

Cognitive vulnerability: A model of the etiology of fear

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Abstract

This paper attempts to fill the partial theoretical vacuum surrounding the understanding of fear acquisition. A review of recent and contemporary theories of the etiology of fear is presented, serving as a justification for further theorizing and allowing for greater understanding of those aspects of fear that remain to be adequately explained. A new model of the etiology of specific fears is subsequently put forward and the various aspects and implications of this model are discussed. How an individual perceives a stimulus is proposed as being critical in determining fear in relation to the stimulus. In particular, perceptions of the stimulus as uncontrollable, unpredictable, dangerous and disgusting create a schema of vulnerability. The Cognitive Vulnerability Model integrates much of the extensive body of research on fears and specific phobias into a unifying theory of the etiology of fear. The model offers parsimonious explanations for the various characteristics of specific fears and phobias.

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Fear is a powerful and considerably aversive human emotion. While most people experience fear only infrequently, there are some people to whom fear and anxiety constitutes a debilitating disorder. These disorders cause significant distress and interfere appreciably with a person's life. For this reason the study of anxiety disorders is important. It is hoped that by better understanding these psychopathologies, their causes and correlates, more effective treatments and preventative measures may be discovered.

One relatively common anxiety disorder is Specific Phobia which is defined as a marked and persistent fear that is cued by circumscribed or clearly discernible objects or situations ([American Psychiatric Association, 1994](#)). Relative to anxiety disorders such as Panic Disorder and Obsessive Compulsive Disorder, Specific Phobia has received little empirical investigation ([Norton, Cox, Asmundson, & Maser, 1995](#)). The reason for this relative neglect may stem from the, until recently, general acceptance of long-standing etiological theories of phobias. There has, however, been increasing criticism of traditional theories of phobic acquisition. This has resulted in some traditional conceptualizations of the genesis of fear being discarded, leaving a theoretical void as new and amended models try to establish themselves and gain empirical credence. In 1988 Barlow declared specific phobias to be the most familiar yet most enigmatic of the anxiety disorders. The recent conclusion by [Ollendick, King, and Muris \(2002\)](#) that

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specific phobias are “multiply determined and over-determined” (p. 104) is indicative of both the complexities of specific phobias and the current lack of clear theoretical direction in the field.

There are several features that characterize specific phobias. Based on clinical and empirical data, these include the excessive reaction almost invariably elicited by the feared stimulus, the apparent various pathways to fear acquisition, the differential distribution of fears across potential stimuli, and the individual differences in fear expression despite often similar experiences. Unfortunately, however, previous and current theories of the etiology of specific phobias have experienced difficulties in adequately accounting for these characteristics.

The present paper introduces a new model of the etiological factors involved in fear acquisition. The model offers an alternative account of the various characteristics associated with specific phobias without being necessarily incompatible with many previous theories. Before presenting this model, however, a critical review of the major contemporary theories will be undertaken. Such an examination reveals some of the major problems to date regarding theories of the cause of fear and specific phobias and serves as a justification for further theorizing in this area. It should be recognized up front that the literature review is intended to be selective rather than exhaustive as a full literature review lies beyond the scope of this paper. Nonetheless, it will be shown that there is a need to take cognitive factors into account when considering the ontogenesis of specific phobias. In particular, it will be argued that the perceptions of an object or situation as uncontrollable, unpredictable, dangerous, and disgusting are central to the etiology of fear. On the basis of an examination of these variables, a cognitive model of specific phobias will be advanced and the implications of this model discussed.

1. Etiological theories of fear and phobia

1.1. *Classical conditioning theory*

A number of contemporary theories concerning the etiology of specific phobias derive from the classical conditioning paradigm. The original learning conceptualization incorporated Pavlovian conditioning principles and stemmed from an influential study by [Watson and Rayner \(1920\)](#). It was found that by pairing a neutral stimulus with an aversive noise, a conditioned fear response could be established to the previously neutral stimulus. This conditioning explanation was extended by [Mowrer's \(1939\)](#) two-factor theory of fear and avoidance which posited that once a neutral object or situation acquired fear-evoking properties it subsequently developed motivating capacities. Mowrer argued that fear reduction following avoidance acts as a reinforcer and serves to ‘stamp in’ new behavior. This theory was used to explain the avoidance behavior typifying phobic individuals.

Support for the classical conditioning theory of fear has come from a number of sources. First, the results of a multitude of experiments using laboratory animals have proved consistent with conditioning theory ([Rachman, 1977, 1990](#)). Also, observations of people involved in military combat have demonstrated that traumatic experiences often lead to the development of fears ([Gillespie, 1945](#)). Finally, several studies have found that a majority of phobic individuals consider classical conditioning experiences as being central to their fear acquisition ([Di Nardo, Guzy, & Bak, 1988](#); [Lautch, 1971](#); [Merckelbach, de Ruiter, van den Hout, & Hoekstra, 1989](#); [Öst & Hugdahl, 1981, 1985](#); [Rimm, Janda, Lancaster, Nahl, & Dittmar, 1977](#)).

A veritable explosion of research into the neural basis of emotion now underpins the classical conditioning account of fear acquisition. In particular, the role of both the amygdala and the hippocampus have been found to play critical and distinctive roles in fear conditioning processes ([LeDoux, 1998](#); [Maren, 2001](#)). However, while both interesting and instructive, the relatively recent confirmation of neurobiological changes resulting from fear conditioning is, in itself, insufficient to explain the various complexities of fears and phobias as experienced by individuals.

1.2. *The preparedness model*

Despite the experimental support for the classical conditioning model of the etiology of phobias, several substantial problems became apparent with this model. [Seligman \(1971\)](#), for example, identified a number of seemingly incongruent findings within the behavioral literature. He believed that there were four dissimilarities which distinguished phobias from the conditioned fears proposed by advocates of the classical conditioning theory. These were their ease of acquisition, irrationality, uneven distribution across potentially fear-relevant stimuli, and high resistance to extinction.

On the basis of these discrepancies, Seligman (1970, 1971) proposed a new theory which moderated, without abandoning, the classical conditioning approach. The theory incorporated the use of genetic or biological explanations to account for some of the characteristics of phobias. More specifically, Seligman (1970) believed that phobias could best be understood as the result of biologically ‘prepared’ leaning and that this was supported by the observation that phobias commonly involve objects or situations that have been a threat or danger to the human species throughout its evolutionary history.

There are three major assumptions of Seligman’s (1971) preparedness theory of phobias. First, phobias stem from the experience of an initially neutral stimulus (CS) in temporal contiguity with an aversive event (UCS). Second, stimuli can be located along a continuum of preparedness for fear conditioning ranging from prepared to contraprepared. Third, CSs believed to be highly prepared for fear conditioning are those stimuli that have possessed biological significance for pretechnological people. Frequently feared stimuli such as spiders and snakes are referred to as fear-relevant and are proposed as being highly prepared for fear conditioning (McNally & Reiss, 1982).

1.2.1. Öhman's multiple-level evolutionary perspective

A number of significant contributions to contemporary preparedness theory have been made by Öhman and his colleagues (e.g., Dimberg & Öhman, 1983; Hugdahl & Öhman, 1977; Öhman, 1986; Öhman & Dimberg, 1978; Öhman, Dimberg, & Öst, 1985) who have used a Pavlovian electrodermal conditioning paradigm to test for differential responding to fear-relevant and fear-irrelevant stimuli. Based on this research, Öhman (1986) has put forward a comprehensive model of phobias as part of a broad-reaching perspective on the control of behavior.

Fitting into this multiple-level perspective is a model of emotional processing which has various implications for explaining phobic behaviors. After encountering a biologically primed or prepared stimulus, an affective reaction is believed to be elicited after a rapid, automatic, and holistic analysis of the stimulus. This reaction is seen as initiating a sequence of controlled processing procedures. In the case of phobias, it is proposed that these conscious, controlled processing mechanisms are overridden by the automatic affective response, resulting in the primary and secondary appraisals having only limited effects on efferent priming and subsequent overt responses. The primary and secondary appraisals involve evaluations of what is at stake and the availability of coping resources and options respectively. This account by Öhman (1986) has been used to explain the supposedly irrational and uncontrollable reactions of phobic individuals despite their conscious realization that the reactions are excessive.

