Chapter 15

Mechanisms of Learning and Behavior Change in Social Anxiety Disorder

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INTRODUCTION

Mechanisms that determine social behavior are an integral component of understanding social anxieties and fears across continua of severity, including their pathological manifestations. The current literature compellingly focuses on cognitive factors in relation to social anxiety disorder, yet information about a wealth of heuristic behavioral, learning-based mechanisms is available, but underutilized. This chapter focuses on basic behavioral principles that can be incorporated in the conceptualization of mechanisms that may be involved in the development of social anxiety disorder, how it is perpetuated, and how this syndrome can be treated therapeutically.

Various behaviorally-oriented theoretical perspectives on social anxieties and social anxiety disorders (social phobias) have been forwarded since Isaac Marks's pioneering (1969, 1970; Marks & Gelder, 1966) and subsequent work (Marks, 1985, 1987). Using early conditioning theories as a basis, and expanding into new dimensions, a host of cognitive-behavioral and cognitive theories of social anxiety disorder have been developed (Clark & Wells, 1995; Hofmann, 2007; Hofmann & Barlow, 2002; Moscovitch, 2009; Rapee & Heimberg, 1997). Neurobiological theories also are an area of focus (e.g., Liebowitz, Gorman, Fyer, & Klein, 1985; Tancer, Lewis, & Stein, 1995; Schneier & Welkowitz, 1996). Evolutionary, genetic, and ethological data and theories (Ohman, Dimberg, & Ost, 1985; Trower & Gilbert, 1989; Weeks, Rodebaugh, Heimberg, Norton, & Jakatdar, 2009) are a fascinating foray into broad, distal determinants of social behavior. Nevertheless, exclusively (Beidel & Turner, 1998) or predominantly (Barlow, 2002) behavioral and conditioning models (Mineka & Sutton, 2006) continue to be important for the field. Although the early history of behavioral

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theories emphasized an extreme nurture position in the "nature versus nurture" debate, contemporary behavioral theories of anxieties and fears incorporate both learning and biogenetic influences (Eelen & Vervliet, 2006).

Early behavioral models for social and other phobias focused on stimulus-response relations (Pavlov, 1927; Watson & Rayner, 1920) and two-factor theory (Mowrer, 1947), providing a primarily respondent conditioning-based behavioral analysis of the factors that give rise to and maintain the disorder. These conditioning models were refined to include indirect conditioning (Rachman, 1976, 1977). Nevertheless, the idea of direct traumatic conditioning predominated, but many limitations of purely respondent conditioning approaches were identified in trying to explain the development of anxieties, fears, and phobias (Mineka & Sutton, 2006). As an alternative, Mineka and colleagues (Mineka & Sutton, 2006; Mineka & Zinbarg, 1995; Mineka & Zinbarg, 1996) have presented models of conditioning from an ethological perspective that also emphasize experiential variables (e.g., prior experience with the conditioned stimulus, inflation of fear after exposure to a more intense unconditioned stimulus), preparedness (e.g., angry facial expressions), and genetic/temperamental variables (e.g., behavioral inhibition). The evolutionary focus, with the addition of cognitive elements, was earlier used with basic learning principles in attempting to explain the development and maintenance of social anxiety disorder (Trower & Gilbert, 1989; Trower, Gilbert, & Sherling, 1990; Trower & Turland, 1984). In addition to the idea of direct traumatic conditioning, Mineka and colleagues have included observational or vicarious conditioning, and verbal or instructional learning, as two other associative pathways that can lead to the development of phobias (Mineka & Sutton, 2006). These other types of learning seem particularly relevant to social anxiety disorder in that the influence of parents and caregivers, and other aspects of the learning environment, likely are involved in the development of this syndrome, particularly early in life (Bögels, Alden, Beidel, Clark, Pine, Stein et al., 2010). Another behavioral model of anxieties and fears in general has been proposed (Öhman & Mineka, 2001; Mineka & Öhman, 2002) in an "evolved fear module." This evolutionarily-shaped behavioral system incorporates the three associative pathways, as well as the preparedness of eliciting stimuli, automaticity in responding, encapsulation from higher-order cognitions, and its own neural circuitry in the amygdala (Mineka & Sutton, 2006). Such a model might be specifically and fruitfully applied to social fears and anxieties.

