An Interacting Cognitive Subsystems (ICS) Account of Hypnosis

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Abstract:
This paper puts forward a theoretical account of hypnosis utilising Interacting Cognitive Subsystems (ICS), a distributed architecture for human cognition. The account hinges on two commonly occurring and inherent aspects of the ICS framework, "interlock" and "buffered processing", which when combined are proposed as having the explanatory power to account for the range of empirical findings and subjective experiences that are associated with hypnosis. Interlock refers to a situation where the unchanged output of subsystem processing is used as the input for another subsystem in a feedback loop. Buffered processing refers to non-automatic cognition, the process whereby new schemata are developed and through which process thoughts and behaviours can change. The combination of these two processes allows the development of new schemata which incorporate new information that would otherwise be ignored, thus allowing for behavioural change. Based on this theoretical explanation it should be possible to develop hypnotic scripts and procedures that more accurately target a client's specific issues.

Keywords:
Interacting Cognitive Subsystems, Interlock, Buffered processing

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Introduction

Current theoretical accounts of hypnosis present a confusing picture since various camps argue for the existence of two opposing positions, one of State (or "special process") and the other of Non-state (or "social psychological"), or for the unification of these two positions (see Kirsch & Lynn, 1995; Wagstaff, 1998; Kallio & Revonsuo, 2003). Kallio and Revonsuo (2003) have suggested that the theoretical disagreements which have developed during our attempts to understand hypnosis will remain unresolved because, they contend, our current theories are inadequate. The following paper has taken this as a challenge and proposes that until recently we have not had an adequate framework of human cognition within which to model hypnosis, but that this is no longer true. By applying an emerging and rich model of human cognition to the challenge of understanding hypnosis we can begin to integrate and test the variety of subjective experiences and empirical findings that have accumulated without the benefit of a shared theoretical grounding. With such a framework the state/non-state dichotomy can be seen as little more than a diversion preventing a more detailed understanding of hypnosis. There are other practical benefits. Having a theoretical underpinning for hypnosis allows for the development of interventions and empirical studies guided by these underlying principles, which themselves can feed back into further refinements of a model.

A Theoretical Account of Hypnosis

The most parsimonious and unifying approach to developing a theoretical account of hypnosis is to base it within a cognitive architecture that is suitable for explaining both hypnosis and human cognition in general. A special theory of hypnosis which does not embody our understanding of human cognition will propel us into the same debates that have plagued the furthering of our understanding of other human experiences such as, for example, creativity (for example see Weisburg, 1993).

There are a variety of candidate frameworks on which to base an account of hypnosis. However, few have demonstrated both (i) the breadth to cover the vast range of human behaviour and (ii) the explanatory power to make predictions in novel and complex situations. These are essential qualities for a framework of human cognition to possess. One good candidate for this explanatory role is Barnard’s distributed architecture for human cognition, Interacting Cognitive Subsystems (ICS) (Barnard, 1985, 1996; Teasdale & Barnard, 1993). In the literature. ICS has been used to make predictions concerning human behaviour during interactions with technology (Barnard, 1987), to model well-known and frequently researched phenomena of working memory (Barnard, 1999; Scott, Barnard & May, 2001), and to explain the Attentional Blink effect (this is where a visually presented target prevents the detection of a second visually presented target that follows the former target; this inability to detect the second target typically lasts approximately half a second, see Barnard & Bowman, 2003), rumination and recollection deficits in low, or “dysphoric”, mood (Ramponi, Barnard & Nimmo-Smith, 2004), and more general mood-dependent cognition (Teasdale & Barnard, 1993).

Interacting Cognitive Subsystems

The ICS architecture consists of an integrated and distributed network of subsystems, each subsystem being responsible for processing a specific kind of information. It is a modular architecture, which has continuously developed from empirical findings - for example, the neuropsychological literature concerned with functional dissociation (e.g., Northoff et al., 2000) and studies examining working memory (e.g., Baddeley 1990). ICS has been applied to and developed in a number of areas, perhaps most notably in refining our understanding of cognition and negative affect (Barnard & Teasdale, 1991; Teasdale & Barnard, 1993).