An extension to Öhman’s work has recently been attempted by the addition of the concept of an evolved module for fear elicitation and learning (Öhman & Mineka, 2001). According to this account, the fear module is an evolutionary crafted mental, behavioral and neural system which shows selectivity in regards to inputs for fear conditioning, automatic elicitation, a resistance to conscious cognitive influences, and specific adaptive neural circuitry (Mineka & Öhman, 2002). According to Cummins and Cummins (1999), the motivation for an innate modules view is the ability to incorporate cognitive phenomena into evolutionary explanations, without which evolutionary cognitive psychology would come up short.

1.2.2. Alternative accounts of preparedness effects

The major advantage of preparedness theory is its ability to explain the differential associability of phobic fear responses to certain stimuli that can be construed as having been potentially dangerous to pretechnological men and women. This explanation is based on analogue studies showing that conditioned “fear” responses are acquired more easily to slides of supposedly fear-relevant stimuli than to slides of fear-irrelevant stimuli (e.g., Öhman et al., 1985).

Although preparedness theory is “already enshrined as psychological fact in most introductory psychology text books” (Davey, 1997) the research findings supporting the theory of biological preparedness have not gone unchallenged (de Jong & Merckelbach, 1997) and other mechanisms have been proposed to account for the differential acquisition of laboratory conditioned fear responses. Maltzman and Boyd (1984), for example, have argued that the significance, or ‘interest attracting’ properties, of a stimulus and its assumed fear-relevance have traditionally been confounded in experiments and that apparent preparedness effects may have been produced because of the differential significance of fear-relevant and fear-irrelevant stimuli. Results of their study demonstrated that enhanced skin conditioned responding occurs to fear-irrelevant as well as fear-relevant stimuli when subjects perceive these as either very pleasant or very unpleasant. This result suggests that experimental findings taken to support biological preparedness may be explained by differences in the significance of the stimuli used in the experiments.

Ontogenetic or cultural preparedness has also been advanced as an explanation for the differential responding to stimuli that has been demonstrated in electrodermal conditioning studies (Bandura, 1977; Delprato, 1980; Rosenthal, 1979). According to this theory, certain cultural factors and developmental events prepare individuals to respond more to some stimuli than to others. However, initial studies of this hypothesis failed to find significant results for ontogenetic versus phylogenetic stimuli (Cook, Hodes, & Lang, 1986; Hugdahl & Kärker, 1981). McNally (1987), however, has criticized the assumed fear-relevance of the ontogenetic stimuli used in such studies. Indeed, experimental support for the cultural preparedness theory has come from studies using what is believed to be more salient ontogenetic stimuli. These studies have found no significant differences in conditioned electrodermal responses between technological and biological fear-relevant stimuli (Hugdahl & Johnsen, 1989; Lovibond, Hanna, Siddle, & Bond, 1994).

Alternative explanations of differential fear conditioning in laboratory studies undermine both the explanatory power of preparedness theory and the genetically based mechanisms used by proponents of preparedness theory to account for differential fear acquisition. Identification of new mechanisms to explain the uneven fear distribution may, therefore, be required. However, both stimulus significance and ontogenetic preparedness theories are inadequate for this task. For example, although the cultural preparedness hypothesis explains the uneven pattern of phobic fears in the population, the reason why, for example, snakes or mice evoke fear in more people than do cats or birds is not explained. To argue that a stimulus acquires a cultural preparedness for fear because people generally fear it is tautological.

Although preparedness theory has received some empirical support using clinical populations of phobics (e.g., de Silva, 1988; de Silva, Rachman, & Seligman, 1977), a thorough review of the experimental literature by McNally (1987) has revealed a failure of preparedness theory to find support for a number of its key assumptions. One problem with the electrodermal conditioning studies used to support preparedness theory is the assumed survival-relevance of the stimuli used in the studies. For example, several studies used slides of mushrooms as representative of unprepared stimuli and slides of spiders as examples of survival-relevant stimuli. However, in a study by Merckelbach, van den Hout, Jansen, and van der Molen (1988), a group of independent judges rated fear of mushrooms as more survival-relevant than fear of spiders. This is consistent with the argument of Delprato (1980) who proposed that the threat from mushroom toxicosis would be more relevant to the survival of the human species than the threat from snakes and spiders combined. Merckelbach et al. (1998) hypothesized that stimulus features other than survival-relevance were responsible for previous results taken to support preparedness theory. Their study found that after controlling for dangerousness and unpredictability, supposed survival-relevance was not related to fearfulness.

1.3. Rachman's reconceptualization of the classical conditioning theory

After a thorough examination of the literature, Rachman (1976, 1977, 1991) also proposed a number of arguments against accepting the traditional classical conditioning theory of fear, which he believes, at best, can only provide a partial explanation for the genesis of some fears (Rachman, 1998). With respect to the characteristics of phobias these arguments relate to the inability of classical conditioning theory to account for (1) the failure of some people to acquire fear in fear-evoking situations, (2) the uneven distribution of fears in the phobic population, and (3) the finding that phobias and fears could apparently be acquired vicariously or through the reception of symbolic information.

In response to these apparent inconsistencies, Rachman (1977, 1990, 1998) proposed that there are three pathways to fear and that these can be seen as different ways of acquiring beliefs about the existence of fear-relevant contingencies. The three pathways are believed to be classical conditioning, vicarious acquisition through direct or indirect observations, and informational acquisition. In support of Rachman's proposal, several studies have shown that a high percentage of phobic subjects attribute the origin of their fear to either one of these pathways or to a mixed pathway (Hekmat, 1987; Himle, Crystal, Curtis, & Fluent, 1991; Merckelbach, Arntz, & de Jong, 1991; Merckelbach et al., 1989). The veracity of these self-reports has been given support by primate studies which have demonstrated that witnessing another monkey act fearfully towards a stimulus may lead to fear acquisition (Mineka, Davidson, Cook, & Keir, 1984; Röder, Timmermans, & Vossen, 1989).

Despite support for Rachman's theory, research that has also used a non-phobic control group has found either few or no differences between the learning histories of fearful and non-fearful subjects (Di Nardo, Guzy, Jenkins, et al., 1988; Ehlers, Hofmann, Herda, & Roth, 1994; Menzies & Clarke, 1993; Merckelbach, Arntz, Arrindell, & de Jong, 1992; Ten Berge, Veerkamp & Hoogstraten, 2002). In some cases the experience of pain or aversive events is related to less rather than to more fear (Phelan & Link, 2004; Van Wijk & Hoogstraten, 2005). These results indicate that

association-based learning experiences, despite the important status attached to them in the literature, do not effectively differentiate fearful from non-fearful individuals. The mechanisms and reasons underlying fear acquisition are, therefore, in need of explication for it is these factors, and not the experience of a learning event per se, which seem important in determining a person's fear response. Indeed, it seems fair to conclude that learning experiences along the line of Rachman's three pathways are not causes of fear or anxiety but merely serve as opportunities for the potential development of anxiety.

1.4. The non-associative account of fear acquisition

An intriguing variation on preparedness theory has been the non-associative account of fear acquisition, which turns preparedness theory on its head by positing not that people come to acquire fear but that people are born with innate fears and that what they learn is how to overcome these existing predispositions (Rachman, 2002). This idea is derived from Darwinian accounts of fear acquisition which propose that neither direct nor indirect learning events are necessary for the development of fear. Studies of separation anxiety in children (Bowlby, 1975) and fear of heights by babies using a 'visual cliff' paradigm (Gibson & Walk, 1960) provide evidence of fear expression prior to a learning experience. Clinical phobias are believed to occur later in life as a result of inbuilt fears failing to habituate. In support of this contention, studies have found that many people, when given the opportunity, report that their fear has always been present (Menzies & Clarke, 1993, 1995).

There is, however, an issue of recall error with the use of retrospective reports to obtain information on the development of fear. This is especially the case given that questions regarding phobic origins are predominantly asked of adults who must then try to recall long-distant events. For this reason prospective investigations provide better evidence of non-associative fear acquisition. The Dunedin study, a longitudinal investigation of birth cohorts of children in New Zealand, has provided some support for the non-associative theory of fear acquisition (Poulton, Davies, Menzies, Langley, & Silva, 1998; Poulton, Menzies, Craske, Langley, & Silva, 1999).