Behavioral models have emphasized social skills deficits in the formulation of social anxiety disorder (e.g., Marks, 1985). This syndrome has been regarded as being the result of social skills deficits (primary deficit), or as the result of anxiety related to social behavior despite the knowledge of fluent social functioning (secondary deficit), or a combination of these factors (tertiary deficit; Hopko, McNeil, Zvolensky, & Eifert, 2001). Both skills deficits and anxiety are useful intervening variables (cf. MacCorquodale & Meehl, 1948) as they can be used as a summary label for the actual environmental variables that produce patterns of behavior referred to as social anxiety disorder (see Masia &

Morris, 1998). For example, an individual whose social anxiety disorder involves being "so nervous [she] can't talk at parties" may be labeled as anxious. Likewise, an individual who says he "just doesn't know what to say when around new people at a party" may be thought to have a skills deficit. Using the labels "anxiety" or "skills deficit" as hypothetical constructs (i.e., actual entities with causal status), however, provides little explanation of the variables controlling the anxious responses. For example, suggesting that an individual did not go to a party because of anxiety provides no more information about the setting events and maintaining variables than simply saying that the individual did not attend the party. Instead, a more parsimonious and useful analysis would focus on the environment-behavior relations (e.g., type of party, number of people attending who were well known or unknown) leading to the pattern of behavior (e.g., increased heart rate, phobic cognitions, and overt avoidance) referred to as social anxiety disorder. In such a case, anxiety and skills deficits simply are summary terms for these relations, and not the cause. For example, if an individual reports being "anxious" when in social settings, one should assess for the particular characteristics of that situation, seek to determine other events that may provoke anxiety, and attempt to identify stimulus or functional similarities across situations that may represent the controlling variables (e.g., presence of an authority figure). Similarly, regarding skills deficits, one should consider the various situations that require social functioning, knowledge and prior learning of social skills, and the current options to keep them "polished."

Following from a focus on environment-behavior relations, the importance of situation specificity becomes more clear. Individuals with social anxiety disorder vary in the number and type of situations that evoke anxiety and fear (e.g., conversations in groups, public speaking, blushing after being embarrassed) (Bögels et al., 2010); the scope and severity of these social fears and anxieties are highly related to particular situational variables (Holt, Heimberg, Hope, & Liebowitz, 1992). Social anxiety disorder is influenced by biological and developmental factors, but certainly also is under environmental control and may manifest differently across settings. For example, when there is an informal party associated with one's workplace, an individual may engage in avoidance or escape because he has found that he does not know what to say or do, and so attending the party is not reinforcing. Additionally, when exposed to a social situation in which an individual previously was criticized and ridiculed, he also may engage in avoidance or escape. In both cases, the structure of the resulting (avoidance) behavior is similar, but the function clearly differs. In contrast to situations in which escape or avoidance does occur, the same individual may experience little anxiety or social difficulty in a situation in which he has had positive and comfortable prior exposure. Although the first part of this example could be labeled as consistent with social anxiety disorder due to a skills deficit, the second as reflective of possible social anxiety disorder due to anxiety, and the third as an absence of social anxiety disorder, looking beyond labels and focusing on environment-behavior relations may allow for the particular situational variables supporting social anxiety disorder to be identified and targeted more easily and accurately.

Consistent with the cognitive Zeitgeist in psychology (Eifert & Plaud, 1998), social anxiety disorder often is considered to be a result of cognitive processes (e.g., anxious anticipation of negative evaluation by others); these variables are endowed with causal status and are regarded as primary determinants of the disorder (e.g., Barlow, 2002; Beck & Emery, 1985; Clark & Wells, 1995; Rapee & Heimberg, 1997). In general, purely behavioral theories of psychopathology often are dismissed as they traditionally have focused upon simple instances of conditioning and ignored the role of cognitions and other private events (Anderson, Hawkins, & Scotti, 1997). In response to such criticisms, comprehensive behavioral theories of psychopathology have been proposed (e.g., Lejuez, Schaal, & O'Donnell, 1998; Lewinsohn, 1974). We believe that such behavioral approaches have relevance for the understanding and treatment of social anxiety disorder. In fact, although the issue is far from resolved, research suggests that the behavioral components of social anxiety disorder treatments are underutilized (e.g., Strahan & Conger, 1998); yet, they may account for a considerable percentage of treatment gain (Emmelkamp & Mersch, 1982; Feske & Chambless, 1995; Hope, Heimberg, & Bruch, 1995; Scholing & Emmelkamp, 1996). Furthermore, significant improvement in cognitive symptoms of social anxiety disorder has been found with purely behavioral treatment protocols (Newman, Hofmann, Trabert, Roth, & Taylor, 1994).

