HOW DOES COGNITIVE THERAPY PREVENT DEPRESSIVE RELAPSE AND WHY SHOULD ATTENTIONAL CONTROL (MINDFULNESS) TRAINING HELP?

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Summary—There is encouraging evidence that structured psychological treatments for depression, in particular cognitive therapy, can reduce subsequent relapse after the period of initial treatment has been completed. However, there is a continuing need for prophylactic psychological approaches that can be administered to recovered patients in euthymic mood. An information-processing analysis of depressive maintenance and relapse is used to define the requirements for effective prevention, and to propose mechanisms through which cognitive therapy achieves its prophylactic effects. This analysis suggests that similar effects can be achieved using techniques of stress-reduction based on the skills of attentional control taught in mindfulness meditation. An information-processing analysis is presented of mindfulness and mindfulness, and of their relevance to preventing depressive relapse. This analysis provides the basis for the development of Attentional Control Training, a new approach to preventing relapse that integrates features of cognitive therapy and mindfulness training and is applicable to recovered depressed patients.

INTRODUCTION

The prevention of relapse, recurrence, and chronicity constitutes a major problem in the treatment of depression. Recent evidence suggests that psychological treatments may be superior to anti-depressant medication in preventing relapse after active treatment has been withdrawn; at least four treatment trials have found cognitive therapy for depression superior to pharmacotherapy in reducing relapse, or the need for further treatment, in the follow-up period (Blackburn, Eunson & Bishop, 1986; Simons, Murphy, Levine & Wetzel, 1986; Evans, Hollon, De Rubeis, Piasecki, Grove, Garves & Tuason, 1992; Shea, Elkin, Imber, Sotsky, Watkins, Collins, Pilkonis, Leber, Krupnick, Dolan & Parloff, 1992).

How are these prophylactic effects to be explained? Can we use an understanding of the way these effects are achieved to improve the effectiveness and efficiency of psychological approaches to the prevention of relapse in depression? In particular, can this understanding help us develop cost-effective methods of prevention applicable in the euthymic state (Hollon, Shelton & Davis, 1993, p. 273)?

In this paper we present an information-processing analysis of depressive relapse and its prevention by cognitive therapy. Our analysis suggests that preventive interventions operate through their effects in changing the patterns of cognitive processing that become active in states of mild negative affect. From this perspective, training in the re-deployment of attention, as in methods of stress-reduction based on techniques of mindfulness meditation (Kabat-Zinn, 1990), is highly relevant to prevention of depressive relapse. We describe mindfulness training and present an information-processing analysis of its therapeutic effects. Finally, we summarise the essentials of Attentional Control Training (ACT) (Segal, Williams & Teasdale, in preparation), a relapse prevention programme that integrates elements of mindfulness training with more traditional elements of cognitive therapy (Beck, Rush, Shaw & Emery, 1979). The goal of this treatment is to reduce relapse and recurrence in patients who have recovered following a range of initial treatments for depression.

The information-processing analysis we present has been developed within the Interacting
Cognitive Subsystems conceptual framework (ICS) (Barnard & Teasdale, 1991; Teasdale, 1993; Teasdale & Barnard, 1993). We begin by describing the essential features of this approach.

**THE INTERACTING COGNITIVE SUBSYSTEMS (ICS) FRAMEWORK**

ICS is a comprehensive conceptual framework within which accounts of all aspects of information-processing may be developed. Teasdale and Barnard (1993) provide a comprehensive description of ICS and describe its application to maintenance, vulnerability, relapse and treatment in depression. Teasdale (1993) discusses aspects of ICS relevant to understanding depression and its treatment by cognitive therapy. Here, we provide a summary of those aspects of this approach directly relevant to its application to depression.

**Distinct types of information**

Within ICS, different aspects of experience are represented in patterns of qualitatively different kinds of information, or mental codes. The relations between these types of information are shown in Fig. 1. At the most superficial level there are three sensory codes representing, respectively, basic features of **Visual, Acoustic** and proprioceptive (**Body-state**) sensory input. For example, **Acoustic** code represents basic features of sound stimuli such as pitch, timbre and loudness.

At a 'deeper' level, recurring regularities in patterns of sensory codes are represented in intermediate codes. For example, the essential 'core' patterns common to the sounds of the same word spoken with different accents, pitch, or loudness are represented in a speech-level (**Morphonolexical, MPL**) code. Analogously, recurring patterns common to the visual input from similar objects seen from different perspectives and orientations are represented in **Object** code.

At an even 'deeper' level there are mental codes related to meaning. ICS recognises two distinct kinds of meaning, one specific, the other more generic. **Propositional** code represents specific meanings. Meaning at this level can be grasped relatively easily as there is a fairly direct relationship between language and concepts at this level; a sentence conveys one or more specific meanings.

Patterns of **Implicational** code represent a more generic, holistic, level of meaning. This generic level represents 'deep' recurring regularities across all the other information codes. Meaning at this level is difficult to convey because it does not map directly onto language. ICS proposes that only this generic level of meaning is directly linked to emotion.

The level of analysis represented by **Implicational** meaning can be illustrated by the analogy between a sentence and a poem. A sentence conveys specific meanings by appropriate arrangements

![Diagram](image)

Fig. 1. Interacting Cognitive Subsystems (ICS): the relationship between sensory, intermediate, and meaning codes (AC, **Acoustic**; VIS, **Visual**; BS, **Body-state**; MPL, **Morphonolexical**; OBJ, **Object**; PROP, **Propositional**; IMPLIC, **Implicational**). (From Teasdale & Barnard, 1993.)
of letters or phonemes. Analogously, a poem conveys 'holistic' meanings, that cannot be conveyed by single sentences, by appropriate arrangements of patterns of specific meanings and sensory contributions from the sounds of the words, from rhythm and metre, and from visual imagery.