Despite support from both retrospective and prospective research, the non-associative account of fear acquisition has come under criticism. Davey (2002), for instance, argues that results from the longitudinal Dunedin study are also consistent with other theories. In addition, he criticizes evolutionary-based theories for their post hoc reconstructions of feared stimuli. For example, fear of insects may represent an apparently understandable evolutionary-relevant and therefore non-associative fear, however people's awareness of the role of insects in disease contamination only commenced around the 1900s (Muris, Merckelbach, de Jong, & Ollendick, 2002). Kleinknecht (2002) has raised several objections to the non-associative account of fear acquisition and has argued that a number of questions require answering before the non-associative account can be accepted as a 'fourth pathway' to fear. Finally, Marks (2002) has perceptively drawn attention to the erroneous dichotomy introduced by the term 'non-associative.' He argues that fear cannot be viewed in black and white terms as being associative or non-associative. Instead, the extent of required learning to develop a fear should be seen as occupying a continuum, from requiring no learning at one end all the way to requiring a great deal of learning at the other end of the continuum. This begs the question then as to exactly what determines the requisite degree of learning, a question which the non-associative account of fear acquisition has thus far proven incapable of answering.

1.5. Davey's contemporary conditioning model

In an attempt to account for both the inadequacies of the classical conditioning approach and for the implication of cognitive processes in fear acquisition, Davey (1989, 1992a) has proposed a comprehensive contemporary conditioning model of the etiology of phobias. According to this model a conditioned stimulus (CS) comes to elicit a cognitive representation of the unconditioned stimulus (UCS) through its learned association with the UCS. Davey (1992a) argues that this process depends upon a number of factors that determine the expectation that the UCS will follow the CS. These factors include information concerning situational contingency, socially and verbally transmitted information about the contingency, and pre-existing beliefs about the contingency.

Davey (1989, 1992a) has used his model of human conditioning in an attempt to counter some of the traditional criticisms directed at conditioning accounts of phobias. These areas of criticism are argued to include the failure of many individuals to develop a phobia following the experience of a traumatic event, the apparent absence of trauma in clinical anamneses or recollections, the observation of incubation effects, and the uneven distribution of fears.

1.5.1. Individual differences in fear acquisition

Davey (1992a) has described two processes that may be used to explain the absence of fear responses, for some individuals, following a traumatic experience with a particular stimulus. The first process is latent inhibition, which is where exposure to a stimulus (CS) prior to conditioning is believed to cause the CS to acquire inhibitory properties that affect the associability of the CS and UCS in subsequent pairings (Klein, 1991). In support of this idea, Davey (1989) found that dental patients who experienced a traumatic or painful dental treatment, but did not acquire a dental fear, reported a history of prior dental experiences favorable to latent inhibition. Results from other studies, however, appear inconsistent with the process of latent inhibition. Ehlers et al. (1994), for example, found that driving phobics developed their fears, on average, 10 years after they first learned to drive a car. Phobic and control subjects also experienced similar numbers of accidents and had similar outcomes in relation to these accidents.

The second process used by Davey to explain the lack of fear acquisition for some people following a traumatic experience is UCS devaluation. According to this process, individuals may use coping strategies such as denial, selective ignoring, or devaluation of the importance of a stressful event in order to cognitively neutralize an aversive UCS. Such a process can be termed ‘coping’. Several studies have provided support for the idea that coping plays a role in the mediation of emotional responses including anxiety (Folkman & Lazarus, 1985, 1988a,b). Folkman and Lazarus (1988a), however, have found that the coping strategies of positive reappraisal and distancing were actually associated with an increase in worry and fear rather than a decrease for some groups of subjects. Similarly, studies of the efficacy of coping interventions for dental fears have found either no effects (Prins, 1988) or adverse effects (Harrison, Berggren, & Carlsson, 1989). In addition, a retrospective study of a large number of children by Sipes, Rardin, and Fitzgerald (1985) found that only seven per cent of children used cognitive coping strategies in order to overcome their fears.

1.5.2. Apparent absence of trauma in clinical anamneses

When phobic individuals are asked to recall the origin of their fears many report an absence of any trauma associated with the first appearance of their fear. In an attempt to explain this phenomenon, Davey (1992a) has argued that an individual may learn an association between a CS and a relatively innocuous UCS (a process called sensory preconditioning) and then, through an inflation of the aversiveness of the UCS, have the fear response to the CS considerably increased. Attempts to test the process of UCS inflation using humans in a laboratory setting have produced disappointing results. A series of studies by de Jong, Merckelbach, Koertshuis, and Muris (1994) found little support for the hypothesis that UCS inflation leads to increased skin conductance responses (SCRs) to preconditioned stimuli. Also, while White and Davey (1989) have provided some support for the process of UCS inflation using an electrodermal conditioning procedure, this study can be criticized for using the same stimulus (a 1000 Hz tone) as both the UCS and the preconditioned CS.

Even assuming the validity of the processes proposed by Davey (1989, 1992a) there are still at least two major concerns related to the use of UCS inflation as an explanation of human fear acquisition. First, there is currently no empirical support for the process of UCS inflation in the ontogenesis of clinical phobias. Second, and most importantly, in the event that a phobic person is unable to explain the factors associated with the genesis of their fear, there appears to be no means by which any hypothesis concerning the acquisition of a phobic response via sensory preconditioning and UCS inflation can be evaluated. Using the processes advanced by Davey, an almost limitless series of speculations can be applied post hoc in order to explain any outcome. As such, these explanations are essentially untestable and, therefore, sensory preconditioning and UCS inflation appear to add little of value to an understanding of the etiology of fear and specific phobias.

1.5.3. Incubation effects

Davey (1992a) has argued that another problem with the traditional conditioning model of phobias was its inability to explain increases in anxiety (the CR) following CS-alone presentations. Davey believes that these incubation-like effects can be explained in some instances by UCS inflation occurring between successive CS presentations. Some support for the role of UCS inflation comes from a study by Jones and Davey (1990) which found retarded extinction of a differential fear CR following instructions given to subjects to rehearse the UCS. Additional support for the validity of incubation effects has come from a study by Sandin and Chorot (1989) who found resistance to CS extinction under conditions predicted by Eysenck (1976). Nicholaichuk, Quesnel, and Tait (1982; see also Bersh, 1980), however, have criticized the literature cited by Eysenck as having numerous methodological problems. In addition, they point to the fact that incubation is often inferred from retarded extinction rather than from an actual increase in response magnitude.

Consistent with these criticisms, their study failed to find any evidence of incubation effects. Another problem with Davey's (1992a) explanation of incubation effects is that, even if these effects can be produced in a laboratory, there is no evidence, to date, implicating incubation effects in the ontogenesis of specific phobias. Also, assuming the validity of the process of incubation, there is little evidence that UCS inflation, in particular, is responsible for producing these incubation effects.

1.5.4. The uneven distribution of fears

In an attempt to explain the uneven distribution of phobic fears in the population, Davey (1992a) has argued that "any factor which increases the tendency for an individual to expect a stimulus to be associated with an aversive consequence should result in preparedness-like effects" (p. 47). Possible factors are proposed to range from cultural beliefs to biological predispositions. However, this account of the uneven fear distribution is vague. Davey also fails to discuss the mechanisms that may be underlying those factors supposedly responsible for preparedness-like effects. Finally, his endorsement of ontogenetic preparedness introduces additional problems into his theory. While ontogenetic fear-relevant stimuli have shown so-called preparedness effects similar to phylogenetic fear-relevant stimuli, this account of the uneven distribution of fears fails to adequately explain the characteristic of phobias which Seligman's (1971) preparedness theory was originally developed to address. That is, if there is no difference between the associability of, for example, spiders and guns to a fear response, why are there so many spider phobias and so few gun phobias? As in other areas, Davey's contemporary conditioning theory has problems in adequately accounting for this particular characteristic of specific phobias.

1.6. From conditioning theories to cognitive theories of fear acquisition

The preceding literature review has briefly highlighted some of the major problems associated with etiological theories based on a conditioning approach. Many of these problems can be seen as stemming from their inability to account for either the cognitive features involved in phobias, the particular features characterizing phobic disorders, or both of these factors. Although the neo-conditioning theories, which derive from and attempt to moderate classical conditioning theory, have been widely accepted as adequate etiological theories of phobias, there is another approach to the conceptualization of fear acquisition. This approach, although far from unified, reflects a cognitive orientation.

1.7. Bandura's self-efficacy theory

One of the major cognitive theories of specific phobias has been put forward by Bandura (1977, 1983) who proposed that a person's self-efficacy or perceived ability to perform specific, effective courses of action, as well as their expectations about the likely outcomes of such actions, are major determinants of action. In relation to phobias it is argued that a person's self-efficacy in performing an action related to the phobic stimulus is an important causal factor in the ability to actually perform that action. Several studies have provided support for the self-efficacy theory of phobic behavior (Bandura, Adams, & Beyer, 1977; Bandura, Adams, Hardy, & Howells, 1980; Bandura, Reese, & Adams, 1982; Williams & Watson, 1985).