The Structure of ICS: Subsystems

ICS consists of 9 subsystems which all share the same basic structure and functions, differing only in the mental "codes" which each
subsystem uses to represent and processes information. The shared structure consists of (i) the 'transformational engine' and (ii) a memory record (see Teasdale and Barnard, 1993, pp.58).

The transformational engine is where mental codes specific to a subsystem are transformed into codes that are specific to other subsystems, allowing information to flow around the entire collection of subsystems and for it to be integrated with other information in the system. This process of transformation or translation allows mental codes relevant to, for example, the visual system (representing information describing the observable world) to be transformed into codes relevant to the propositional system (representing factual knowledge about that observed world). In this way visual information becomes represented in a form that can be further used in, for example, planning motor behaviour (e.g., grasping an object) or using language to describe an object rather than this visual information being purely confined to a description of the elements of the visual field, i.e., colour, contour etc. Other information from other systems can similarly be transformed into codes that are intelligible to different subsystems and this can add important detail to the developing representation. For example, information from body-state receptors representing information that the individual is in a moving environment such as a rolling ship can be integrated into planning the same grasping action mentioned earlier. Thus what would have been disparate pieces of information become combined.

The memory record of each subsystem captures any information that enters that subsystem and copies and stores it exactly. These code-specific memory stores provide a database from which regularities in code patterns can be detected.

It is through the simplicity of both structure and function in ICS that the complexity of human cognition is supported through the basic features which propose that (i) information can exist in a number of different encoded forms, and (ii) it is the specific integration of these codes that determines the form and content of any particular representation. The variety and intricacy of human cognition can be understood as emerging from the complex and rich possibilities of interactions between these elements of cognition.

The 9 major subsystems can be split into 3 categories (See Teasdale and Barnard, 1993, pp.60);

sensory subsystems for gathering information,

effector subsystems that constitute the final stages for the control of behaviour,

central subsystems for dealing with descriptions and meanings.

The 3 sensory subsystems, Acoustic [AC], Visual [VIS], and Body State [BS], represent information taken directly from the state of the world, both external and internal; their respective memory records will contain the basic information of what we hear (timbre, pitch etc.), see (hue, brightness etc.), and experience (pressure, taste, smell etc.).

The 2 effector subsystems, Articulatory [ART] and Limb [LIM], are responsible for controlling and co-ordinating the muscles for speech and voluntary muscles respectively. Their memory records will consist of information such as the position, timing and force of the various muscles. Thus it is through the work of these subsystems that one can both ask, "Where's my car?", and then go about the physical actions necessary in finding it. There are additionally 2 minor subsystems, [VISC] which is responsible for controlling autonomic responses and [SOM], responsible for coordinating somatic muscular responses. The output from these two subsystems is only received by [BS] but they may receive input from other subsystems.

The remaining 4 subsystems are referred to as the central subsystems, which can be further subdivided into those that deal with structural information (the object [OBJ] and morphonolexical [MPL] subsystems) and those that deal with levels of meaning (the propositional [PROP] and implicational [IMPLIC] subsystems – these latter two subsystems will be dealt with in more detail in the following section). Barnard describes the
content of [MPL] as "what we hear in the head" (Teasdale and Barnard, 1993, p. 52) and defines it as, primarily, a surface description of words including important structural information such as their order. [OBJ] provides the same surface level description of the relationships between items in "visual", as opposed to "sound", space so including information such as the position of objects relative to one another etc.

The Structure of ICS: the "Central Engine"

The [PROP] and [IMPLIC] subsystems are referred to as the "central engine" of ICS (Scott, Barnard & May, 2001). They process and represent levels of meaning and it is their interaction that forms the core of cognition. [PROP] deals with semantic, factual information that can be described as "knowing that" representations. [IMPLIC] deals with abstract meanings, such as familiarity and causal relatedness. It represents schematic models of experience, including emotional experience, which include the meaningful and emotive consequences of factual information.