Poetry also illustrates a second important point: sensory features, such as tone of voice or proprioceptive feedback from facial expression or bodily arousal, make a direct contribution to Implicational meanings, together with patterns of specific meanings (see Fig. 1). So, the higher order meanings we derive from the specific meanings conveyed in what someone is telling us may be directly influenced by the actual sounds of the words, and by whether, at a bodily level, we are calm and alert rather than tired and uncomfortable.

The knowledge in patterns of Implicational code can be thought of as representing schematic mental modes of experience. Mental models provide us with 'internal maps' of the relationships between different aspects of experience (Johnson-Laird, 1983). Schematic models tell us about the inter-relationships between generic features of experience, capturing very high level recurring regularities in the world, the body and 'the mind'. These models represent the 'deep' or thematic structure of experience.

The knowledge in schematic models is implicit. From this generic knowledge, explicit specific, meanings, such as predictions, expectations, attributions, and instructions, can be derived. For example, from a text conveying the specific meanings: 'John knocked the glass off the table. Mary went to the kitchen to fetch a broom', the ['brokenness'] schematic model will be synthesised. This model encodes all the high order recurring regularities that have previously been extracted from experiences involving breakage of fragile objects. The implicit knowledge inherent in this schematic model allows us to immediately infer the specific meaning that the glass was broken, although this is nowhere explicitly stated.

Implicational schematic models are composed of informational elements, or variables. Each of these variables corresponds to a 'deep' dimension, extracted from experience. Individuals will differ from each other in the dimensions they have extracted from experience, and in the relationships between those dimensions that have been encoded. Differences in schematic models between individuals reflect both differences in experience and in the way that experience has been analysed.

We can think of the high order meanings of schematic models in terms of patterns of values across variables (Fig. 2). The values of variables reflect the current state of the underlying dimensions of experience that they represent. For example, the pattern shown in Fig. 2 might represent a model extracted as prototypical of previous depressing experiences, such as ['myself as globally worthless, unlovable, and incompetent']. In this case, the dimensions encoded might be derived from patterns of specific meanings reflecting whether one had recently succeeded or failed at tasks, whether others had succeeded or failed at those tasks, whether one's performance had been criticised by significant
others, and, from more directly sensorily-derived sources, whether one's bodily arousal was high, low, or normal, whether one's posture was erect or stooped, whether one was frowning or smiling, and so on. These patterns will be constantly made, remade, and varied according to the shifting state of the underlying dimensions. The total pattern determines high level meaning, and, as we shall see, emotional response.

In addition to the information codes already noted, ICS includes effector codes that control the motor, speech, somatic and visceral effector outputs of information-processing.

**Information processing**

Within ICS, information processing involves the transformation of patterns in one information code into patterns in another information code. The processes that perform these conversions are arranged in nine separate cognitive subsystems, each subsystem processing information in one specific information code. Each subsystem has its own memory store, specialised for storage of representations in the particular information code that its subsystem takes as input. Extended processing involves a continuing flow and exchange of information between subsystems. In the course of these transfers information is repeatedly modified by the actions of transformation processes and the contributions from memory stores. The conversions performed by transformation processes are 'learned' on the basis of regularities and covariances in the patterns of information codes previously encountered.

**ICS AND EMOTIONS**

Emotion-related schematic models encode the prototypical features extracted from previous situations eliciting a given emotion. The production of an emotional response depends on these affect-related models; when such patterns of Implicative code are processed, emotion is produced. For example, a depressed emotional state results from the synthesis of schematic models encoding themes such as ['globally negative view of self'] or ['hopeless, highly aversive, uncontrollable situation that will persist indefinitely'], that have been extracted as prototypical of previous depressing situations.

In ICS, generic level meanings can directly produce emotional responses, but specific level meanings cannot. In this way, the ICS approach captures the important distinction between 'emotional', 'gut-level', 'hot' meanings and 'intellectual', 'rational', 'cold' meanings (Teasdale, 1993). Relatedly, within ICS, sensorily derived elements can make a direct contribution to the synthesis of high level affect-related meanings, and so to the production of emotion (Figs 1 and 2). For example, patterns of loss-related low level meanings that may be sufficient to create depressogenic ['hopeless-self-devaluative'] schematic models in conjunction with bodily feedback indicating sluggishness, bowed posture and frowning expression, may create more 'acceptant' or 'coping' models (meanings) in conjunction with feedback indicating bodily alertness and an erect, dignified posture.

Having outlined aspects of the ICS approach, we now consider its implications for understanding and treating depression.

**Maintenance of depression**

In ICS, emotional reactions occur when emotion-related schematic models are produced from patterns of lower level meanings and patterns of sensorily-derived input. Production of a depressed emotional response occurs when depressogenic schematic models are synthesised. Maintenance of a depressed state depends on the continuing production of depressogenic schematic models. This is an essentially dynamic account; if the production of such models ceases (e.g. as a result of the production of alternative, non-depressogenic, schematic models), then the depressed state will lift.