Despite the support for self-efficacy theory, there are a number of problems with its use in explaining the etiology of specific phobias. First, studies investigating self-efficacy theory have failed to establish the direction of causality between self-efficacy cognitions and behavior. For example, experimental manipulations of self-efficacy have tended to use procedures such as modelling which, according to social-learning theory itself, would be likely to affect phobic behavior. Second, the validity of self-efficacy as a cause of behavior has yet to be established. Third, concentration of self-efficacy theory on phobic behaviors ignores the importance of anxiety and fear which are, by definition, critical features of specific phobias. Finally, self-efficacy theory is incapable of explaining some of the characteristics associated with specific phobias, such as the uneven distribution of feared stimuli. For these reasons self-efficacy theory currently represents an inadequate conceptualization of the genesis of phobic fears.

1.8. Maladaptive cognitions — Beck and Emery's theory

A number of cognitive theorists has proposed that maladaptive cognitions are significant factors in the etiology and maintenance of phobic disorders (Beck, 1976; Beck & Emery, 1985; Ellis, 1962; Guidano & Liotti, 1983;

Meichenbaum, 1977). Beck and Emery (1985) have proposed a comprehensive theory relating to the role of maladaptive cognitions in specific phobias. They posited that anxious people are mentally focused on threat as a result of the activation of cognitive schemas concerned with danger and harm. These schemas are argued to play a crucial role in the etiology and maintenance of phobic fears. Beck and Emery propose that an upset in the regulatory functions of the cognitive system may lead an individual to indiscriminately interpret an environmental event as being dangerous. In addition, they argue that one of the key components of this interpretation is the magnification of the amount of risk and degree of harm in the feared situation.

Beck and Emery (1985) argue that a sense of vulnerability lies at the core of anxiety disorders. Vulnerability is defined by them as a person's perception of himself as "subject to internal or external dangers over which his [or her] control is lacking or is insufficient to afford...a sense of safety" (p. 67). Upon encountering a potentially harmful stimulus a number of processes are believed to come into play. Beck and Emery adopt the coping model of Lazarus (1966) to describe this sequence of processes. First, an individual is believed to make a primary appraisal of the situation, which takes the form of an initial impression of the potential threat to their domain. If the situation is appraised as noxious, successive reappraisals are made concerning such questions as whether the situation represents an immediate threat to vital interests and whether it involves possible physical injury. While making a primary appraisal, a person is posited as simultaneously making a secondary appraisal concerning their resources for dealing with the threat. The relation of the person's perceived coping resources to the perceived danger of the situation is believed to determine the response of the person to the situation.

The central idea of Beck and Emery's (1985) theory is that phobias result from a systematically biased interpretation of the danger associated with a stimulus. Some support for this argument may be seen as coming from a study by Thorpe and Salkovskis (1995) which found high correlations between harm cognitions concerning spiders and both fear and avoidance of spiders. There are, however, methodological problems in this study and what Thorpe and Salkovskis label as 'harm cognitions' include a number of harm-irrelevant cognitions. In addition, Thorpe and Salkovskis (1995) found that the specific belief "I would come to physical harm" was endorsed by only 24% of the people with phobias prior to actual exposure to a spider. Similarly, de Jong and Muris (2002) found that after controlling for the perceived disgustingness of spiders the beliefs of people that they would be harmed by a spider was not statistically significant. These results are consistent with a study on agoraphobics where people, despite mounting anxiety brought on by having to perform a series of scary tasks, expressed thoughts related to danger on less than one per cent of occasions (Williams, Kinney, Harap, & Liebmann, 1997).

Beck and Emery (1985) also rely to a considerable extent on the concept of learned avoidance and preparedness in order to explain the etiology of specific phobias. However, the process of learned avoidance has trouble explaining, for example, fear of snakes where a person may not have actually encountered a snake. The belief that phobias may stem from the learned avoidance of an already feared stimulus also fails to explain both the origin of any pre-existing fear and why avoidance would lead to the heightened experience of anxiety characterising specific phobias. In addition, there is currently conflicting research in relation to the validity of preparedness theory (see McNally, 1987), which Beck and Emery also advance in an attempt to explain the individual differences found in fear acquisition.

1.9. Other cognitive research

Despite problems in applying cognitive theory to specific phobias, there have been a large number of investigations into the various cognitive factors related to anxiety and phobias. Such cognitive concepts include negative self-focused attention (Sarason, 1975; Wine, 1971), patterns of anxious self-statements (Cacioppo, Glass, & Merluzzi, 1979; Huber & Altmaier, 1983), memory bias (MacLeod & McLaughlin, 1995; Rapee, McCallum, Melville, Ravenscroft, & Rodney, 1994; Watts & Coyle, 1993; Watts, Trezise, & Sharrock, 1986), anxious cognitive schemas (Beck, 1976), attentional bias (Martin, Harder, & Jones, 1992; Mogg, Mathews, & Weinman, 1989; Watts, McKenna, Sharrock, & Trezise, 1986), deficits in storage and retrieval processes (Mueller, 1980), perceived loomingness (Riskind, Kelley, Harman, Moore, & Gaines, 1992), automatic questioning (Kendall & Ingram, 1987), and cognitive asymmetry in negative and positive self-statements (Schwartz, 1986). However, despite the large number of cognitive concepts and mechanisms found to be related to anxiety and fear, it remains for the direction of causality between these mechanisms and anxiety disorders to be established.

Another problem with cognitive approaches to the investigation of specific phobias is their tendency to abstract the various cognitive phenomena, whether structures, propositions, operations, or products (see Kendall & Ingram, 1987),

from the stimuli which give rise to them. Cognitive research, therefore, often loses track of what is significant about the specific stimuli that lead to cognitive distortions. In relation to specific phobias, the question which needs to be addressed, and which must be subsumed within a broader theoretical framework, is what makes some stimuli more likely to be feared than others? The answer to this question must be a necessary supplement to the reason why some individuals experience fear to certain stimuli whereas others do not, despite similar experiences. It is proposed, therefore, that to account for the various characteristics of specific phobias it is necessary to explain both stimulus differences in fear propensity and individual differences in fear acquisition.

2. Variables crucial to explaining the etiology and characteristics of specific fear

2.1. *Danger*

In attempting to describe why a stimulus, such as a particular animal, tends to evoke a higher proportion of fear responses in the population than another animal, the degree of danger or harm the animal represents is an obvious explanation. The importance of danger or harmfulness is emphasized by almost all theories of the etiology of specific phobias and has occupied a prominent place in those theories reviewed so far. Several findings support the hypothesized role of danger in the etiology of phobias. Taylor and Rachman (1994), for example, found that people with snake fears significantly over-predicted the degree of danger associated with a snake, suggesting a potential cognitive mechanism for differences between high and low fear individuals in the perception of danger. Also, Lipsitz, Barlow, Mannuzza, Hofmann, and Fyer (2002) found that 39 % of their participants with specific phobia stated that their fear was focussed on potential danger or harm.

However, danger-relevance, by itself, provides an insufficient explanation of some clinical phobias. For example, many harmless animals such as mice, cockroaches, and moths may elicit substantial fear-responses from some people. In addition, studies demonstrate that there are significant differences in the fear ratings of animals even after controlling for harmfulness (e.g., Bennett-Levy & Marteau, 1983).

It appears, therefore, that stimulus properties other than danger or harm are important in fear acquisition. This is not to say, however, that perceived danger is likely to be an unimportant factor in determining some fears. Many highly feared stimuli, such as snakes, spiders, and dogs may represent the propensity for considerable aversive outcomes. However, by itself, this explanation of differential fear acquisition is limited.

2.2. *Disgust*

Disgust is a basic emotion that has come to attract considerable interest from clinical psychologists (McNally, 2002). Although the emotion of disgust is believed to have originated as a food-related emotion it has subsequently been transformed and greatly expanded in human cultural evolution (Rozin, Haidt, & McCauley, 2000). Davey and colleagues have proposed that the disgust-evoking properties of some animals may be an important causative factor in fear acquisition, independent of their potential danger (Davey, 1992b, 1993, 1994; Davey, Forster, & Mayhew, 1993; Jain & Davey, 1992; Matchett & Davey, 1991; Ware, Jain, Burgess, & Davey, 1994). In an investigation of spider fears, Davey (1992b) found evidence inconsistent with a straight-forward danger-defence model of animal fears. For example, fear of spiders was found to covary not only with fear of animals labelled fear-evoking (e.g., rats, snakes, and lizards), but also with fear of animals generally considered disgust-evoking, such as caterpillars, maggots, and slugs. It was proposed on the basis of these findings that several common animal fears may derive from a disease-avoidance rather than a predator-defence process (Davey, 1992b; Matchett & Davey, 1991). The disgust-evoking status of a particular animal was hypothesized to stem from the association of the animal with either (1) disease, (2) dirty or disease-ridden places or putrefying food, or (3) natural disgust-eliciting stimuli such as faeces or mucous.