Subsystems gradually develop the ability to recognise regularities and co-occurrences of input and output, which also results in the processes of transformation developing. This is how the system "learns" and, as such, how preferences and biases in thinking and behaviour develop. Changes in the process of transformation will determine how automatically information is transformed, and how quickly representations are activated; thus it is crucial for developing an understanding of spontaneous or impulsive thoughts and behaviours, or of those that are more considered. In this way the nature of an individual's pattern of information flow between subsystems, and the representations which are available for processing (their preferences and biases), are dependent on the individual's experience of regularities rather than on any functionality of ICS itself. This is an important concept as it supports the vast range of human experience and learning, allowing for variation between individuals and within experiences, and as such can help us understand how different individuals might respond to their perceptions of events. Ultimately, it is also important in understanding how we can use this to address issues of therapy when working with individuals whose perceptions lead them to think and/or behave in less than optimum ways. Secondly it is important that the structure of the framework itself does not impose or deny certain kinds of functionality other than those that exist in human cognition.

The codes that represent meaning develop from the detection and extraction of patterns at lower-level codes. So, for example, [PROP] meanings arise from the detection and extraction of co-occurrences across patterns in [MPL] and patterns of [OBJ]. In terms of human experience this means that a person learns facts about the world as a result of detecting and extracting regularities in what s/he hears, what s/he observes, and what s/he feels. Patterns of [PROP] and [IMPLIC] then capture recurring regularities at even higher levels of abstraction. We are able to develop higher-level semantic understanding of the world as a result of extracted regularities of the factual knowledge represented in the [PROP] subsystem, and in the same way we develop representations of implicational meaning as a result of learned regularities in the [IMPLIC] subsystem. Learning can then be understood as occurring at the level of individual transformation processes, where inputs are mapped onto outputs on the basis of regular co-occurrences in the patterns of information stored in the memory records of subsystems.

From the above description it is clear that ICS can provide an account which recognises types of information that are qualitatively different, that include information concerning emotion, and which allow descriptions of cognitive-affective interaction to be included into a more general and comprehensive account of information processing (Teasdale & Barnard, 1993). As such, ICS-based descriptions of cognition should appeal to applied theories of human experience and behaviour because they permit a scientific, empiricist account of human emotion, behaviour, and cognition whilst simultaneously recognizing that logical, propositional, and especially verbal, representations are not the sole basis of human cognition. The ICS approach has
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appeal not only because it is able to incorporate propositional, factual cognition into the ways in which particular cognitive content can lead to emotions and behaviours, but because it can also provide an architecture of cognition that can account for implicational and other non-verbal or non-propositional material.

The development of meaning: Discrepant and discriminative information

For a particular meaning to become active in the [IMPLIC] subsystem the total input from other subsystems must contain those elements that the [IMPLIC] subsystem has learned are those paired with that particular meaning, i.e., the subsystem has learned that 'A' is paired with 'B' (for example, the environment peculiar to English pubs (A) activates a desire to smoke (B) - see Figure 1). Such learned pairings may represent all of the material available for that particular pairing, or may comprise only a partial or a degraded set. That is, ICS allows subsystems to make predictions based on partial information and it can perform pattern completion if some information is missing.

![Figure 1. Simple co-occurrence learning in a single subsystem](image)

Both of these are important heuristics that allow the cognitive system to respond rapidly to incoming information. However, although subsystems can perform this kind of pattern completion they cannot ignore discrepant elements in a particular code if these elements have in the past acted as discriminative markers of lack of coherence between other elements. In the above example we might imagine that the pub environment is paired with the discrepant and discriminative element that one is with a friend who dislikes smoke and is severely asthmatic. If discrepant material (i.e., not normally part of the set of paired co-occurrences) is passed to the subsystem, further processing is required in order to determine what the appropriate response to this new pattern might be. If the discrepant material is also discriminating (indicative of a possible alternative response), then an alternative response may be chosen provided, of course, that an alternative response is within the individual's repertoire. In this example it may be either to not respond to the desire to smoke or, even, to become unaware of it for the time during which one is in that particular set of circumstances.

