (extrinsic, such as money, promotion, time-off and benefits or intrinsic, such as satisfaction). Expectancy refers to the momentary belief concerning the likelihood that a particular act will be followed by a particular outcome.[21] Employee's performance is related to instrumentality. Instrumentality refers to the perception of employees whether they will actually get what they desire even if it has been promised by a manager. Performance is the product of employee's force and his/her ability to execute the required action. The author comments that ability is a complex concept that involves employee's actual skills and confidence. Several hypotheses were generated from the theory and were tested.

According to expectancy theory and its application to addiction, expectancies about the costs or benefits of drug use contribute to excessive use. These expectancies may involve more than beliefs (memory templates). The two main factors hypothesised that determine the initiation and repetition of a specific behaviour by a human being are: the outcome expectancy and the efficacy expectancy.[22] The outcome expectancy is the belief that a specific outcome (positive or negative) will occur following certain behaviour, i.e. by following a certain route you arrive on time at work. The efficacy expectation is the belief that someone is able to execute the above behaviour, i.e. that you will be able to drive on a motorway. Outcome expectancies are built on previous experiences and maintained by positive and negative reinforcements (social learning process).

Other cognitive theories

Expectancy theory places emphasis on conscious cognitive processes, which are related to the experience of craving. Evidence though suggest that subjective report of craving is only moderately linked with substance use and relapse.[5] The cognitive processing model proposes that drug abuse can operate independently of the processes controlling craving.[23] According to this model, addictive drug abuse is regulated by automatic cognitive processes, while craving represents the activation of non-automatic processes. These non-automatic processes are activated to either aid in completing interrupted drug use or block automatic drug-use sequences.[5]

Another cognitive model proposed that as addiction develops the expectancy-based control system of behaviour becomes unconscious and therefore behaviour is influenced less by conscious expectancies involving controlled processes and more by unconscious expectancies involving automatic processes.[24]

A recent extension of the expectancy theory is the Cognitive Bias theory that aims to address shortfalls of earlier expectancy based cognitive models.[25]

Neuropsychology models (spreading activation models of memory, schema theory, implicit cognition and neural network theory) have been adopted. The emerging theory proposes that addiction is the result of biases that affect conscious functions, such as beliefs, attention and memories, as well as unconscious processes in information recall from memory.[25]

It is hypothesised that representations of the behaviour are "linked" in long-term or semantic memory with propositions about outcome (e.g. relaxing, risk, etc). Such links may be created by direct experience but are not likely to be solely determined by this, and may be formed by abstraction of information from the environment. The motivational significance of these associations is likely to be positive and appetitive, consistent with experience in the early stages of an addiction career and the initial effects of the substance/behaviour.[26] These "semantic" links become strengthened and more tightly connected with repetition of behaviour. Over time, activation of one part of the "network" (e.g. alcohol-representations) automatically triggers propositional links in other parts (e.g. relaxation concepts) and vice versa. Thus, an accessibility bias for positive information about the behaviour develops. Negative and behaviourally inhibiting information may be available, however, it is hypothesised that this information is less accessible and relies more on effortful and non-automatic cognitive processes, therefore its moderating impact on behaviour is compromised.[26]

The Excessive Appetites model of addiction[27] was proposed to provide a coherent account of the whole process of taking-up to giving-up any form of appetitive behaviour (even beyond drug abuse, such as gambling and eating) to which people can become severely attached with a negative effect on them and those immediately around them. At the core of the model is the development, within a social context, of appetite-specific schemata, based on different kinds of learning. Additional secondary processes have an amplifying effect on schemata such as "acquired emotional regulation cycle", which includes abstinence violation effect (AVE), and "consequences of conflict".

Transtheoretical model of change

An influential model that relies mostly on the choice principle, but addresses how people modify addictive behaviour, is the Transtheoretical model of behaviour change or Stages of Change model.[28] Although it is described as a model it proposes new theory concepts, therefore it could be seen as a theory. The model focuses on this particular aspect of addiction rather addiction itself and suggests that the process of recovery from an addictive behaviour involves transition through the following stages: (i) pre-contemplation stage, in which no change is contemplated; (ii) contemplation, in which change is contemplated for the near future; (iii) preparation, in which plans are made on how to change behaviour in a definite way; (iv) action stage, in which the plans are put into action and change takes place; and (v) maintenance, in which the new pattern of behaviour emerges, establishes and is maintained. There is a sixth stage, that of termination, which was added more recently and in someway overlaps with the maintenance stage. In this stage the individual has adopted the new behaviour. The model proposes that individuals can move forwards or backwards. The model has enjoyed popularity, whilst also receiving major criticism. The popularity might be explained by the seemingly scientific approach of "diagnosing" the stage of change and the perceived relation to specific treatment plan, as well as the provision of categories to classify people rather than use everyday language.[1] Motivational interventions developed in 1990's are partly based on the Stages of Change model and were described as "Motivational Interviewing".[29] The criticism relates to several aspects of the model, such as the definition and validity of stages, the proposed linear progress through the stages, the inability of the model to account for the unconscious decision making processes.[1]

PRIME theory

West (2006)[1] proposed a new theory of addiction called PRIME, an acronym standing for the proposed five levels of motivation: plans, responses, impulses/inhibitory forces, motives, evaluations. This is a synthetic theory that aims to encompass all the ele-

ments of previous theories that proven to be valid and useful under one theoretical common framework. The levels of motivation are hierarchical from low levels of responses that involve reflexes and automatic behaviours to the higher ones that of evaluations and plans that involve expectancies and the concept of identity.