Despite the plausibility of both disgust as a factor in fear acquisition and disgust-sensitivity as a potential personality characteristic which discriminates between fearful and nonfearful responses to some animals, there are several problems in the disease-avoidance literature which need to be addressed. First, the measures of both disgust and disgust sensitivity used by Davey have questionable validity. Disgust sensitivity to animals, for example, has been operationalized by a scale which measures how much a person would be prepared to eat contaminated yet desirable food (e.g., Davey, 1994; Davey et al., 1993). Although Merckelbach, de Jong, Arntz, and Schouten (1993) found that spider phobias exhibited

more disgust sensitivity than controls using this measure, the specificity of this scale raises doubts concerning its validity as an accurate measure of disgust sensitivity to animals. Although a more valid and reliable Disgust Scale has been developed (see Haidt, McCauley, & Rozin, 1994), few studies using this measure or the updated scales based upon this work have yet been published. Tolin, Lohr, Sawchuk, and Lee (1997) however, found that spider and blood/injury phobics scored higher on five of the subscales of the Disgust Scale, in comparison to controls.

Measurement of disgust has also been problematic. Ware et al. (1994), for example, conducted a principle components analysis of the fear ratings of a number of animals and extracted two factors which they labelled as *predatory animals* and *fear-relevant animals*, despite the existence of alternative and perhaps more relevant labels such as *exotic* and *common*, or *large* and *small*. Yet, on the basis of the labels they applied, and after unjustifiably equating fear-relevant animals with disgust-evoking animals, Ware et al. (1994) went on to declare that it was “clear that fear of animals from the fear-relevant category is significantly associated with disgust” (p. 62). This conclusion is unwarranted considering that disgust *itself* was not actually measured in the study. In addition, the correlations between disgust sensitivity and predatory animal fears, and disgust sensitivity and fear-relevant animal fears, were both small and not significantly different from one another. However, Davey (1994) subsequently claimed that fear of fear-relevant animals was found to be highly correlated with disgust sensitivity whereas fear of predatory animals was uncorrelated with disgust sensitivity. It can be seen, therefore, that the study of disgust as a variable in fear acquisition has been inadequately carried out and that the interpretations arising from this research may even be, in some cases, misleading.

Empirical support for the disease-avoidance model of fear acquisition has been mixed. For example, Davey (1993) found that even in a group of subjects who were given only disease-relevant information about an unknown animal, predicted fear was significantly more related to the subjects’ perception of possible attack than to their perception that they would become infected if bitten. Another study by Arntz, Lavy, van den Berg, and van Rijsoort (1993) found that disgust of spiders does not appear to play a very prominent role in spider phobias. However, this conclusion was based on disgust of spiders being operationalized via a single question (“When there is a spider in my vicinity, I believe that the spider is dirty”) and may, therefore, need replicating using a more substantial measure.

Despite the problems in the disease-avoidance literature, evidence suggests that disgustingness may represent, at least in relation to some animals, a considerably aversive property. Tucker and Bond (1997), for example, have found that gender and disgust sensitivity predicted fear of harmless animals. Also, Davison and Neale (1994) have described the case of a woman who became terrified of frogs after mowing over some in her backyard. This fear stems not from a danger ascribed to frogs but to the disgust or revulsion and subsequent distress involved in chopping up frogs with the lawn mower. Other research suggests that disgust is not so much related to fear but to avoidance (Woody & Tolin, 2002). Indeed, disgust has been found to be a stronger predictor of spider avoidance than has anxiety (Woody, McLean, & Klassen, 2005).

2.3. Unpredictability

While a person’s perception of a negative or aversive outcome may be important in fear acquisition, there are other mechanisms that also appear to be important in explaining the genesis of anxiety and fear. One variable that appears to contribute to both the development and maintenance of anxiety and fear is unpredictability (Zvolensky, Eifert, Lejuez, Hopko, & Forsyth, 2000), which may be closely related to uncertainty. Both of these variables imply a lack of knowledge concerning some aspect of a stimulus, such as its identity, movement, or location. A number of studies across a wide range of areas has demonstrated a relationship between both unpredictability and uncertainty and anxiety and fear (Booth-Butterfield, Booth-Butterfield, & Koester, 1988; Craske, Zarate, Burton, & Barlow, 1993; Foa, Steketee, & Rothbaum, 1989; Kennedy & Silverman, 1985; Lox, 1992; Roberts, 1993).

One important aspect of unpredictability in relation to animals appears to pertain to an animal’s movement. In a study by Lick, Candiotte, and Unger (1978), a group of phobic subjects who were led to believe that the movement of their fear-relevant animal was unpredictable manifested significantly higher levels of cognitive and physiological fear than phobic subjects who believed the animal’s actions to be predictable. Another study has found that the perceived spatiotemporal unpredictability, as well as the perceived dangerousness and survival relevance, of a number of objects was significantly correlated with fearfulness towards those items (Merckelbach et al., 1988). However, the correlation between survival relevance and fearfulness was found to be non-significant after perceived unpredictability was partialled out. Based on these results, it was suggested that the

uneven distribution of feared stimuli, which is traditionally explained by the supposed preparedness of biologically significant stimuli, may result predominantly from the perceived spatiotemporal unpredictability of these stimuli.

It also appears that differential predictability perceptions exist between phobics and non-phobic individuals. [Rachman and Cuk \(1992\)](#) found that subjects who rated themselves as highly fearful of snakes or spiders perceived these animals as significantly less predictable than did control subjects. They also found that decreases in self-reported fear, brought about following the observation of a modelling video, were accompanied by significant decreases in perceived unpredictability. While the exact nature of the relationship between declines in fear and unpredictability was not investigated, it is plausible that increased knowledge of the fear-eliciting animal's movement served to decrease perceived unpredictability which then contributed to a reduction in subjective fear.

It appears that anxiety regarding uncertain or unpredictable events may also reflect a biologically inherited characteristic. A study by [Gunner, Leighton, and Peleoux \(1984\)](#), for example, found that one year old infants demonstrated more fearfulness to potentially frightening mechanical toys when the toys commenced playing unpredictably than when the toys commenced playing on a predictable schedule. Interestingly, the predictability of the length of time the toy played was unrelated to fearfulness. This suggests that only some aspects of the unpredictability of a stimulus may be important in eliciting fear.

It appears that there are several dimensions to unpredictability and uncertainty. Examples in relation to animals would be (1) uncertainty of the identity and, therefore, the potential harmfulness of the animal; (2) unpredictability of the animal's movements; (3) uncertainty or unpredictability of encountering an animal; (4) the unpredictability of the animal approaching or attempting to attack the person; (5) unpredictability of the length of the encounter; (6) unpredictability of the intensity of an aversive event ([Arntz, van Eck, & de Jong, 1991](#)); and (7) the unpredictability of actually suffering harm if attacked. It is likely that some of these dimensions are more important in determining fear than other dimensions and that individual differences in the order of importance of this fear-relevance may also occur.

Despite empirical support and the intuitive appeal of unpredictability as a fear-relevant variable it has received relatively little theoretical attention in relation to specific phobias. In addition, while a number of aspects of feared stimuli have been investigated in relation to anxiety (see [Bennett-Levy & Marteau, 1983](#); [Davey, 1989](#); [Doogan & Thomas, 1992](#); [Ehlers et al., 1994](#); [Murray & Foote, 1979](#)), researchers have failed to explore those factors which may underlie these aspects. [Doogan and Thomas \(1992\)](#), for example, found that adults with a high fear of dogs were significantly more likely than low-fear adults to be afraid of dogs' barking, making sudden movements, snapping, growling, and jumping up. However, the reasons behind such fears were not investigated. Growling, for example, is most likely a feared event because it indicates aggression and therefore signals danger. Fear of sudden movement, on the other hand, may imply a fear of the unpredictability of dogs, a fear of the inability to escape if the dog decided to attack, or perhaps both. Such interpretations, however, are necessarily speculative due to the absence of any relevant empirical investigations.