These abilities to recognise both co-occurrences that have predictive value and, when information is discrepant, are a necessary requirement for learning to occur and to support the flexibility that is a feature of human cognition. A learning system must be able to generate a particular response on the basis of learned regularities indicative of the appropriateness of that response; but it must also be able to recognise when the necessary conditions for such a response are not met. Within the ICS model, material that is discrepant (indicative of an imperfect match between the presently appraised material and the learned regularities) and discriminative (indicative of a plausible alternative) serves this function. As an example, if [IMPLIC] is integrating a range of patterns from a variety of subsystems in order to generate a schematic model, elements that are discrepant with this developing model will not be integrated into it when they are not discriminative. Teasdale and Barnard (1993) provide the following example, "If the majority of the elements conform to a schematic model ["myself as worthless, useless, pathetic, incompetent, unlovable"], elements that do not cohere with this pattern, such as evidence of recent success, will not be processed further". Such a representation can clearly be seen as a possible source of depression, reduced confidence, and lowered self-esteem, and a source that is resistant to information in the environment that is not coherent with this schematic model. Clearly this invokes echoes of Beck's (1976) cognitive model of depression where material that is (in ICS terms, implicationally) discrepant to a depressive schema is ignored because it
does not sufficiently discriminate between the current (depressive) schema and any others which may be available. This conclusion appears, at first sight, contradictory. Earlier it was stated that discrepant material led to further processing. Now it is stated that such material would be ignored. This is centred on the fact that processing within ICS distinguishes between discrepant and discriminating material.

If the subsystem has learned that ‘A’ is paired with ‘B’, and then experiences a situation in which ‘A’ is paired with ‘C’ (for example in the original scenario above, the knowledge that smoking is likely to lead to ill health), this material (‘C’) is discrepant. It is only discriminating, however, if the presence of the new material offers the prospect of an alternative response, or the development of a new alternative response. If, however, the system has learned that, in each and every case, the presence of ‘A’ is a predictor of the occurrence of ‘B’ (pubs produce a desire to smoke) the presence of a discrepant stimulus ‘C’ in the scenario is of little consequence (see Figure 2).

Figure 2. A subsystem dealing with (a) discrepant and discriminating information and (b) only discrepant information.

It is worth pointing out that this example illustrates how such learned non-discrimination may be correctly representing reality – smokers may still have a strong desire to smoke even when they know the potential hazards to their health.

As Teasdale and Barnard (1993) have stated, it is the differences in schematic models represented in [IMPLIC] that differentiate between individuals who are vulnerable to depression and those who are not. Similarly, schematic representations may differentiate between those with high and low confidence, those who can give up smoking once learning of the health implications and those who cannot, and those who are able to deal with emotionally negative experiences and those who cannot.

Memory and buffered processing in ICS

Each subsystem within ICS possesses a COPY process, which creates a representation of all information coming into that subsystem and stores it in its own memory record, the memory record serving as a store and as a buffer for on-going processing. This happens in parallel with transformations. Although subsystems can only transform one stream of information at a time, the COPY process records all of the information coming into a subsystem. This allows transformations to occur in two different ways: “unbuffered”, where information comes into a subsystem and is transformed into another code in real time, and “buffered”, where the information is coming from the memory record. The difference is important because ICS builds up knowledge from accumulated experience, which can be thought of as building up a knowledge base of how a subsystem should structure or “parse” the information coming into it. This acts to determine which pieces of information are related to which others, so that they can become appropriately associated and form a coherent whole. Both familiar and unfamiliar patterns can be produced through this system of parsing so that

(i) the system can respond quickly to patterns of information that have previously co-occurred

(ii) it can also continue to learn to respond to novel patterns of information.

Novel patterns will require buffered processing in order that a subsystem may determine which pieces of information should be related, based on any previous co-occurrences.
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Proceduralised processing

Proceduralised, or non-buffered processing is characterised in ICS by making use of patterns of previous co-occurrences over the entire system in order to produce representations of meaning, affect and response. This compares with the idea of schema (e.g., Beck, 1976; Rumelhart & Ortony, 1977). The procedural processing of information between subsystems, particularly [PROP] and [IMPLIC], thus embodies the theoretical properties of theories of schema and their importance in understanding both adaptive and maladaptive behaviour (e.g., Young, 1990; Beck, 1983). Knowledge about events in the world, and about previous interpretations, feelings and responses will be represented in the system's knowledge base along with routines for determining how that knowledge is processed, integrated, etc. In essence, proceduralised processing governs ICS activity in situations that are routine and expected for the individual.