As a result of such findings, it is important that theoreticians re-examine the potential for understanding the nature of social anxiety disorder from behavioral perspectives. It has been suggested that, in order to understand fully and treat anxiety disorders, a behavior analysis of human emotion is "ultimately necessary" (Friman, Hayes, & Wilson, 1998, p. 149). Current behavioral theorizing incorporates the development of more comprehensive learning principles to explain complex phenomena once thought to be accessible only through cognitive explanations. Furthermore, these behavioral principles (e.g., functional equivalence, the matching law, and experiential avoidance) recently have been extrapolated in a far-reaching manner, and thus will be discussed in order to demonstrate how a comprehensive theory of social anxiety disorder is possible within a strictly behavioral framework. Notably, such formulations can include cognitive responses as important elements. To enhance the utility of behavioral theories, an exclusive focus on simple, isolated conditioning explanations with little or no recognition of cognitions or other more complex variables have been replaced by more thorough and comprehensive formulations that remain consistent with a behavioral framework.

CURRENT STATUS OF BEHAVIORAL THEORY OF SOCIAL ANXIETIES AND SOCIAL ANXIETY DISORDER

The most comprehensive specifically-behavioral formulation of social anxiety disorder that has been provided to date is that of Beidel and Turner (1998). In presenting a behavioral account of social anxiety disorder, they proposed a model that outlines several ways in which this syndrome may develop and

be maintained. Similar to other contemporary theorists, they emphasize that the etiology and maintenance of social anxiety disorder is multidimensional. In clinical endeavors, these interacting multiple determinants of psychological disorders (and adaptive human behavior) are best approached by an idiographic approach to assessment and treatment (Eifert, Schulte, Zvolensky, Lejuez, & Lau, 1997).

Beidel and Turner (1998) identify psychological factors as one broad class of contributors to social anxiety disorder, specifically listing direct conditioning, observational learning, and information transfer as components. Direct respondent conditioning events (see Miller, 1977; Pavlov, 1927; Skinner, 1953; Wolpe, 1958) appear to determine initial development of social anxiety disorder (Öst & Hugdahl, 1981) in about half of cases (Mineka & Zinbarg, 1995), although such findings are not entirely consistent (Hofmann, Ehlers, & Roth, 1995). Interestingly, the specific subtype of social anxiety disorder is more associated with traumatic conditioning experiences than the generalized subtype (Stemberger, Turner, Beidel, & Calhoun, 1995). Similar to Mineka and colleagues (Mineka & Sutton, 2006; Mineka & Zinbarg, 1995, 1996), Beidel and Turner discuss the limitations of direct conditioning explanations of social anxiety disorder and propose vicarious conditioning as a supplementary explanation. Additionally, Beidel and Turner discuss information transfer to account for instances of social anxiety disorder that appear to be verbally transmitted. For example, a child who frequently hears a parent using phrases such as, "Be polite!" and "What will your teacher think?", may come to associate social situations as consistently having strict rules and being highly evaluative. Moreover, frequently overhearing one's caregivers utter phrases like "Going to this ceremony is going to be painful; I don't want to go!" and "Do I have to take [child's name] to her friend's birthday party? It's going to be miserable," suggest social events are uncomfortable and that avoidance is a coping strategy to consider. Information transfer is but one aspect of the broader area of language-based learning, which is extremely complex; this latter topic is discussed in greater detail in a subsequent section.

Beidel and Turner (1998) also emphasize genetic and biological factors, citing both twin and family studies. Despite inconclusive results, they suggest at least some evidence for a genetic component to social anxiety disorder. Available data suggest that social anxiety disorder, like other anxiety disorders, is somewhat familial, with a degree of genetic influence (e.g., Stein, Gelernter, & Smoller, 2004; Stein, Jang, & Livesley, 2002). As a separate categorization, Beidel and Turner also consider other predispositional factors and trait variables that increase the likelihood of social anxiety disorder, and serve to maintain it. Family environment, peer relationships and loneliness, cognitive development, temperament (specifically behavioral inhibition), shyness, early attachment, and social skill deficits all are cited as factors that can contribute to social anxiety disorder. In accordance with this work, Beidel, Morris, and Turner (2004) outline the developmental role of parenting factors, as well as peer relations. Along these

lines, loneliness and peer relations are considered in terms of inability to receive social reinforcement from peers, leading rejected children to seek reinforcement outside the social environment, thus producing a cycle of avoidant behavior and social neglect. Similarly, Barrett, Rapee, Dadds, and Ryan (1996) found that both clinically anxious children and their parents predominantly chose avoidant solutions to ambiguous social situations, relative to aggressive and typical children.