Depression is often maintained in the absence of a continuing stream of severe loss events or difficulties from the environment. In this situation, ICS suggests, 'internal maintenance' of depression depends on the establishment of self-perpetuating processing configurations that continue to regenerate depressogenic schematic models. Figure 3 illustrates such a configuration. Here, the outputs generated from depressogenic schematic mental models 'feedback' to regenerate schematic models similar to those from which they were derived.
Implicational schematic models can produce Propositional specific meanings as output, as in our earlier example in which the specific meaning 'something fragile is broken' was derived from the ['brokenness'] schematic model. In the 'cognitive loop' in Fig. 3, depressogenic schematic models output negative specific meanings [negative predictions for the future, attributions of failures to personal inadequacy, negative evaluations of interpersonal interactions, retrieval cues to access memories of previous failures or difficulties, etc.]. These negative specific meanings can contribute to the synthesis of further schematic models. Reflecting the negative content of the specific meanings, there is an inherent possibility that the models produced will, themselves, be depressogenic. These models will regenerate and maintain the depressed state. These models will also produce further negative specific meanings, so that the information circulating round the cognitive loop will continue to be dominated by depressogenic content. In this way, self-perpetuating 'depressive interlock' configurations can become established. The risk of interlock is particularly high for 'globally negative' schematic models of the self or future; such models can be re-instated by a wide range of negative specific meanings and so are particularly likely to be regenerated by their own negative outputs. The negative specific meanings of the depressive interlock configuration may be experienced as streams of 'negative automatic thoughts' (Fig. 3).

The 'sensory' loop shown in Fig. 3 can also act to perpetuate the depressive interlock configuration. Depressogenic schematic models produce depressive emotional reactions that include bodily effects such as changes in arousal and activation, bowed and stooped posture, tearful, sad, frowning expression, etc. These responses lead to sensorily-derived (Body-state) informational elements that can contribute, in conjunction with meaning-derived elements, to the synthesis of further depressogenic schematic models. The outputs of these models will produce further depressive responses in the body. In this way, the sensory loop, in conjunction with the 'cognitive' loop, can act to perpetuate the 'depressive interlock' configuration maintaining the production of depression.

Teasdale and Barnard (1993, Chap. 13) review empirical evidence consistent with the analysis of depression maintenance just presented. On this view, the 'internal' regeneration of depressed states depends critically on the establishment and maintenance of self-perpetuating 'depressive

Fig. 3. The 'internal' maintenance of depression by a self-perpetuating 'Depressive Interlock' processing configuration. The 'central engine' of cognition (the Implicational-Propositional-Implicational loop) is shown as broad, hatched arrows.
interlock' configurations. The cognitive loop of the depressive interlock configuration involves repeated cycles in which specific meanings are derived from schematic models, and schematic models are synthesised from patterns of specific meanings. Similar reciprocal cycles of Propositional-Implicational processing lie at the heart of the configurations supporting a wide range of 'controlled processing' tasks, such as the execution of complex or novel tasks, problem-solving, text comprehension, etc. For that reason, such cycles have been termed the 'central engine' of cognition (Teasdale & Barnard, 1993, Chap. 6). Consistent with self-regulatory, motivational models of depression (Kuhl & Helle, 1986; Pyszczynski & Greenberg, 1987) the ICS analysis suggests that, in the depressive interlock configuration, 'central engine' resources are devoted to repetitive, 'ruminative', information processing cycles motivated to the attainment of central personal goals, or intentions, that can neither be attained nor relinquished (Teasdale & Barnard, 1993, Chap. 14).

We can extend this analysis of maintenance to explain vulnerability to onset or relapse in depression. On this view, vulnerability to relapse depends on the ease with which the depressive interlock configurations that have maintained an episode of depression can be reinstated, subsequently, in situations of mild negative affect. The ICS analysis suggests that the risk of depressive interlock becoming (re-)established is particularly high for 'globally negative' models of the self or future; such models can be reinstated by a wide range of negative specific meanings and so are particularly likely to be regenerated by their own negative outputs. Consistent with this analysis, vulnerability to disabling depression is associated with evidence, in mildly depressed mood, of global negative self views and dysfunctional, depressogenic attitudes (Teasdale & Dent, 1987; Miranda & Persons, 1988; Miranda, Persons & Byers, 1990; Teasdale & Barnard, 1993, pp. 33–34).

**PREVENTING RELAPSE—THE ICS PRESCRIPTION**

The ICS analysis of relapse and recurrence suggests that, following recovery, mild states of depression can reactivate depressogenic cycles of cognitive processing similar to those prevailing during the prior episode. These cycles can transform what, in other circumstances, might be no more than mild or transient experiences of depressed mood into an incipient relapse to major depression.

This analysis suggests that interventions to reduce relapse should 'normalise' the patterns of processing that become active in mild negative affect. From this perspective, it is not essential, or even desirable, that treatments should aim to eliminate the experience of states of unhappiness or mild depression. Rather, the specific aim of such treatments should be to prevent the re-establishment of depressive interlock configurations in these conditions so that negative moods remain mild or transient rather than escalating to more severe or persistent affective states. How is this to be achieved?

Below, we identify three, broadly distinguishable, strategies to prevent establishment of interlock. In practice, these strategies are likely to be interlinked:

(1) The establishment of interlock can be prevented by redeploying the resources necessary for the maintenance of that configuration to the processing of other, non-depressogenic, information. Within ICS, the transformation processes that change one kind of information (mental code) into another can only handle one coherent data stream at a time; each of these transformation operations can act, effectively, as a processing 'bottleneck'. It follows that establishing an alternative processing configuration, competing for the resources that support the interlock configuration will, inevitably, disrupt interlock.

The cognitive loop of the interlock configuration includes cycles of reciprocal conversions of generic meanings to specific meanings and of specific meanings back to generic meanings. As we have seen, this 'central engine' of cognition is also pivotal in many configurations involving 'controlled processing', for example, the configurations supporting performance of complex or novel tasks. It follows that deploying limited 'central engine' resources to alternative 'controlled processing' configurations may be a useful technique for avoiding, or escaping, interlock. There is evidence, for example, that demanding distraction tasks produce short-term improvements in depression (e.g. Fennell, Teasdale, Jones & Damlé, 1987).