Non-proceduralised processing

This form of “buffered” processing is characteristic of novel situations where the routines for dealing with incoming information are not already available. It is evidenced by heavy use of memory records, and/or numerous exchanges of information between the central subsystems of ICS. This type of processing may occur because the situation is novel, or because the information available is contradictory to or inconsistent (i.e., discrepant and discriminative) with previous experiences and as such the currently available repertoire of responses needs to be refined if the behaviour/thinking/feeling is going to be suitably adaptive. Teasdale and Barnard (1993) provide the example of changes in emotional response to a looming object. If a child’s experience of a rapidly approaching object is routinely paired with an inconsistent event (comforting from the child’s mother) it will elicit a different emotional response from the child to the fear and withdrawal responses that are typical in these situations. This leads to two important differences between buffered processing and unbuffered, direct code transformation. Firstly it means that buffered transformations do not have to occur in real time: and as such, degraded input can be amalgamated with previous memory content to build up a complete representation of the current state of affairs. In this way the process is acting to complete patterns of input based on previous experience. The second important difference is that buffered processing enables a subsystem to deal with novel combinations of units of representation, including the combination of two sets of information which were both COPY-ed but which could not have been simultaneously transformed into the same new code. In ICS, buffered processing has privileged access to the transformational processor and, as subsystems cannot process streams that are buffered and non-buffered at the same time (Barnard, 1987), where there is discrepant and discriminative information input to a subsystem it will switch to buffered processing.

These two forms of processing provide for a great deal of system flexibility that can account for cognitive phenomena such as the accrual of skill, and the integration of information for problem solving and decision making etc. They also form the basis for developing an understanding of the underlying mechanism of hypnosis.

An ICS approach to hypnosis

Application of the ICS model to the challenges of hypnosis highlights a phenomenon known as interlock. This is hypothesised to be a normal operating procedure in ICS that typically is used to explain what are considered routinely occurring maladaptive behaviours in clients, such as interpersonal misinterpretations (which may result in social faux pas at one end of the continuum, or serious violence at the other) or action slips etc. However, it is also useful for understanding how hypnosis works as it has the property of allowing information to be recycled around the cognitive system without its
being critically analysed, and as such, new information (which would be ignored during normal conditions of conscious processing) can gain access to high levels of representations that drive beliefs and understanding. In conjunction with hypothesized changes in how the content of representational schemata are processed it may also provide a theoretical account of how hypnosis can act therapeutically.

In order to develop an ICS-based model of hypnosis it is necessary to consider a particular example. The simplest example to think of is where behaviours, or the mental representations that drive behaviours, are learned in a way that would lead to a lack of confidence or poor self-esteem without there being any underlying cognitive dysfunction. For example, the inability to respond successfully to an event may be the result of inconsistent learning. Where learning has been inconsistent there is unlikely to be a strong mapping between a set of circumstances (which are perceived normally), and a repertoire of suitable responses (any of which could be performed normally). Instead, there may rather be a mixture of responses that reflect the person’s learned inability to select a socially appropriate response to an ambiguous social situation. Alternatively, learning may have occurred in circumstances which are highly specific and which do not generalise outside of that environment. Representations that have been developed within that specific environment will lead to suitable responses dependent on circumstances within that particular setting. If, however, the environment changes (with consequent alterations in cues and contingencies), this behaviour may appear to become maladaptive. An example might be where an individual grows up in an environment where demonstrations of independence and self-worth have been associated with others’ expressions of negativity or indifference rather than with displays of affection and approval. In that environment a reduced interest in self-worth may be an appropriate, protective response; however it would be entirely inappropriate in what we would consider healthy adult relationships in the context of wider society. This is consistent with theories which look at poor self-esteem or lack of confidence from a wide range of perspectives (e.g., evolutionary, neurobiological, intrapsychic, behavioural, interpersonal, and cognitive). Behaviour develops through normal learning processes and these learned responses and patterns of thinking should be open to change by future experiences.