A broad array of psychological and biological factors is appropriately considered in Beidel and Turner's (1998) formulation of social anxiety disorder. Consistent with a diathesis-stress model of psychopathology (e.g., Barlow, 1992), it is recognized that an individual with a genetic predisposition for anxiety, fear, or panic, including social anxiety disorder, is more susceptible to environmental influences that could lead to the development of the disorder. Conversely, certain biological substrates might lead to a resistance to certain environmental influences, or a resilience in response to stressors. Nevertheless, in some individuals, only environmental influences are necessary to elicit psychopathology. In most cases, however, it is not the independent effects of psychological or biological factors, but instead the interaction of the two that drives the development and maintenance of social anxiety disorder. Contemporary formulations strongly suggest that numerous environmental, biological, and developmental factors combine in a variety of arrays to produce anxiety, fear, and associated disorders (Mineka & Sutton, 2006). Although Beidel and Turner (1998) currently provide the most comprehensive purely behavioral view, there still are contemporary learning principles that can further add to our understanding of social anxiety and phobia. Rather than attempting to provide an overall, integrated model, we instead propose mechanisms and processes that may help account for the development, generalization, maintenance, and therapeutic change of social anxiety disorder (as well as other forms of psychopathology). Integration of these ideas awaits further development of theory.

CONTEMPORARY BEHAVIORAL PRINCIPLES AS A BASIS FOR THE FURTHER DEVELOPMENT OF THEORIES OF SOCIAL ANXIETIES, SOCIAL ANXIETY DISORDER, AND THERAPEUTIC CHANGE

Current theories of social anxiety disorder are well constructed and are increasingly comprehensive, yet in many cases the basic behavioral principles that underlie these formulations have not been clearly delineated. It should be noted that the field of behavior analysis is a natural science approach to behavior, including social behavior (e.g., Guerin, 1994), that provides one background for the exposition of these principles. Knowledge regarding these underlying principles allows for the further evolution of a formulation, including etiology and treatment, without moving in a direction that is inconsistent with the underlying framework of the formulation itself. As such, we present a number of behavior

analytic principles, including some of the research support for them, which are relevant to a behavioral formulation of social anxiety and phobia. Furthermore, we use social anxiety and phobia examples to highlight the understanding of these principles and their role in the development and maintenance of social anxiety disorder.

Initiation of Social Anxiety and Phobia

Any theory of social anxiety disorder must account for the early learning of socially anxious/avoidant responses in childhood and adolescence, given that the typical age of onset is in the mid-teens, although it sometimes occurs earlier in childhood (Hofmann, Heinrichs, & Moscovitch, 2004). The role of temperament is well documented, with behaviorally inhibited children being especially likely to develop social anxiety disorder (Schwartz, Snidman, & Kagan, 1999). Experiential variables, resulting in individual differences in vulnerability and protective factors, also are important in the development of social anxiety disorder in childhood and adolescence. Harsh, criticizing, and controlling parenting styles are associated with the development of social anxieties and fears (Greco & Morris, 2002).

The three pathways of fear acquisition identified by Rachman (1977) can be readily applied to social fears. Direct conditioning (e.g., a traumatic social encounter involving embarrassment and shame), vicarious learning (e.g., observing someone else being humiliated by an authority figure), and verbal threat information (e.g., a parent cautioning a child to be wary of speaking to her teachers at school because they may negatively evaluate her) all are possible mechanisms of social fear initiation, either singly or in combination. As noted by Mineka and Sutton (2006), rapid observational learning of fears and anxieties may occur in children as a result of parental modeling. Additionally, instructional or verbal learning (i.e., transmission of verbal threat information) can occur; again, as suggested by Mineka and Sutton (2006), "negative information may primarily set up negative expectancies that then potentiate the outcome of direct or conditioning episodes" (pp. 78-79). Both self-report and experimental evidence suggests there exists a vicarious learning pathway to fear (Askew & Field, 2008), and that such a pathway may be important in the development of social fears in children (e.g., Lawson, Banerjee, & Field, 2007). Negative information from parents or others about social events and social interactions, or certain kinds of media exposure (Muris & Field, 2010) may create a stimulus situation in which social conditioning episodes may result in anxiety and fear, and associated avoidance.

There are numerous opportunities in childhood for naturalistically occurring events that serve as "conditioning trials" for social anxiety. For example, there may be traumatic conditioning associated with an event that is social in nature (Marks, 1987; Stemberger et al., 1995; Wolpe, 1958). It may happen that an individual mispronounces words or "freezes" while speaking in front of peers,

consequently receiving ridicule for the poor performance. As a result, future instances involving similar stimuli (e.g., speaking when peers are listening) may produce a fear response (e.g., physiological arousal) despite the absence of ridicule. Further, the negative reinforcement via escape or avoidance, and positive reinforcement (e.g., compassion from concerned friends or family members) following reports or observable instances of fear, may strengthen these initial patterns of behavior, therefore producing further phobic behavior. The resulting limited contact with social stimuli may produce anxious apprehension and further decrements in social skills.