In 'normal' depressed moods, distraction techniques involving the redeployment of central engine
resources to the performance of complex or novel tasks may be sufficient to dispel the unpleasant mood state. However, the schematic models that are particularly likely to establish persistent interlock configurations relate to more intensely negative topics—a global negative view of self, an utterly hopeless view of the future, etc. Goal-related processing of information related to such models is likely to command a high 'processing priority'. If such models have recently been processed and are still readily accessible in memory, they are likely to 'recapture' processing resources after any distraction task involving information unrelated to depression has been completed. Consequently, the effects of distraction may be short-lived. In this situation, it will also be necessary to:

(2) Promote the synthesis of alternative schematic models, related to depressing topics but not, themselves, depressogenic, using the fragments of Implicational code (Fig. 2) that would normally yield depressogenic 'globally negative' models. In other words, starting with sub-patterns of Implicational code (for example, related to just having failed or been criticised, or to the bodily effects of mild dysphoria), the goal is to prevent these sub-patterns 'coalescing' or 'completing' into the total pattern characteristic of a depressogenic model. Rather, the aim is to retain the 'core' of these sub-patterns but to incorporate them into an alternative total pattern, related to depressive topics but not, itself, likely to set up a depressive interlock configuration. For example, production of specific meanings with negative self-devaluative content, such as attributions of failures to personal inadequacy, depends on depressogenic schematic models that encode the 'reality' of one's global worthlessness and incompetence. Alternative schematic models could share many features in common with the total code pattern representing the ['globally-worthless-self'] model, but differ in key respects so that they no longer encode the 'reality' of this self-view. For example, an alternative model might be described as ['the-mental-state-in-which-I-view-myself-as-utterly-worthless']. Such a model would imply a quite different set of specific meanings as outputs. Most importantly, these outputs would not serve to fuel the establishment of a depressive interlock configuration but would re-direct the evolution of subsequent information-processing into more functional directions.

The sensory loop of the depressive interlock configuration contributes fragments of Implicational code related to depressive posture, facial expression and other aspects of the depressive bodily response. Normally, these fragments will be integrated with fragments produced by the cognitive loop to complete a total pattern corresponding to a depressogenic schematic model. Changing these sensorily derived contributions of Implicational code provides a relatively direct way to alter the total pattern sufficiently to facilitate 'completion' to alternative, non-depressogenic, schematic models related to depression. For example, changing a bowed, 'defeated,' stooped posture ('carrying the burdens of the world') to an erect, dignified posture would be expected to increase the probability of synthesising models related to views of feelings of worthlessness or hopelessness as 'mental states' rather than as 'reflections of reality'.

(3) A final strategy, complementary, and linked, to the first and second strategies, is to facilitate production from depression-related models of outputs (specific meanings and bodily effects) that do not 'feedback' to regenerate depressogenic models.

We illustrate aspects of this general 'prescription' more concretely in the next section, where we suggest mechanisms through which cognitive therapy achieves its prophylactic effects.

THE PROPHYLACTIC EFFECTS OF COGNITIVE THERAPY

Evidence for significant effects of psychological treatments reducing risk of relapse in depression is currently most convincing for cognitive therapy (Blackburn, Eunson & Bishop, 1986; Simons, Murphy, Levine & Wetzel, 1986; Evans, Hollon, De Rubeis, Pisecky, Grove, Garvey & Tuason, 1992; Shea et al., 1992). However, there is also some evidence that other, structured, more behavioural treatment approaches for depression have good long-term outcomes (Romano & Rehm, 1979; Thompson & Gallagher, 1984; McLean & Hakstian, 1990). The analysis we present is relevant to both types of treatment approach.

We have suggested that to prevent relapse it is necessary to pre-empt the production, or regeneration, of depressogenic schematic models by the production of alternative models. We can think of schematic models in terms of patterns of values across a number of generic variables
(Fig. 2). In changing depressogenic models into more adaptive, non-depressogenic, models related to the same topics, we have to retain certain core elements of the original, maladaptive patterns at the same time as changing other elements to create a different total pattern. We can illustrate how this might be achieved using an analogy from experimental research on memory.

Presented with a word fragment or stem (such as MOU—______) Ss are more likely to complete it to make a common word (e.g. MOUSE) than a less common word (e.g. MOUND). This tendency can be reversed by prior presentations of the less common word (MOUND). In this way, S’s predominant tendencies to complete stems with popular endings can be counteracted so that, subsequently, they produce responses that are less common. In such situations, S’s performance can be affected by prior exposure to words ‘automatically’ without any necessary conscious recollection of previously seeing the less common word. Jacoby and Kelley (1990) suggest that these effects are mediated through access to episodic memory records of the earlier presentations of the less common words; subsequent presentation of the word stem or fragment acts as a cue to access these representations—these are then used in the current stem- or fragment-completion task.

We can extrapolate from these findings to understand the way in which cognitive therapy achieves its immediate and long-term effects. The essential suggestion is that the total therapy regime, including the overall treatment rationale, the high treatment structure, and the active and frequent practice of coping responses, leads to repeated experiences in which alternative, less depressogenic, schematic models concerning depression, its symptoms and effects, and related problematic life situations, are synthesised and stored in memory. In other words, during treatment, patients have frequent experiences of approaching problematic situations with a different ‘view’ or ‘set’ concerning depression and related areas.

We can regard the ‘core’ Implicational pattern related to ‘depression’ as analogous to a word fragment or stem. This core pattern can be completed by the addition of further elements to create either the pattern of, for example, [‘depression-as-a-sign-of-my-irremediable-personal-inadequacy’] (corresponding to completion of the word stem with a common ending) or the pattern of [‘depression-as-a-normal-state-to-be-dealt-with’] (corresponding to completion of the word stem with an uncommon ending). The task of therapy is seen as providing experiences that encourage synthesis of the latter class of schematic models rather than the former (such experiences correspond to prior presentation of the word made by the uncommon ending).