The theory proposed that there are three types of abnormalities that underlie addiction: (i) abnormalities of the motivational system that exist independently of the addictive behaviour, such as propensity to anxiety or depression; (ii) abnormalities of the motivational system that stem from the addictive behaviour itself, such as the acquisition of a strongly entrenched habit or an acquired drive; and (iii) abnormalities in the individual's social or physical environment, such as the presence of strong social or other pressures to engage in the activity". That means that an activity becomes addictive if it affects an already unbalanced system (co-morbid anxiety, traits of impulsivity), which operates within an unbalanced environment (belonging to a social group in which the particular activity is considered normal), in such a way of undermining the normal checks and balances that operate to prevent undesirable behaviour (activity becoming continuously rewarding).

The theory is based on the principles of Chaos theory. This means that the motivational system is inheritably unstable in the sense that it is susceptible to continuous influence of smaller or bigger internal and external stimuli. This can explain both the development of an addictive behaviour and the need for change. Therefore an event that could be seen as significant or insignificant can send an individual down to a specific path (use) or could set up susceptibility so other triggers are needed for the addictive behaviour to develop. The theory also accounts for the co-occurrence of addictive behaviours as long as they are mutually reinforcing in terms of their effect on the balance of the motivational system or the individual's environment.

Discussion

The theories and models discussed above, consider substance abuse as a decision making process. The cognitive elements involved are or can be conscious and therefore modifiable. Overall they can be considered as cognitive theories and as such, discussed under a common framework, can be compared and combined in order to contribute to a better understanding of the phenomenon. Psychoanalytic theories or models are not discussed in this paper. These theories and associated research need to be reviewed separately.

Some of the theories discussed above focus on understanding the mechanisms involved in the development and maintenance of substance use (biological, psychological, social or even spiritual). Others explore the interrelationship between the different mechanisms involved. Others attempt to combine methods of investigation. Research on substance use aimed on understanding the different facets of the addiction phenomenon too, with more attention though on the change of the established addictive behaviour, the developing and evaluating clinical interventions (pharmacological, psychological or social) for the person and the family involved, rather than understanding the underpinning mechanisms and concepts involved in the process of change during treatment.

Most of the evidence on treatment interventions for all substance groups is coming from the USA. It has been argued that there are differences in philosophy and orientation of treatment services between USA, UK and other countries, therefore interventions effective in one country should not be assumed a priori as effective in other countries.[30,31]

The application of theories into models, measurement of relevant concepts, generation and testing of hypothesis, and outcome and process clinical research are the main steps involved in the scientific study and testing of theories. A scientific study that is necessary in order to maintain a coherent approach into the development of science.

Psychological interventions are the main approach for most substances as stand alone or in combination with other interventions. Within psychological interventions Cognitive Behaviour Therapy (CBT) or related models based on the above discussed theories have had considerable evidence supporting their effectiveness.[32,33] Those clinical models and interventions need to be reviewed separately.

Γνωσιακές θεωρίες σχετικά με τον εθισμό: Μια αφηγηματική ανασκόπηση

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Ψυχιατρική 2010, 21:315–323

Υπάρχουν πολλές θεωρίες που προσπαθούν να κατανοήσουν και να ερμηνεύσουν το φαινόμενο του εθισμού. Από επιστημονική άποψη και για λόγους επιστημονικής ανάπτυξης θεωρείται σημαντικό, θεωρίες οι οποίες μοιράζονται κοινούς όρους να εξετάζονται μέσα σε κοινό πλαίσιο. Αυτό επιτρέπει την ανάπτυξη και δοκιμασία νέων επιστημονικών υποθέσεων. Η παρούσα εργασία παρουσιάζει κριτικά εκείνες τις θεωρίες και τα μοντέλα που εξετάζουν τη χρήση ουσιών σαν μία διαδικασία λήψης αποφάσεων, διαδικασία η οποία περιλαμβάνει συνειδητές αλλά και υποσυνείδητες λειτουργίες. Θεωρίες και μοντέλα όπως απλά συμπεριφορικά, γνωστικές θεωρίες, νευροψυχολογικά μοντέλα καθώς και τη νέα ιεραρχικά δομημένη θεωρία PRIME. Κεντρικοί όροι στις παραπάνω θεωρίες είναι οι θετικές και αρνητικές προσδοκίες από τη χρήση, η αυτοπεποίθηση, οι δεξιότητες, τα αντανακλαστικά, η αξιολόγηση των πράξεων και άλλα. Κάποιες από αυτές τις θεωρίες έχουν προτείνει και δοκιμάσει θεραπευτικά μοντέλα. Η προσέγγιση στην εργασία είναι συνθετική και στόχο έχει να επισημαίνει τις ομοιότητες μεταξύ τους και να προβάλει επικοδομητικά το ρόλο τους σε μία συνολική επιστημονική κατανόηση των πολλών πλευρών του φαινομένου.

Λέξεις ευρετηρίου: εθισμός, θεωρίες, γνωσίες, συμπεριφορά

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