Still, other naturalistic events in childhood can serve as "conditioning trials" for social anxiety. Interpersonal constraint (i.e., behavioral inhibition), which often is associated with socially anxious individuals, can be perceived by others as disinterest or coldness (Rodebaugh et al., 2013). Given that the behavior of individuals influences the behavior of others in the environment, consider the case in which an interpersonally constrained person unknowingly sets up learning opportunities that may result in social anxiety. A person who is less forthcoming than others in social encounters, or a person who is particularly shy, may be socially neglected, which may result in being punished by others. This behavior of others, in turn, can produce in the interpersonally constrained individual an anxiety or fear response, with related future apprehension, avoidance, and a decline in social skills. Additionally, limited contact with typically reinforcing social stimuli also may produce this anxious apprehension and decrements in social skills. Comfortable, positive, and healthy social interaction has great reinforcement power (Vollmer & Hackenberg, 2001); however, if an individual does not contact such contingencies regularly, he or she may not have opportunities to learn that many social encounters can be pleasurable or otherwise reinforcing. The result then may be a future anxious avoidance of unknown social stimuli.

Despite the simplicity of basic direct and indirect (e.g., vicarious learning and verbal threat information) conditioning interpretations, explaining why some individuals develop social anxiety disorder and others do not is far from simple. For example, some individuals develop social anxiety disorder in the absence of recalled traumatic conditioning events, whereas others experience social trauma (e.g., by committing a *faux pas*) and do not develop social anxiety disorder or even social anxieties that persist beyond a few hours. Although the absence of recall identification does not preclude the possibility that direct conditioning occurred, other plausible causes are necessary to strengthen a behavioral theory of social anxiety disorder. Information transfer of verbal threat information and vicarious (i.e., observational) conditioning are possible mechanisms (Beidel & Turner, 1998; Mineka & Zinbarg, 1995, 1996).

A body of research suggests that observational or vicarious learning can serve as an explanatory model for abnormal fears, and that it can be conceptualized as a form of associative learning (see Askew & Field, 2008). Additionally, verbal threat information has been implicated in the development and

maintenance of a range of childhood fears (e.g., monster doll, novel animals, safety; see Muris & Field, 2010 for a review); experimental research has demonstrated, generally, that verbal threat information can produce effects on fear that are long-lasting. Lawson and colleagues (2007) utilized an elegant experimental paradigm to test whether verbal information could produce in children fear beliefs related specifically to social situations. Verbal threat information influenced implicit and explicit fear beliefs in children, independent of the existing level of social anxiety and the source of the information, and with effects observed for negative, but not positive, information. While additional work is required to elucidate specific mechanisms, potential moderating variables, and issues of sequencing, there is support for the indirect conditioning of social fears in children through observational/vicarious learning and verbal threat information routes.

As a complementary view of the role of verbal threat information, rule-governed behavior consists of responses emitted by an individual that are not the result of direct exposure to a conditioning event, but instead are a result of verbally transmitted reports of other individuals' experiences (Hayes, Zettle, & Rosenfarb, 1989). For example, an individual who hears reports of others experiencing an embarrassing social situation, such as through a *faux pas*, may attempt to avoid such situations, despite the fact that he or she never had such experiences. Thus, despite the absence of a direct conditioning event, the individual behaves in a manner one might expect had she or he had such an experience. Although rules could be considered to mediate the individual's behavior in response to particular environmental contingencies, research has shown that rule-following itself is selected and maintained by the contingencies for following or complying with rules, and thereby is subject to environmental control (Catania, Matthews, & Shimoff, 1982; Galizio, 1979). An individual will only continue to follow a rule if rule-following under similar circumstances previously was reinforced.

As an example of rule-governed social behavior, suppose a heterosexual adolescent boy operates under a rule, based on embarrassing anecdotes from same-sex peers, that he will approach a girl to talk (and express interest in her) only if he "knows" for certain that she currently does not have a romantic partner and very likely will not "turn down" his advances. The rule may function to prevent the embarrassment of rejection, but unfortunately also operates to insulate the boy from contacting positive, developmentally growth-inducing socialization. That is, the potentially positive outcomes associated with approach towards, and interaction with, potential romantic partners are not contacted, and thus the frequency of such behavior is not subject to being increased via positive reinforcement. As a result, this individual's behavior is under the control of contingencies for following rules regarding the avoidance of aversive experiences and the consequences of negative social evaluation. Individuals may be more aware of the contingencies supporting rule-governed behavior due to learning through observation or verbal communication as opposed to direct experience,

but similar to other conditioned behavior, awareness is not necessary for the occurrence of the behavior in question (Miller, 1977). As such, rule-governance describes the way in which environmental contingencies may be learned indirectly. Rule governance does not, however, describe a determinant of behavior that overrides environmental control.