Three assumptions are made here in the development of an ICS model of hypnosis and a model that can inform intervention in this particular case. Each of these assumptions may be questioned but they allow the development of a working model that can at a later date be further detailed to deal with violations of these assumptions.

The three assumptions are as follows:

(i) The cognitive framework is fully functional. This allows us to ignore the complexities of developing the theory to account for damaged subsystems.

(ii) There are no concerns as to the accuracy of information coming in from the senses, or going out to the effectors. This means that perception is not distorted and that the results of cognitive processes are produced accurately (either physically in the case of motor control, or in the form of conclusions reached in the case of “thinking”).

(iii) However unlikely this might be in clinical experience the model is accounting for ‘pure disorders’ (for example a lack of confidence) with no other associated problems.

The subsystems that are of critical importance for developing an understanding of hypnosis are the [PROP] and [IMPLIC] subsystems. This is because these subsystems represent meaning at different levels, rather than representing information which is the level at which the other subsystems are representing material. [PROP] represents meaning at the level of statements that can be classified as true or false and [IMPLIC] at a more holistic or schematic level. These are the levels of representation which drive understanding, thought and behaviour (and as such can provide an account of human behaviour) as has been demonstrated in previous work (e.g., Teasdale & Barnard, 1993).
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As the same framework should be able to account for adaptive and non-adaptive behaviour these same two subsystems should be able to account for all human experience, including hypnosis. The model that will be outlined below will rely strongly on the two previously described processes of interlock and buffered processing.

Interlock, buffered processing, and hypnosis

Once the various sources of information concerning a particular set of circumstances (here relating to an individual’s feelings of confidence) have passed between subsystems, via buffered and non-buffered processing, the [IMPLIC] subsystem can develop schemata based on the input from these other subsystems. This representation will then be transformed, and relevant parts will be passed back to various subsystems for controlling actions, developing propositional representations, feelings etc. This also allows subsystems to compare their own current representations with those fed back from other subsystems and to integrate new information or make corrections. A corollary of this is that such feedback will typically lead to representations that continue to support an individual’s state of reduced self-esteem and confidence because new discrepant and discriminating information will not be integrated into this representation (the mechanism through which this lack of integration occurs having been described earlier). We can understand these processes as confirming or even strengthening the thinking and behavioural biases that the individual has developed over time. ICS however supports a normally occurring process, namely the process of interlock, whereby new information can become integrated into developing schemata even though it might not be discriminating. When interlock occurs, rather than the reciprocal input to [IMPLIC] from the various subsystems including any new information such systems reflect back to [IMPLIC], in the various subsystem codes, the information that has already been used to produce the [IMPLIC] representation that is now being fed back. It can be thought of as a self-preserving feedback loop, where the same information circulates through the various subsystems, reinforcing the representations at the various levels, and all of this occurring in an unbuffered, automatic manner. Interlock occurs, or is more likely to occur, when the representations maintained in [PROP] and [IMPLIC] are congruent (that is, when the “facts” that one represents at that time are congruent with the wider meaning of those facts). This congruence of representations has the effect of making it more likely that the system will “settle”, and as such will fall into interlock (Teasdale & Barnard, pp. 179-180, 221). We can hypothesise that either inducing oneself, or being induced, into a state of relaxation (i.e., the fact that one is relaxing and the experience of feeling mentally and physically relaxed) has the effect of producing congruent states in [PROP] and [IMPLIC]. The experience of this congruent state derives from the fact that one is relaxing, coupled with having an understanding of the meaning of relaxation (which explains why it is important to ensure that clients have an understanding of what the feeling of relaxation actually is, and what it means, prior to attempting hypnosis). This results in 2 levels of meaning which can produce reciprocal transformation, i.e., interlock (Teasdale & Barnard, p. 106).