The persistence of therapeutic effects, in particular the prevention of relapse in the face of mild states of depression after completion of treatment, will depend on completing the core ‘depression’ pattern with additional patterns that yield non-depressogenic (e.g. ‘coping’) schematic models rather than ‘depressogenic’ schematic models. The analogy suggests that, at times of potential relapse, synthesis of alternative (e.g. ‘coping’) models will depend on fragmentary ‘depression’ patterns acting as cues to access episodic memory records in which this ‘core’ pattern forms part of a total [‘depression-as-a-normal-state-to-be-dealt-with’] pattern rather than part of a [‘depression-as-a-sign-of-my-irremediable-personal-inadequacy’] or [‘me as a globally worthless person’] or [‘the future as utterly awful and hopeless’] pattern. Jacoby’s work on verbal memory suggests that such access will depend on the presence, in the Implicational memory record, of many episodic representations of the more adaptive patterns in conjunction with a wide variety of contexts. These representations, in turn, will have to have been created on many occasions, in many different contexts, if they, rather than depressogenic representations, are subsequently to be accessed.

This account suggests that, to prevent relapse, treatments should involve repeated ‘homework’ experiences of practising coping skills, or approaching depression-related situations with a different ‘set’, in many different contexts. This is a feature of cognitive therapy and of other structured psychological treatments for depression, but not of more traditional ‘office-based’ psychodynamically oriented therapies. Interestingly, the limited evidence available suggests that more purely ‘office-based’ treatments tend to have weaker long term effects in preventing relapse or reducing further need for treatment than structured treatments involving homework, even when the two approaches are comparably effective in reducing symptoms in the short-term (e.g. Thompson & Gallagher, 1984). From the ICS perspective, the importance of practising coping skills is not primarily to establish a ‘habit’ or ‘repertoire’ of skills, per se. Rather, it is to acquire a stock of episodic memories of ‘coping’, or other non-depressogenic, schematic models related to depression.
Subsequently accessing these models in states of mild depression will prevent the ‘escalation’ to more intense and persistent states that might otherwise occur. Accessing memories of ‘coping’ schematic models may also lead to performance of coping behaviours. However, reflecting the fact that a general ‘coping set’ has been accessed, these coping behaviours may be quite variable and flexible and need bear no close relation to the specific coping skills taught in therapy. Recent evidence is consistent with this view: in a five-year follow-up of depressed patients seen at the Center for Cognitive Therapy in Philadelphia, Ludgate (1993) found that patients’ perceptions of the extent to which they had acquired skills during therapy predicted long-term outcome, but their reports of their actual use of those skills in the follow-up period did not. Relatedly, Wright and Thase (1993) reported that homework compliance predicted lack of relapse in the follow-up period: those who got better without much homework had poorer long-term outcome.

Our analysis of the prophylactic effects of cognitive therapy has focused on the replacement of depressogenic schematic models with more adaptive models related to the same topics, and the creation of a large store of representations of such modified models in Implicational memory. Once accessed, these models will create outputs related to ‘coping’ or other, non-depressogenic, modes of responding. These outputs will direct the subsequent activity of the ‘central engine’ of cognition in directions incompatible with the re-establishment of the depressive interlock configuration. In this way, the effects of cognitive therapy can be seen as conforming to the three interlinked components of the general ICS ‘prescription’ for preventing depressive relapse that we laid out earlier.

We now turn to consider methods of stress reduction based on mindfulness meditation. We shall suggest that this approach can be applied to produce effects through mechanisms similar to those through which, we have proposed, cognitive therapy reduces depressive relapse. Further, mindfulness has the great attraction that it is a generic approach for dealing with negative psychological states that can be learned in the non-depressed state.

MINDFULNESS MEDITATION AS A GENERIC STRESS-REDUCTION PROCEDURE

Kabat-Zinn (1990) provides a detailed description of a stress-reduction and relaxation programme in which training in methods for the voluntary deployment of attention, based on mindfulness meditation, forms a major part. The programme consists of eight weekly 2-hour sessions, at which two therapists meet with up to 30 clients, together with a programme of daily homework exercises. There is encouraging preliminary evidence for the efficacy of this programme in the treatment of chronic pain (Kabat-Zinn, Lipworth & Burney, 1985), anxiety and panic disorders (Kabat-Zinn et al., 1992), and psoriasis (Bernhard, Kristeller & Kabat-Zinn, 1988). This evidence is particularly impressive when it is remembered that the skills taught by the programme are generic, there being no specific focus on procedures particularly tailored to any given disorder.

In formal mindfulness practice, the student sits quietly in an erect and dignified posture and attempts, non-strivingly, to maintain attention on a particular focus, commonly his or her own breathing. When the attention wanders from the breath to the thoughts and feelings that inevitably arise, the student ‘acknowledges and accepts’ the thoughts or feelings, ‘lets go’ of them, and gently re-directs attention back to the breath. This procedure is repeated many times, whenever the student notices that the attention has wandered. In informal practice, students apply the same general approach as often as possible during the course of their normal day, bringing the attention back to the ‘here and now’, using a focus on the breath as an ‘anchor’, whenever they notice that attention has been diverted to streams of thought, worries, reverie, or general lack of awareness.