Both direct and indirect respondent and operant conditioning provide examples in which behavioral principles successfully may be used to explain more complex behavior without ascribing causal status to cognitive variables. Nevertheless, the principles discussed in this section might only explain initial development of social anxiety disorder. In the following sections, we examine behavioral principles that underlie both the generalization of social anxiety disorder to contexts in which it has not previously been directly or indirectly conditioned, and the maintenance of social anxiety disorder within those contexts.

Generalization of Social Anxiety Disorder

As children, adolescents, and young adults move through developmental phases in life, they encounter social situations that evolve in complexity and import. Avoidance of interactions with peers during childhood may then generalize to avoidance of encounters with potential romantic partners, and to peer relationships in education, training, or employment. As demands for independent functioning increase over the early part of the lifespan, there is likely to be generalization to social situations that are new and not previously encountered in social anxiety disorder.

Phobic behavior may occur under conditions in which conditioned stimuli are absent (i.e., respondent conditioning) and such behavior has yet to be reinforced (i.e., operant conditioning). These instances appear to present difficulties for a behavioral view, and neither direct respondent nor operant conditioning principles alone can explain the occurrence of this behavior in such situations. Principles based upon stimulus control, however, provide a solid foundation for explaining such instances of behavior.

Stimulus Generalization

Stimulus generalization occurs when a response that has been reinforced in the presence of one stimulus occurs for the first time in the presence of a structurally similar stimulus (Fields, Reeve, Adams, & Verhave, 1991; see Honig & Urcuioli, 1981, for a review). For example, consider an individual having an embarrassing experience in a nightclub (e.g., being "turned down" when requesting to dance with someone). If the individual worries that "everyone in the nightclub saw this interaction and is now laughing" at him, feelings of relief likely will result after leaving the situation (i.e., negative reinforcement via escape). Because of this history of negative reinforcement, the individual may leave future situations at the first instance of distress or even come to avoid such situations altogether (e.g., avoidance of inviting someone to dance, or avoidance of the nightclub altogether). Following from these experiences, a stimulus

generalization account of social anxiety disorder helps explain why *structurally* similar settings such as parties or informal social gatherings may result in escape or complete avoidance for this individual even though these situations had not previously produced anxiety, as with the embarrassing experience at the nightclub in the example above.

Thus, stimulus generalization is a useful concept that describes how a response may begin to occur in a variety of contexts without being directly reinforced in those contexts. Consequently, this concept provides the basic explanation of how social anxiety disorder may generalize without any further operant or respondent conditioning events. The processes underlying generalization, however, often are considerably more complex than simple structural similarities. As a result, more complex behavior principles are needed.

Stimulus Equivalence

According to Hayes, Kohlenberg, and Hayes (1991), more sophisticated behavioral principles are necessary to provide for an adequate analysis of the role of verbal behavior and its relation to psychopathology than can be provided with the principle of stimulus generalization alone. Whereas stimulus generalization requires physical similarity between stimuli, stimulus equivalence describes the formation of a relation between unpaired stimuli based on their trained relation to the same stimuli (Barnes, 1994; Sidman, Wynne, Maguire, & Barnes, 1989). That is, if through experience, stimulus A is paired with stimulus B, and stimulus B is paired with stimulus C, then a relation can occur between stimuli A and C, even though that relation has not been directly trained. An example adapted from Masia, McNeil, Cohn, and Hope (1999), based on semantic conditioning, may exemplify this principle most clearly. Suppose the word "evaluation" (stimulus A) is paired with "social" (stimulus B). Further suppose that "evaluation" (stimulus A) and "negative" (stimulus C) are paired. Then, if new bidirectional relations occur, "social" (stimulus B) and "negative" (stimulus C) might be related, even though that equivalence was never specifically taught. Such conditioning could then lead to generalization across social situations, not just ones involving evaluation. Important to note is the understanding that relational events (i.e., stimuli) involved in stimulus equivalence may include both public (i.e., observable behavior) and private events (e.g., cognition, emotion; Friman et al., 1998). There are other, detailed processes of conditioning that occur in stimulus equivalence which are beyond the scope of this chapter (Barnes, 1994). Although it is conceivable how relations among otherwise structurally dissimilar stimuli may be formed, the most central feature of social anxiety and phobia may be the functional qualities shared by stimuli, which may be best accounted for by the principle of functional equivalence.

Functional Equivalence

Similar to stimulus equivalence, generalization may occur in relation to function, not as a result of structural similarity among stimuli. The end result is the

transfer of function across stimulus class members, but the method by which this process occurs is unique and distinct from stimulus equivalence (Augustson & Dougher, 1997; Hayes et al., 1991; Sidman et al., 1989).