A final area which deserves mention in relation to the role of unpredictability in the determination of fear is that the predictability of a stimulus may be either comforting or aversive in nature. For example, a snake may act predictably by either always fleeing from an encounter with a human or by always attacking a human when encountered. It cannot be assumed, therefore, that predictability is necessarily comforting. Indeed, unpredictability seems to occupy a dimension of aversiveness ranging from predictably good to predictably aversive with varying degrees of unpredictability in between. However, in the real world, predictably aversive objects or situations are rare. For example, very few snakes will always attack when encountered and it is also highly unlikely that an accident will occur every time a person travels in a car or aeroplane. An unpredictable aversive event can therefore be seen, in a practical and heuristic sense, as the opposite pole of a predictable event.

2.4. Uncontrollability

Another variable which appears to bear a relation to anxiety and fear is uncontrollability. Control can be defined as "the belief that one has at one's disposal a response that can influence the aversiveness of an event" ([Thompson, 1981](#), p. 89). It is possible, however, that lack of control per se may be anxiety provoking for many individuals. It is also possible that there are a number of dimensions to lack of control in relation to specific phobias. Using animal phobias as an example, these may include (1) the inability to exert influence over the movement, approach, or behavior of an

animal; (2) lack of control by the person over their response to an encounter with an animal; (3) the inability to control when an encounter with an animal will occur; and (4) the inability to avoid or terminate an encounter with an animal.

Control over an aversive stimulus appears to be able to reduce various physiological responses compared to lack of control (Weinberg & Levine, 1980). Weiss (1968, 1971), for example, has found that uncontrollable shocks are much more ulcerogenic for rats than escapable shocks, even after controlling for the number of shocks received. In another animal study, Drugan and Maier (1986) found that uncontrollable shocks led to development of several pathologies including stress-induced analgesia whereas controllable shock resulted in few and more transient repercussions. Finally, a review of the available literature by Miller (1979) found that instrumental control leads to decreased anticipatory and impact arousal in relation to aversive environmental events.

There are various other sources of support for the hypothesis that uncontrollability is an important variable in relation to specific phobias. Lick and Unger (1975), for example, have reported that subjects experience substantially greater cognitive and physiological distress while looking at an uncaged feared animal from a considerable distance than when touching the caged animal. Although this finding may stem from the decreased potential of the caged animal to cause harm, self-reported reasons for this phenomenon related to feeling out of control when the phobic stimulus was uncaged compared to when it was caged. Other anecdotal reports have also revealed concerns about lack of control. Melville (1977), for example, reports a woman who had a fear of flying as saying “I kept seeing everyone as puppets, all strapped to their chairs with no control over their destinies, me included” (p. 54). Also, Bandura (1983) has found that people who see themselves as unable to control a potentially aversive event view these events anxiously, imagine harmful consequences, and demonstrate phobic avoidance responses to these events.

Despite this support, experiments allowing subjects to exert varying degrees of control over stimulus situations have yielded inconsistent results concerning the causal role of control in relation to fear. Several studies have found that perceived controllability decreases the aversive nature of a stressor (Geer & Maisel, 1972; Glass, Reim, & Singer, 1971; Sartory & Daum, 1992). Sartory and Daum (1992), for example, found that spider and snake phobics who could switch off the presentation of fear-relevant slides experienced less subjective arousal and a more rapid attenuation of their phasic cardiac response than yoked phobic subjects without such control. In contrast, a study by Craske, Bunt, Rapee, and Barlow (1991) found no significant effect on self-reported fear of control over exposure duration using similar procedures. There is also evidence that increases in perceived control may be associated with negative reactions (for a review see Burger, 1989). Rose, McGlynn, and Lazarte (1995), for example, found that snake phobics who had control over the distance a caged snake was brought towards them had relatively higher skin conductance responses (SCRs) than yoked subjects who were also snake phobics.

Rose et al. (1995) offered several possible reasons for the increased SCR found for those subjects having control. These included the idea that having control may lead to an increased perception of being evaluated and that having control increases the attention being paid to the task. Craske et al. (1991) also offered a number of possible explanations for their inability to find anxiolytic effects for control. One of these explanations concerned the subjects' general lack of control over the exposure situation. It seems likely that some aspects of uncontrollability may be significantly more important to a phobic individual than other aspects. It is possible that, in the study by Craske et al. control over the duration of observation of the spider may not have been relevant to the actual concerns of subjects in relation to spiders. Control over the possible approach of the spider or the ability to escape, on the other hand, may have been considerably more salient.

2.5. The relationship of uncontrollability to unpredictability

One problem with the study of uncontrollability is that it often overlaps to some extent with unpredictability and many experiments have traditionally confounded these variables (for reviews, see Miller, 1979; Weinberg & Levine, 1980). In many instances, having control over the delivery or reception of an aversive stimulus also leads to increased predictability. Some theorists (e.g., Averill, 1973) believe that it is this element of predictability which is of central importance in accounting for the often anxiolytic effects of having control. In contrast, Seligman (1975), for example, has argued that having control has important consequences beyond predictability. Support for this latter proposal comes from a study by Geer and Maisel (1972) which found that having control over the presentation of aversive photographs, compared with knowledge of the time relationships of the aversive presentations, led to significantly lower SCRs.

Despite the theoretical debate, it seems that unpredictability and uncontrollability are conceptually and practically orthogonal on a number of dimensions. Using animals to illustrate this point, it is not necessarily the case that

manipulating either unpredictability or uncontrollability automatically affects the other variable. For example, knowing that an animal might suddenly move towards you (unpredictability) would be independent of your perceived inability to deal with the animal if it did rapidly approach you (uncontrollability). Similarly, being able to effectively avoid a rapidly approaching animal does not make that animal less predictable in its movements. The orthogonality of these variables in such cases allows for their independent manipulation and, therefore, for more accurate conclusions to be gained concerning the causal nature of their relationship to fear. Nonetheless, it is still important to keep in mind that in some instances and under some conditions, control over the onset of a feared encounter may afford onset prediction and that this may have implications for the treatment of anxiety disorders (Zvolensky, Lejuez, & Eifert, 2000).

2.6. Perceived vulnerability

Based on the literature just reviewed, it is proposed that a combination of perceived dangerousness, perceived disgustingness, perceived uncontrollability, and perceived unpredictability lies at the heart of phobic fears. These fear-relevant variables are not totally independent but can be seen as contributing to a person's perceived vulnerability. Indeed, perceptions of danger, disgust, unpredictability and uncontrollability are seen as integral to the aversive nature of vulnerability. It is proposed, therefore, that fear of animals, flying, driving, heights, storms, and many other situations can all be conceptualized in terms of the perception of uncontrollability, danger, disgust, and unpredictability associated with them.

The term 'vulnerability' has lately been employed by researchers and incorporated into various models of anxiety disorders. For instance, cognitive vulnerability has become an important concept in cognitive theories of depression (Beevers, 2005; Scher, Ingram, & Segal, 2005; Timbremont & Braet, 2004) while Riskind and colleagues (Riskind, 1997; Riskind, Wheeler, & Picerno, 1997; Williams, Shahar, Riskind, & Joiner, 2005) have used the term 'looming vulnerability' in relation to their attempt to understand important characteristics of feared stimuli. However, in the former case the term vulnerability can more accurately be seen as meaning reactivity or susceptibility while in the latter case the concept of vulnerability is narrowly confined to a very specific and somewhat obscure stimulus property. In still other research, so-called vulnerability factors are merely synonymous with predisposing factors (Wenzel, Haugen, Jackson, & Brendle, 2005). These definitions fail to capture the phenomenology of vulnerability that is the pervasive extent of subjective unease and associated feelings of incapacity and inability associated with a stimulus or event. Perceived vulnerability is an emotionally deep and highly motivational feeling which represents the experience of susceptibility to an outcome considered aversive. Irurita (1999) comes reasonably close in relating vulnerability to an inability to both retain control over a person's life situation and to protect themselves against various threats to their integrity.

Only a smattering of research has attempted to examine the various vulnerability perceptions in combination. Mineka and Kihlstrom (1978) provided one of the earliest attempts to relate unpredictable and uncontrollable aversive events to human psychopathologies. In their review of the literature relating to "experimental neurosis" they noted that this condition, which involves cognitive, affective, and somatic disturbances in an organism, seemed to be brought on by both the lack of control over, and inability to predict, an aversive event. It was suggested that uncontrollability and unpredictability may lead, in some complex and unspecified way, to the experience of either anxiety or depression.