Kabat-Zinn’s programme aims to teach patients to be in a mindful state more often, particularly in stress-related situations. The essence of this state is to ‘be’ fully in the present moment, without judging or evaluating it, without reflecting backwards on past memories, without looking forward to anticipate the future, as in anxious worry, and without attempting to ‘problem-solve’ or otherwise avoid any unpleasant aspects of the immediate situation. In this state, one is highly aware and focused on the reality of the present moment ‘as it is’, accepting it and acknowledging it in its full ‘reality’ without immediately engaging in discursive thought about it, without trying to work out how to change it, and without drifting off into a state of diffuse thinking focused on somewhere else or some other time. The central feature of the mindfulness state seems to be a heightened
awareness of being in the here and now, rather than operating in a 'mindless' 'automatic pilot' mode, in which one 'automatically' reacts rather than 'consciously' and 'mindfully' responds. The mindful state is also associated with a lack of elaborative processing involving thoughts that are essentially about the currently experienced situation, its implications, further meanings, or the need for related, but not immediate, action. Rather, mindfulness involves direct and immediate experience of the present situation.

We can already note a number of points that suggest the potential relevance of this approach to the prevention of relapse in depression:

1. Mindfulness is a generic skill and so it can be practised on many aspects of experience in many situations. Conventional techniques of cognitive therapy for depression cannot necessarily be practised and maintained with any frequency after recovery because they depend on the presence of symptoms of depression or of related negative automatic thoughts. By contrast, the skills of attentional control taught in mindfulness training can be practised on a wide range of thoughts, feelings, and experiences in addition to those specifically related to depression. With mindfulness, Ss can continue to practise and maintain skills relevant to relapse prevention on a daily basis during the follow-up period. Further, as the practise of mindfulness is often an intrinsically positive experience, Ss will continue to be reinforced for this activity, and are likely to persist in practising relevant skills. Such persistence is particularly important in relapse prevention in depression where patients have to prepare themselves to deal with an event of unknown and uncertain onset that may not occur for months or even years after recovery from the acute episode.

2. Depressive relapse often seems to occur when patients fail to take appropriate remedial or coping activity at an early stage of incipient relapse, when control over depression is likely to be relatively easy to obtain. Patients may defer recognition or acknowledgement of problems to a later stage in the relapse process, when a more full-blown depressive syndrome may be much more difficult to deal with. Mindfulness training aims to make individuals fully aware of their thoughts and feelings, from moment to moment, whether those experiences are pleasant, unpleasant, or neutral. This training in 'turning towards' potential difficulties, rather than 'looking away' from them, is likely to facilitate early detection of signs of potential relapse in depression, and so to increase the chances that remedial actions will be implemented at a time when they are likely to prove most effective.

3. The mindful state is characterised by direct experience of current reality 'in the moment' rather than elaborative, ruminative, thinking about one's situation, and its origins, implications and associations. Mindfulness training appears to be associated with a reduction in the tendency to 'float away' into ruminative, elaborative thought streams. Such training would be expected to reduce the tendency of those prone to depressive relapse to become locked into the ruminative cognitive cycles that, we have suggested, play such an important role in relapse (see also Nolen-Hoeksema, 1991).

MINDFULNESS AND MINDLESSNESS—the ICS PERSPECTIVE

How are the effects of mindfulness mediation to be explained? What is the difference between 'mindfulness' and 'mindlessness' and why should the former be of clinical benefit?

From the ICS perspective, differences in subjective experience, such as the distinction between mindfulness and mindlessness, are markers of different underlying configurations of information processing. On this view, training individuals to experience specific subjective modes is a method of training them to operate within certain underlying information processing configurations. Subjective experience, which is accessible to us and reflects the products of information processing, allows us to monitor and modify the information processing operations to which we have no direct access.

ICS suggests that the 'clarity' or 'vividness' of subjective experience reflects the extent to which different cognitive subsystems throughout the total system are handling 'linked' information, related to the same topic (Teasdale & Barnard, pp. 162–164). When several different subsystems are processing closely related information, processing is highly integrated, many processes handling variants of the same basic information. These 'variations on a theme' can be 'overlaid' and 'resonate' to create a vivid, multidimensional, entity in 'phenomenal space'. In this situation,
subjective experience will be characterised by a sense of unity, clarity and richness, reflecting the extra layers of representation and meaning acquired by virtue of extended processing focused on a single topic. Involvement of the transformation processes that deal with meanings (both specific and generic) in such integrated processing configurations will be associated with a subjective sense of ‘knowing what’s going on’, as well as a sense of vividness and clarity.

By contrast, when transformation processes are handling a variety of different data systems, without continuity of topic from subsystem to subsystem throughout the system as a whole, the corresponding subjective experience will be diffuse and amorphous without any clear focus of attention. Indeed, one may be scarcely aware at all. In this situation, any involvement of transformation processes involved with meanings is likely to be on a ‘time-sharing’ basis, processes rapidly oscillating between a number of disparate data streams, rather than remaining ‘dedicated’ to the processing of a single coherent stream.

This analysis suggests that states of ‘mindful’ awareness are associated with integrated processing of information related to the same topic over many transformation processes and subsystems, including the subsystems dealing with meaning. By contrast, ‘multi-tasking’ configurations in which several, unrelated, data streams are being processed throughout the total system will be associated with the more diffuse awareness of ‘mindlessness’.

We can illustrate these points by considering Fig. 4, where the processing configurations involved in driving a car under two different conditions are shown. The figure shows the subsystems involved in the processing configurations and the pattern of flow of information between subsystems. Driving a car ‘on automatic pilot’, while deeply engrossed in thinking through a problem, as in Fig. 4a, one may be hardly aware of driving at all, although aware to some extent of one’s own internally verbalised thoughts. In this situation, ‘automatic-pilot’ driving is managed simply as a perceptual-motor skill, involving only sensory, intermediate, and effector subsystems. Problem-related thought streams are generated by cycles of interaction between the Propositional and Implicational subsystems, handling, respectively, specific and generic meanings. The products of these cycles are sent out to the speech-level subsystem, where they are experienced as streams of verbalisable thoughts. As can be seen in Fig. 4(a), the two configurations supporting, respectively, ‘automatic-pilot’ driving and thinking are effectively completely ‘insulated’ from each other; there are no ‘points of contact’ between the information circulating around the processing configurations.