Defined briefly, a functional stimulus class is a set of structurally dissimilar stimuli that are grouped together because of similar discriminative stimulus functions (Dougher & Markham, 1994; Hayes et al., 1991; Sidman et al., 1989; Vaughan, 1988). Thus, unlike stimulus equivalence, relations are formed via functional similarities among the stimuli. For example, a graduate seminar, a formal party, and a picnic all may belong in the same functional stimulus class because outgoing and talkative behavior is reinforced in each setting (e.g., the teacher engaging in eye contact and saying "right" after the individual provides a comment or an answer to a question in a graduate seminar, or people laughing after the individual tells a joke at a party or picnic). Although these settings all may share structural stimulus properties (e.g., large groups of people), a stimulus generalization explanation may not be sufficient in all cases because the key aspect of these situations is the social/evaluative nature. Thus, the social/evaluative aspect distinguishes this functional class from other situations involving large groups of people (i.e., the structural similarity), such as those in libraries or at funerals, in which outgoing and talkative behavior rarely is reinforced, and in most cases punished.

Once a functional class is established, patterns of behavior other than that underlying the functional class membership may begin to occur across each of the situations. This "transfer of function" may explain the occurrence of social anxiety disorder in new contexts for which no other obvious reason is available (see Augustson & Dougher, 1997; Sidman et al., 1989). Considering the previous example, if an individual is ridiculed while answering a question in a graduate seminar, speaking as little as possible when in class allows the individual to avoid most potential ridicule. Because that avoidance behavior is negatively reinforced, avoidance also may begin to occur in association with picnics and parties, but not in regard to libraries or funerals. Thus, behavior may occur for the first time in the presence of a particular stimulus if that behavior has been reinforced in the presence of another stimulus that is a member of the same functional class (Dougher & Markham, 1994).

Stimulus generalization, stimulus equivalence, and functional equivalence provide an explanation for the emergence of phobic behavior across several situations that appear to be unrelated to outside observers. Generalization also may occur, however, across responses within a particular context.

Response Generalization

Response generalization can be used to explain how phobic behavior changes and persists over several contexts and how it can be extinguished across these contexts. As social anxiety disorder develops in an individual, there likely is generalization of avoidance responding, with learning that avoidance of social interactions and/or other social situations is (temporarily) reinforcing due

to lessened anxiety. Nevertheless, it is virtually impossible in most lifestyles to completely avoid social interactions. The typical latency between onset of social anxiety disorder and initial treatment for it is longer than many other anxiety disorders. Since social avoidance is partially successful, extended time may elapse before sufficient misery and comorbid disorders (e.g., depression) are manifested, thus prompting treatment. Indeed, the generalization of the avoidance response is a key factor in the perpetuation of social anxiety; changes in avoidance behavior alone predict treatment success and seem to be what initiate the cycle of change in the treatment of social anxiety disorder (Aderka, McLean, Hupert, Davidson, & Foa, 2013).

The neobehavioral concept of experiential avoidance (Forsyth, Eifert, & Barrios, 2006) may be explained by response generalization. Defined as a process that involves both an unwillingness to have, and an effort to control or escape from, unwanted thoughts, emotions, and physiological sensations, experiential avoidance has gained a great deal of attention (e.g., Hayes, Strosahl, & Wilson, 1999). Across situations that individuals with social anxiety disorders find phobic, both overt and subtle avoidance strategies are learned; experiential avoidance strategies often have immediate positive effects (e.g., relief), making them more likely to be readily utilized in future situations involving social stimuli (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996; Hayes et al., 2004). Limiting one's social interactions to restrict either the number of contacts, or sustained contact, or both, allows one not to experience the negative aspects of anxiety, in an attempt to down-regulate fear conditioning (Forsyth et al., 2006). Nevertheless, it also disallows the potentially therapeutic results of exposure (McNeil, Kyle, & Nurius, 2012). Experiential avoidance, when generally, excessively, and rigidly applied across (potential) social encounters, results in the individual with social anxiety disorder maintaining her or his problems, leading to constriction of life functioning, decreased contact with important life values, and eventually leading to chronic suffering (Forsyth et al., 2006).

As with all patterns of behavior, each instance of a particular behavior may be slightly different than previous instances. When a particular response that once produced reinforcement no longer does so, behavioral variability occurs such that other functionally similar patterns of behavior may emerge in the place of the no longer reinforced pattern. For example, consider a highly socially anxious student who initially is able to avoid an instructor calling on her by looking down throughout the class. If the instructor begins calling on the student despite this subtle avoidance strategy, the student may try other similar responses to avoid this unwanted attention until one of the somewhat random strategies (e.g., taking or pretending to take notes) starts to work (i.e., is reinforced) on a regular basis.