Once a state of interlock has been initiated this allows new material to enter the central engine without being critically evaluated. It is important to recognise that the occurrence of interlock does not result in the system shutting down in any way. The systems that are now in interlock pass the same information, in their separate codes, to one another iteratively. However, new information that is coming into the system (although it will not be involved in the information flow that comprises the iterative [PROP → IMPLIC: IMPLIC → PROP] cycles) will still have access to the memory records of subsystems via the COPY process. New material stored via the COPY process becomes an established part of the individual’s experience and as such is available, in principle, to be included in future schemata. So, interlock is responsible for eventually allowing the development of representations that can contain new information because this new material has access to the cognitive system via the COPY proc-
ess. Outside of hypnosis this access would be denied (because although the information would be discrepant, it would not be considered discriminating). Once the system is no longer in interlock, buffered processing can be resumed. Basically this means that an individual is now either able to consciously consider options, or at an unconscious level will have a tendency to construct and activate new schemata, and thus new thoughts and actions, for a given set of circumstances.

Teasdale and Barnard (1993) see the possibility of such “settling” (p. 221) as inherent in ICS and suggest that it leads to the $[\text{PROP} \rightarrow \text{IMPLIC}: \text{IMPLIC} \rightarrow \text{PROP}]$ cycles becoming locked together. Just as Teasdale and Barnard suggest that mood states may be maintained in this way, the reinforcement of a hypnotically constructed representation can lead to behaviour that is more likely to be produced in the future. For example, an [IMPLIC] representation, based on a script used during hypnosis which includes a sense of confidence will generate a [PROP] representation of the fact that one is feeling confident, along with a [BS] representation of the feeling of being confident. These thoughts, feelings etc. are likely to be maintained over a period of time when new, counterfactual information becomes present because the information being processed (the [BS], [PROP], and [IMPLIC] representations) fits a particular theme which will re-create closely related schematic models (Teasdale & Barnard, 1993, p. 106), in this case, of confidence.

The specifics of the new thoughts and behaviour are dependent on the original [IMPLIC] representation generated; this will vary as a function of the individual’s experience, which means that different situations can elicit the same behaviours, and a variety of behaviours are possible. The tendency for the central engine to be prone to interlock could be considered a predisposing factor for hypnotic ability or suggestibility. Perhaps most interestingly, this model allows us to understand the maintenance of post-hypnotic behaviour in the absence of continuing stimuli in the environment which might act as triggers (i.e., continuing hypnotic suggestions); because the interlock loop is self-preserving, its maintenance does not have to rely upon knowledge that is consciously available.

As has been stated earlier, when a system has to deal with discrepant and discriminating input it will begin to process material in a buffered, non-automatic manner. There are two consequences of this kind of processing. One is that buffered processing is treated preferentially to unbuffered processing - and the two cannot occur simultaneously (Barnard, 1987). The other is that the activation of buffered processing results in new material having the opportunity of being involved in the outcome of processing. Here lies the importance of the second consequence: buffered processing is responsible for the development of new schemata. This means that the new information will be represented as a behavioural or cognitive option when a particular set of circumstances, be they internal or external, arises. The more often that the new schemata are accessed, the more preferentially they will be chosen over old schemata (which may on occasions still be activated, thus explaining occasional relapses) resulting in a gradual shift in thoughts (e.g., fears, self-esteem, self-confidence) and associated actions.

Implications and Conclusions

At first sight, this approach to hypnosis may be assumed to be a simple associative network model. It might be assumed that the observed phenomena are explicable as the products of a failure of discriminative stimuli. However, a model of hypnosis based on the ICS approach has some clear differences from an associative network model. The initial development of ICS was in response to observed limitations of associative network models - such as poor representation of levels of meaning, the inability to distinguish between ‘hot’ and ‘cold’ emotional information etc. The ICS model is therefore better able to model the empirical findings that are at variance with an associative network explanation (see Teasdale & Barnard, 1993, pp. 37-46).

An ICS account of the way in which hypnosis works suggests that prior to hypnotic intervention, information (whether internally or externally available) may not be considered
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relevant to, or predictive of, behavioural outcomes; thus it is hypnotic intervention that determines whether information will become integrated into representations of action or meaning even when that information is repeated or highlighted. As the individual’s basic schemata are at least partially developed from co-occurrences that are present in dysfunctional experiences, when the system (i) cannot integrate new information because it is not discriminative or (ii) it maintains dysfunctional schemata which cannot be internally modified, the resultant thoughts and behaviours will be impulsive, rigid, and dysfunctional. This is not because the schemata are rigid, or preferentially selected but because in both cases new information is not made available. The model proposed here suggests that a fundamental factor in the process of change through hypnosis is that individuals may be able to settle into interlock. The same process explains how hypnosis works to alter thoughts, consequential behaviours and affective experiences, and perhaps most crucially provides a theoretical approach to explaining what hypnosis actually is and how to achieve it.