**Fig. 4.** The information-processing configurations supporting (a) ‘Mindless’ driving; and (b) ‘Mindful’ driving. In Fig. 4(a), the actual driving is managed as an ‘automated’ perceptual-motor skill by the lower configuration of subsystems, while the upper configuration, involving the subsystems related to meanings and speech-level representations, processes problem-related thought streams. In Fig. 4(b), the whole processing configuration is integrated on the single topic of driving.
supporting the two activities. The lack of involvement of either of the subsystems handling meaning in the 'automatic pilot' configuration means that, quite literally, the person will have no sense of 'knowing what they are doing' as far as driving is concerned.

By contrast, Fig. 4(b) illustrates a configuration in which cycles of interaction between representations of specific and generic meanings (the 'central engine' of cognition) are involved in driving. In this configuration, processing through several sub-systems will be continuously integrated on the single topic of driving. Relatedly, one will now be 'mindfully' highly aware of driving, associated with a definite sense of 'knowing what one is doing'.

Mindfulness depends on the continuity and coherence of information content throughout the processing configuration. In Fig. 4(b), continuing mindful awareness of the sights, sounds, and physical sensations of driving depends on Implicational schematic models creating Propositional outputs (specific meanings) that cohere with the 'externally' derived information arising from current sensory input. This, necessarily, implies that the internally created Propositional representations are essentially restricted to a 'meaningful re-description' of the information recently received and processed by the total system, or anticipated in the immediate future. In other words, all processing is 'of' the here and now. If, instead, the Propositional output from Implicational schematic models was related to 'elaborations' of the longer term consequences or ramifications of current input (e.g. whether one would arrive at one's destination in time, what the driver behind might be thinking about one's driving, how to be a better driver, etc.) then it would no longer cohere with current externally derived input and mindful awareness would be lost. In this situation, processing is essentially 'about' current experience rather than directly 'of' it.

The above analysis suggests that 'mindful' processing of experience requires 'central engine' processing resources. The subjective experience of mindful awareness of current input can be used as a marker that central engine resources are deployed to the processing of that input. The above account suggests that central engine resources are also required for the production of streams of thoughts unrelated to immediate sensory input, as in thinking through a problem unrelated to driving in Fig. 4(a) (see Teasdale & Barnard, 1993, Chap. 12). This analyses suggests that 'mindful' processing of experience should be particularly effective at interfering with the production of streams of thoughts concerning topics other than the immediate 'here and now'. Consistent with this view, Teasdale, Proctor, Lloyd and Baddeley (1993) found that tasks interfered more with the production of streams of stimulus-independent thoughts (daydreams) when Ss reported being highly aware of task stimuli than when they reported being less aware, even though task performance was equivalent in the two cases.

MINDFULNESS TRAINING, COGNITIVE-BEHAVIOUR THERAPY, AND THE PREVENTION OF RELAPSE IN DEPRESSION—THE ICS PERSPECTIVE

The ICS analysis of depressive relapse identified three interlinked targets for interventions to prevent the escalation of states of mild negative affect to more severe and persistent states at times of potential relapse. First, interventions should re-deploy the processing resources needed to establish depressive interlock to the processing of non-depressogenic material. Second, interventions should create modified schematic models, related to depression but not, themselves, depressogenic, and set up a large store of Implicational memories involving those models in many different contexts. Third, depression-related schematic models should be 're-trained' so that their outputs are less likely to re-generate depressogenic models.

From the ICS perspective, reciprocal cycles of conversions between specific and generic meanings with depressive content occupy a central position in the maintenance of depression and its escalation from milder states of negative affect at relapse. We have suggested that in states of 'mindful awareness' the information circulating through such cycles of reciprocal conversions (the 'central engine' of cognition) is focused on the contents of immediate experience. As a result of mindfulness training, individuals acquire the skill habitually to deploy 'central engine' resources to process information related to specific 'neutral' objects of attention, such as the breath, or to the contents of moment by moment experience. As a result of habitually re-deploying attention in this way, the resources necessary to support depression-enhancing or depression-maintaining
processing cycles are less available. Consequently, from this perspective, the chances of depression developing or persisting should be reduced.

Mindfulness training will, inevitably, include repeated occasions on which the mind 'wanders off' to spontaneously occurring problematic thoughts and worries. To respond to thoughts embodying such content merely by 'accepting and acknowledging' them and then returning attention to the breath must, necessarily, be associated with implicit changes in the models from which the thoughts were derived. For example, depressogenic schematic models often relate to a globally negative view of the self, or to a totally hopeless view of the future. The Propositional outputs from these models often seem to be parts of urgent, but ineffective, problem-solving strategies aimed at achieving centrally important goals than can neither be attained nor abandoned (cf. self-regulatory models of depression; Kuhl & Helle, 1986, Pyszczynski & Greenberg, 1987, and see Teasdale & Barnard, 1993, Chap. 14). It is difficult for the information-processing system to maintain models related to depression, or other problems, as requiring high priority further processing, or urgent action, when, repeatedly, these models have been produced and no related action, in thought or deed, has been taken. Indeed, to redepoly attention away from problem-related thoughts in the first place, as mindfulness training requires, implies some shift away from models that imply the 'reality' of severe characterological deficiency, or a hopeless future, towards models that regard thoughts and feelings related to such issues as 'events in the field of awareness' rather than indicators of 'reality'.

On this view, the 'acknowledgement and acceptance' component of the mindfulness routine is a critical part of the effects of this training in creating alternative schematic models, focused on problem-related topics, but not, themselves, problem-maintaining. The 'informal' component of mindfulness practice will involve the repeated creation of alternative models, or 'views', related to depression, and other problematic topics, in many different contextes. This will provide the store of Implicational memories of modified depression-related models on which, according to our analysis, the prevention of relapse depends.