There has been some support in the literature for the detrimental effects of unpredictability, uncontrollability, and negative outcome in combination. Weiss (1971), for example, found that the length of gastric lesions in rats after unsignaled shocks were significantly greater than for rats who had received signalled and, therefore, predictable shocks. For rats that also received uncontrollable shocks, the length of gastric lesions in both the signalled and unsignaled conditions were greater still, with the differential effect for shock predictability being maintained. The results indicate that the deleterious effects of uncontrollability and unpredictability in relation to an aversive stimulus are cumulative in nature.

Another study by Arntz et al. (1993), assessing the negative beliefs of spider phobics, found that of the spider-related beliefs spontaneously generated by subjects, 57% referred to either the uncontrollable or unpredictable behavior of spiders whereas 16% referred to negative evaluations of spiders. Arntz et al. also conducted a factor analysis of the spider-related beliefs from the Spider Beliefs Questionnaire (SBQ), revealing various themes. The most prominent factor, accounting for almost 32% of the variance on the questionnaire, concerned ideas about the harm represented by spiders. The second important theme, labeled *hunter and prey*, included items such as "will drive me to the wall,"

“cannot be shaken off once it is on me,” and “will control me” and clearly reflects a concern with feelings of uncontrollability. The third most significant factor was related to unpredictability and speed of movement. A fourth theme identified by Arntz et al. concerned ideas about the unpredictability and uncontrollability of spiders entering a person’s personal territory. These results support the hypothesis that a combination of perceived dangerousness, uncontrollability, and unpredictability are important factors in a phobic’s experience of fear.

The most compelling published evidence to date of the relationship between the cognitive vulnerability variables and fear comes from research by [Armfield and Mattiske \(1996\)](#) who looked at the relationship between each of the vulnerability variables and fear of spiders. Together the variables of uncontrollability, unpredictability, dangerousness, and disgustingness accounted for over two-thirds of the variance in self-rated spider fear. Perceptions of uncontrollability and unpredictability had the largest correlations with spider fear. Adding further support to the significance of these findings was that the vulnerability variables accounted for 55 % of the variance in fear scores beyond the variance explained by a number of classical conditioning, informational and vicarious conditioning experiences. Although the study by [Armfield and Mattiske \(1996\)](#) looked at existing fear and could not establish causal direction, strong associations between the vulnerability variables and spider fear inspired further theorising along these lines.

3. A cognitive model of the etiology of fear

3.1. Vulnerability schema

Based on the available literature, it is proposed that common fears may be usefully conceptualized in terms of the perception of dangerousness, disgustingness, unpredictability, and uncontrollability associated with them. These variables ‘organize’ the perception of a stimulus along fear-relevant dimensions and may be seen as comprising a fear-relevant or vulnerability schema. [Kendall and Ingram \(1987\)](#) define a schema as a representation of a person’s life experiences or knowledge that is stored in a cohesive fashion and acts to filter perceptions and guide judgements. In this case, the schema consists of the perception or sense of the uncontrollability, unpredictability, danger and disgust expected when interacting with a particular stimulus or situation.

A person’s vulnerability schema in relation to a particular stimulus is seen as being automatically and almost simultaneously activated following the perception of a fear-relevant object or stimulus. Upon encountering a stimulus the vulnerability schema is unconsciously evoked and subsequently provides a general or holistic perception related to the vulnerability associated with the stimulus. It is not necessary, therefore, for a person to consciously access any information relating to a particular stimulus in order for the person to react to that stimulus.

3.2. Determinants of the vulnerability schema

It is proposed that there are two major determinants of a person’s perceived vulnerability. The first source is individual personality traits or biological dispositions that may include such factors as autonomic lability, extroversion and neuroticism, sense of mastery, disgust sensitivity and locus of control. A growing body of research, for example, now attests to the relationship between fear and disgust sensitivity ([Woody et al., 2005](#)). In most cases, however, the investigations of personality correlates of anxiety states have looked at disorders other than specific phobias. More research is still required, therefore, in relation to the identification of the personality correlates of specific fears and perceived vulnerability.

The other likely source of a person’s perceived vulnerability is experiential factors. These factors are conceptualized broadly as any learning experiences with a particular stimulus involving those variables related to perceived vulnerability. It is proposed that a person may learn about a particular stimulus by any of the three pathways conceived of by [Rachman \(1976, 1977, 1990\)](#).

3.3. Automatic affective reaction

Once the vulnerability schema is automatically elicited two processes may be seen as following. The first is an automatic affective reaction similar to that described by [Öhman \(1986; Öhman et al., 1985\)](#). The idea of such an unconscious or preattentive mechanism has received some support using backward masking studies which have found

that a conditioned SCR can be elicited even though the subject is unaware of the presentation of the fear-relevant stimulus (Öhman & Soares, 1993, 1994; Soares & Öhman, 1993). These results support the idea of a preattentive or non-conscious process and have been used to explain the involuntary and supposedly irrational nature of a phobic's response to the perception of a fear-relevant stimulus.

3.4. *General cognitive evaluation*

The second process which can be seen as following from the stimulus perception and activation of the automatic vulnerability schema is a controlled, cognitive processing of the stimulus and its overall significance for the individual. This takes the form of a general integrative appraisal of the stimulus and is somewhat analogous to the primary and secondary appraisals proposed by Folkman and Lazarus (1985). The general cognitive evaluation represents the final series of processes before the person's conscious response set is initiated and may comprise a mixture of conscious, semi-conscious, and unconscious appraisals. As this cognitive processing is proposed as being influenced by the same sense of vulnerability that results in the automatic affective reaction, it is likely that the cognitive assessment of the fear-relevant stimulus is generally congruent with the preattentive reaction. A person who exhibits an instantaneous fear reaction to a stimulus would also be likely to express various cognitions that subsequently 'explain' their fear response.

3.5. *The role of other cognitive factors*

Other important sources of influence on the general cognitive evaluation are cognitive factors such as attentional and memory biases, negative self-focused attention, patterns of anxious self-statements, and automatic questioning. It is hypothesized that these various cognitive processes may affect the general cognitive evaluation by distorting the information reaching and contained within the information processing system. It is also possible that at least some of the cognitive processes which have been found to occur in specific phobias have some effect on the automatic affective reaction. This may, once again, be through the biasing of information in relation to the stimulus.

3.6. *A summary of the Cognitive Vulnerability Model*

A schematic representation of the etiological factors discussed in relation to the Cognitive Vulnerability Model is shown in Fig. 1. To summarize, a stimulus automatically and unconsciously triggers its respective vulnerability schema. The schema includes perceptions of the uncontrollability and unpredictability of the stimulus along with its potential and likelihood of causing a negative outcome, which may relate to both danger and disgust. The content of this cognitive schema is based on learning experiences associated with a particular stimulus and is moderated by various personality differences. Immediately following the activation of the vulnerability schema two parallel processes are proposed to occur. The first is a rapid automatic affective reaction which may cause an individual to exhibit immediate fear responses. The other process is a relatively slower cognitive appraisal which incorporates various other evaluations and appraisals. A variety of other cognitive factors such as, attentional biases impinge upon the general cognitive appraisal and, to a lesser extent, may serve to exacerbate the pre-attentive automatic reaction. The response set stemming from this process includes an emotional/cognitive response, a physiological response, and a behavioral response. The interpretation of the outcome of the interaction feeds back into the vulnerability schema and the moderating cognitive processes.