There are (at least) two interesting corollaries to this model. The first, referred to earlier, is how it addresses the issue of state vs. non-state views of hypnotic experience. In essence the ICS model indicates that it is immaterial how the individual experiences the process, as this will be due to representations associated with their own idiosyncratic beliefs and previous experience of hypnosis. We can consider the individual’s experience as an inconsequential by-product rather than a crucial therapeutic element. The important part of the process resides in promoting interlock between [PROP] and [IMPLIC] representations, thereby allowing new, discriminating and discrepant material access to mental representation. Using an adequate theoretical framework it is possible to both explain hypnotic phenomena and remove the need for the state/non-state debate. This is achieved by developing a model that allows schemata that correspond to “state” like experiences and behaviours in some individuals and “non-state” experiences and behaviours in others. That is, some individuals may experience, or may learn, certain relationships (eg, expectations and biases) during hypnosis which lead them to behave, and experience hypnosis, in either a state or non-state manner. The process of hypnosis per se, from a cognitive theoretical perspective, is thus independent of the subjective experience or the objective manifestation of hypnosis; as such the debate is a distraction from examining the process of hypnosis. It is only through our understanding of this process that we can develop therapeutic interventions that will have the greatest benefit.

The second corollary is that we may begin to develop an understanding of what hypnotherapists are referring to when they talk about accessing the unconscious. Based on this model, it is the provoking of the individual to engage in unbuffered, automatic processing of information, which may be thought of as the uncritical acceptance of this information. Naturally this begs the question: if hypnosis initiates unbuffered, uncritical processing of information surely it is possible to get anyone to do anything via hypnosis? We know this is not the case and that theoretical explanations for the existence and functioning of a “Critical Factor” are entirely plausible within an ICS model of hypnosis; however they exceed the purpose of the current paper.

Importantly, the model suggests that hypnosis comes about based on an understanding of normal functioning. The cognitive system has learned responses, beliefs etc in particular environments and the system is not able to adapt to new information because it does not consider it to have value, or because it is not integrated into the individual’s schemata. Ultimately this means that we do not need a separate psychology of hypnosis but can use what we know of psychology in order to understand it.

A further important property of the model is that it addresses why in some circumstances, in some people, with certain presenting problems, it is difficult to treat the individual successfully other than through hypnosis. The way in which the person’s system functions predisposes it to not make use of new information, thus therapeutic approaches which are based on providing, for example, insight or social skills training are unlikely
to be generally effective. This is not because the information that they present is incorrect, but rather because that information is denied access to the [IMPLIC] level, where it would be able to influence behaviour, thoughts, and feelings. By this analysis, more adaptive and less dysfunctional or subjectively unpleasant forms of response might result if individuals were facilitated in gaining access to objectively discriminative information and reciprocal [IMPLIC] processing cycles that reflect changes in representations.

The application of ICS to hypnosis highlights the importance of two hypothesized processes: buffered processing and interlock. These are hypothesized to result in behavioural, cognitive, and affective responses that can bring about change. This analysis implies that therapeutic interventions should be targeted at establishing interlock and providing the individual with information that clearly discriminates the desired behaviour and thoughts from those that are typically enacted in a given set of circumstances. These should employ well-established techniques from cognitive therapy and other approaches, but be informed by the cognitive architecture of the ICS model, and should employ scripts that have been specifically developed in the light of that analysis. It is also worth considering that this model suggests that it might be most beneficial to develop scripts that reinforce change across the entire range of ICS subsystems, as they may all contribute to the development of the all-important [IMPLIC] representation. It is common for scripts to make use of a range of modalities based on the idea that this makes the hypnotic experience more vivid for the client. This model provides some theoretical basis for that position although it indicates that vividness per se is not the crucial element; however, vividness requires the recruitment of a range of subsystems into the hypnotic experience.

References


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