Depressogenic schematic models include contributions derived directly from sensory sources (especially proprioceptive Body-state feedback) as well as patterns derived from patterns of meanings. The bodily aspects of the formal mindfulness practice provide a simple and direct means for re-shaping schematic models implying imminent threat, the need for urgent action, or personal global worthlessness. An erect, dignified, posture, slow, regular breathing and an absence of bodily activity will all create patterns of proprioceptive sensory input that will shift the total pattern of schematic model code related to the problematic area away from a pattern implying the reality of the problem, and the related need for urgent action, towards patterns that view mental representations of events as 'representations' rather than 'realities'.

The shift in problem-related schematic models reaches its ultimate point when the focus of attention in mindfulness switches to the problematic state, itself. 'Mindfulness' of a problem depends on the stream of information flowing throughout the system remaining integrated on the single topic of 'the problem' (rather than attempts to deal with it, or understand the origins of it, or elaborate on the implications of the problem for the present and future). This can only be achieved if the specific meanings generated from the problem-related schematic model essentially re-describe aspects of problem-related information (e.g. 'hopeless feeling') so maintaining the coherence of the circulating data stream. This coherence would be lost if the specific meanings refer to a different, albeit, related topic, such as how to solve or understand or avoid the problem.

Specific meanings encoding stereotyped attempts at problem-solving that, ultimately, prove abortive, appear to be an important aspect of the processing configurations sustaining a number of clinical problems, especially depression (see Teasdale & Barnard, 1993, Chap. 14). Paradoxically, it seems that processing directed at solving certain problems may serve to sustain them, whereas processing that merely 'describes', 'accepts' or 'acknowledges' the problem may, by pre-empting the establishment of problem-perpetuating configurations, lead to alleviation of problems. 'Letting go' of problem-related thoughts and returning the attention to the breath necessarily implies postponing, or even relinquishing, the attempt to realise the intentions to which the thoughts relate. Frequently repeated, this procedure will have the effect of 're-training' the transformation process that would normally produce problem-maintaining specific meanings from problem-related schematic models. As a result, such models will be more likely to create outputs that lead the
evolution of processing cycles into directions that reduce the escalation or maintenance of the problem rather than outputs that fuel the maintenance of interlock.

The generation of 'descriptive' specific meanings from problem-related schematic models is 'therapeutic' in other ways. First, if an individual 'knows where they are at' they may be more likely 'mindfully' to take appropriate, early, 'considered' corrective action, than when they are 'mindlessly' 'heedless' of incipient problems, or engage in the 'automatic' and ineffective attempts at coping or problem resolution that often seem to be part of stereotyped problem-perpetuating configurations. Second, the contribution from 'descriptive' specific meanings to the synthesis of subsequent schematic models may modify those models sufficiently to disrupt the maintenance of problem-perpetuating configurations. Schematic models that include elements describing the schematic models synthesised on immediately preceding processing cycles may have effects that are quite different from models without such elements. In other words, the information system's 'internal monitoring' of its own activities may radically alter the course of the further development of those activities.

Our discussion suggests that mindfulness training, applied to depressed patients in remission, could have prophylactic effects through mechanisms similar to those through which cognitive therapy operates. In the final section of this paper, we note a novel treatment approach that aims to combine the strengths of both these approaches.

**Attentional Control Training (ACT)**

Cognitive therapy for depression and mindfulness training offer complementary advantages in the search for more effective and efficient programmes to prevent relapse in depression. Cognitive therapy specifically targets the thoughts and behaviours of particular importance in depression, has techniques that are sufficiently powerful to produce effects in clinically depressed patients, and has demonstrated its effectiveness in alleviating and preventing depression. However, it is demanding of skilled therapist time and not readily applicable in the remitted, euthymic, state. Mindfulness training is applicable and acceptable in the euthymic state, is used by clients on a continuing basis long after the initial training has been completed (Kabat-Zinn, Lipworth, Burney & Sellers, 1987), is economical of therapist time, and teaches generic psychological skills. However, these skills have not yet been shown to be applicable to problems in clinically depressed patients, and there is, as yet, no evidence for the effectiveness of this approach in depression, although there is encouraging evidence for its effectiveness in related disorders.

In terms of the ICS analysis presented, the long-term effects of both cognitive therapy and mindfulness training are mediated through similar mechanisms. Both cognitive therapy and mindfulness training share the same basic underlying rationale—emotional disturbance is caused by thoughts and cognitions that are 'mental events', not 'realities'. Relatedly, both treatment approaches lead patients to alternative 'views' of their problems. In the case of cognitive therapy, these alternative 'views' probably involve more of an active 'coping and controlling' stance than the views implicitly created in mindfulness practice. For this reason, mindfulness is likely to be more appropriate for 'nipping in the bud' the escalation of mild states of negative affect at times of potential relapse than for dealing with the more intense problems characteristic of episodes of major depression.

Attentional Control Training (ACT) (Segal, Williams & Teasdale, in preparation) seeks to combine the complementary strengths of the two treatment approaches that we have described. ACT combines training in redeployment of attention, using the methods of mindfulness training described by Kabat-Zinn (1990) with training in the skills typically taught in cognitive therapy for depression (Beck et al., 1979) in a programme applicable to depressed patients in remission. It is still in the stages of development and initial evaluation, but, already, there is evidence, at the level of clinical report, that this approach is both acceptable and useful to patients who have recently recovered from episodes of major depression (Segal, Williams & Teasdale, in preparation). The information-processing analysis presented here encourages us to believe that this is an approach that is well worth pursuing further.

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