3.7. *A comparison with Barlow's multi-level theory*

While the Cognitive Vulnerability Model presents a novel approach and synthesis of the literature on the etiology of specific phobias it does present similarities with some other theories, such as the Triple Vulnerability Theory put forward by Barlow (2000, 2003). Barlow (1988) originally proposed that anxious apprehension in people with existing biological and psychological vulnerabilities increased the intensity of an alarm response during a frightening experience. Later, Barlow (2003) posited that a sense of unpredictability and uncontrollability lay at the core of anxiety and hypothesized an interacting set of three diatheses or vulnerabilities relevant to the development of anxiety. These

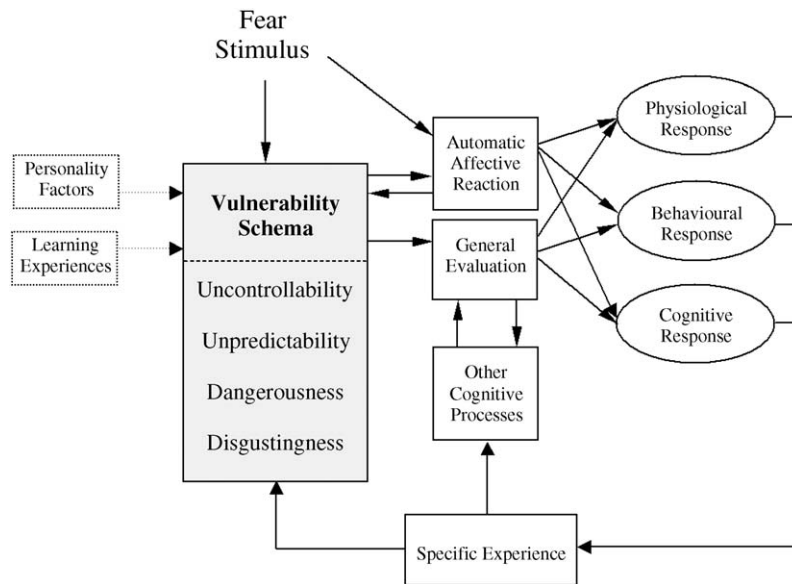


Fig. 1. Cognitive Vulnerability Model of the etiology of fear and the process of fear elicitation.

are generalized biological or genetic vulnerabilities, generalized psychological vulnerabilities and specific psychological vulnerabilities. The third set of vulnerabilities was introduced to account for the development of some specific anxiety disorders, such as sexual dysfunction.

Despite its reference to psychological vulnerabilities there are important differences between Barlow's theory and the current theory. For example, Barlow still leans heavily on behavioral theory, and elsewhere he describes the causes of phobias as being a combination of biological and evolutionary vulnerability and the learning pathways of direct conditioning, observational learning and informational transition (Barlow & Durand, 2004). However, the main difference between Barlow's Triple Vulnerability Theory and the current Cognitive Vulnerability Model is that Barlow sees unpredictability and uncontrollability as focussed largely on possible future threat or danger, leading to anxious apprehension. A perceived inability to influence personally salient events and outcomes arises from the evocation of anxious propositions. In the Cognitive Vulnerability Model, unpredictability and uncontrollability, as well as dangerousness and disgustingness, are aversive outcomes in and of themselves, not only relating directly to the fear response set but also feeding back into the stimulus or event perceptions.

3.8. An explanation of the characteristics of specific phobias

The proposed Cognitive Vulnerability Model has several advantages over other approaches to the explanation of the etiology of specific phobias. One particularly important asset is its ability to explain the various characteristics of specific phobias. For the present, discussion will be confined to the animal type of specific phobias. The reason for this is that the blood-injection-injury type may not represent a 'true' specific phobia (Lumley & Melamed, 1992; Thyer, Himle, & Curtis, 1985) and various phobias within the other subtypes may be more related to panic attacks or social phobias than to specific phobias. Fear of flying, for example, may be diagnosed as a symptom of either panic disorder with agoraphobia or specific phobia (McNally & Louro, 1992). Also, many driving phobias are attributable to the occurrence of panic attacks while driving (Ehlers et al., 1994) and can, therefore, more accurately be seen as fears of having a panic attack while driving and not a fear of driving per se. For these reasons, the animal subtype of specific phobias represents a more cohesive grouping than the other specific phobia subtypes. Nonetheless, the theory is applicable to what may be called 'true' examples of natural environment and situational phobias as well as to animal phobias.

The characteristics of specific phobias identified earlier were their apparent irrationality or excessiveness, various modes of acquisition, differential distribution across potential fear stimuli, and the individual differences in fear

acquisition despite similar experiences. It has been argued that previous and current theories have been inadequate in explaining all of these phenomena. In contrast, the proposed cognitive vulnerability theory offers a number of hypotheses to account for these characteristics.

- (1) The excessive response characterizing specific phobias is posited as stemming from the automatic affective reaction accompanying the perception of vulnerability. This response most likely represents a biologically important mechanism found in all animals that readies them for immediate survival-oriented behavior. Support for this hypothesis has already come from the series of studies by Soares and Öhman mentioned previously (Öhman & Soares, 1993, 1994; Soares & Öhman, 1993). Although these studies were conducted in the context of testing one of the implications of Öhman's preparedness model of the etiology of phobias, the results are also consistent with the precepts of the Cognitive Vulnerability Model.
- (2) The various modes of acquisition have been explained not as causes of fears but merely as ways of gathering information about a particular stimulus. It is proposed that any means of acquiring knowledge about a stimulus may result in the perception of vulnerability in relation to an object or situation.
- (3) The differential distribution of fears across potential stimuli is argued to be a result of specific differences in stimulus characteristics. In particular, the perceived unpredictability of the stimulus, its uncontrollability, and the potential and likelihood of it to cause a negative outcome, whether harm or revulsion, are argued to be critical factors. The Cognitive Vulnerability Model predicts that animals which are perceived across various dimensions as being unpredictable, uncontrollable, potentially harmful, and disgusting would have the highest proportions of fears, and those stimuli low on these vulnerability dimensions would be associated with few phobic fears.
- (4) Finally, individual differences in fear expression are proposed to be caused by differences in perceived vulnerability, which are undergirded by various experiential factors and personality traits. Those people who perceive an animal as being highly uncontrollable, unpredictable, dangerous, and disgusting would demonstrate significant levels of fear and avoidance to that animal. Yet, the interaction of different experiences and different personality characteristics might lead other people to have low perceptions of vulnerability to the same animal.

These hypotheses provide a wealth of possible research directions aimed at disconfirming the model. While some of the components of the model have already been extensively tested, a host of new possibilities are evident. First, the relationship between the vulnerability variables and specific fears need to be confirmed for a range of stimuli and events. This should explain differences in fear acquisition and expression across people and also differences in fear propensity across various stimuli. Sub-conscious processing of vulnerability 'perceptions' should be evident. There is also a strong need for experimental and longitudinal research to confirm the hypothesised causality of the model. Unlike some other etiological theories of specific fears, the Cognitive Vulnerability Model makes specific, testable claims and research is currently underway to test the validity of the new theory.

4. Conclusion

The basic proposition presented in this article is that perceptions of a stimulus as uncontrollable, unpredictable, dangerous and disgusting are essential aspects in the etiology and maintenance of fear. The Cognitive Vulnerability Model draws on a considerable body of research that implicates the vulnerability variables in the determination of anxiety, fear and phobia. Although much of this research is not directly aimed at testing the relationship of the vulnerability variables to specific fears there is considerable empirical support for a role of these variables in the mediation of fear and anxiety response sets across a large variety of situations.

The Cognitive Vulnerability Model offers important theoretical implications for clinical intervention. Already it is widely acknowledged that giving people a sense of control and predictability is important in helping to alleviate fear and in some areas, such as dental fear, treatment for fear is in part directed at engendering an improved sense of both predictability (de Jongh, Adair, & Meijerink-Anderson, 2005) and control (Milgrom, Vignesh, & Weinstein, 1992; Bare & Dundes, 2004). The current model offers a theoretical background for this practice and incorporates perceptions of control and predictability with those of danger and disgust into a model of cognitive vulnerability whereby the focus is a person's perceptions of a stimulus, the phenomenology of an event. It is how a stimulus is perceived that determines fear rather than the stimulus per se.

Previous theories have struggled to adequately address the etiological issues of fear as well as the various modes of acquisition, the differential distribution across potential fear stimuli, and the individual differences in fear acquisition. Some theories fall short in addressing these aspects of specific fear while other theories have received only minimal, or conflicting support. Interestingly, the recent Textbook of Anxiety Disorders, put out under the auspices of the American Psychiatric Association, lists only conditioning, preparedness, multiple pathways and non-associative theories as possible etiological theories, with cognitive factors predominantly assigned to a role in the maintenance of phobias (Harvey & Rapee, 2002). It is concluded that there are multiple pathways to the onset of specific phobia but that further investigation is required. This highlights the inability of current etiological theories to adequately grapple with the complexities of specific fears and phobias.

Although the Cognitive Vulnerability Model rests on the foundations of other cognitive theories of the etiology of fear and draws on ideas propounded by such notables as Beck and Emery (1985) and Öhman, the model offers an entirely new approach to synthesizing the available disparate literature and offers new testable hypotheses which address some of the core puzzles of specific fears. The model is parsimonious and intuitively applicable. Although the model is in its infancy and has yet to be put to extensive testing, it serves as an important step in providing direction to future theorizing and a basis for further research.

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