It should be noted, however, that although such instances of subtle avoidance often are a reasonable alternative to more overt avoidance, subtle avoidance also may produce negative consequences or it may not always provide for the successful avoidance of the aversive stimuli. For example, individuals who

make little eye contact may be considered to be less socially skilled and can be thought of less favorably than individuals who make appropriate eye contact. Furthermore, the student in the prior example may be called on regardless of where her attention is focused. Thus, it is likely that if instances of subtle avoidance engendered via response generalization do not provide the desired result, the new strategies may involve a type of "escalation" leading to more overt and extreme forms of avoidance (e.g., avoiding attending the class altogether).

Maintenance of Social Anxiety and Phobia

The principles based on generalization and equivalence provide an explanation for the emergence of numerous forms of phobic behavior across several situations that, on the surface, may appear to be unrelated. Maintenance of anxious and phobic behavior that is initiated by these more direct conditions involves derived and, indeed, indirect relations between both public and private events (Friman et al., 1998). That is, social anxiety and phobia are perpetuated by complex iterations and reiterations of public and private events, with context being a critical factor. Once particular patterns of phobic behavior have begun to occur in a new context, the consequences provided for such behavior and the relative consequences provided for alternative (i.e., nonphobic) behavior, determine its persistence. As such, principles that consider contextual variables are relevant.

Matching Law

We argue that the basic assumption within a behavioral formulation is that phobic behavior occurs more frequently when it produces greater reinforcement value than all other possible forms of nonphobic behavior. Value is defined as the interaction of several parameters of reinforcement including frequency, magnitude, duration, immediacy, and certainty. Application of the matching law (Herrnstein, 1961; Herrnstein, 1970), a behavioral model of choice behavior, more specifically suggests that the relative frequency of phobic behavior, compared to nonphobic behavior, is proportional to the relative value of reinforcement for phobic behavior compared to nonphobic behavior.

In other words, if the value of reinforcers for phobic behavior is increased, the relative value of reinforcers for nonphobic behavior must decrease. Consequently, the likelihood of future phobic behavior will increase, while the likelihood of future nonphobic behavior will decrease. Conversely, if the individual encounters less frequent reinforcement for phobic behavior than nonphobic behavior, nonphobic behavior will occur more frequently. In both cases, the shift in relative reinforcement frequency will be correlated with the shift in relative preference. For example, if reinforcement is obtained for phobic behavior at twice the frequency of reinforcement for nonphobic behavior, phobic behavior should occur twice as often.

The matching law typically is considered in terms of reinforcers, yet the role of punishers may be accounted for in a similar way, such that the presence of

punishers diminishes the relative value of an alternative (Deluty, 1978). Thus, in a more complex system than that described previously, the value of an alternative is a combination of the obtained reinforcers (increasing value) and punishers (decreasing value), relative to the combination of the obtained reinforcers (increasing value) and punishers (decreasing value) for other alternatives.

Although the precision of the behavioral account provided by the matching law is necessarily reduced in the natural environment, this limitation does not preclude its usefulness in applied settings. The matching law has not yet been applied to social anxiety disorder, but its clinical utility has been asserted (McDowell, 1982) and demonstrated in areas such as social behavior. For example, Conger and Killeen (1974) found that when given a chance to speak with two experimental confederates, individuals would spend more time conversing with the confederate that provided more frequent praise. Furthermore, the ratio of conversation directed at the two confederates was proportional to the ratio of praise.

Related to social fears, consider an individual with generalized social anxiety disorder who is offered a job promotion providing considerably more prestige and salary. Taken alone, one would think that such reinforcers would be enough to make taking such a job highly desirable. Accepting the new position, however, would also present potential punishers such as increased public speaking responsibilities. Thus, not taking the position would be negatively reinforced, as instances of public speaking and other social stressors would be avoided, reducing the relative frequency of aversive work-related social situations. Additionally, positive reinforcers such as continued opportunity to interact with co-workers with whom the individual is well acquainted may increase the value of not taking the new position. As a result, although there may be several potential benefits of taking the new position, the associated benefits of not taking the position and therefore avoiding novel social and evaluative situations may be relatively greater.

Thus, the matching law suggests that the frequency of phobic and nonphobic patterns of behavior should conform to the relative value obtained for those alternatives. Nevertheless, it remains unclear why an individual might continue with a particular pattern of behavior and not engage in others that potentially might produce greater gain. This question may be answered by considering the matching law's focus on obtained as opposed to available reinforcers. For example, going to a party may potentially provide a high level of reinforcement, making it a desirable alternative. However, if the individual avoids parties and has not experienced the available reinforcers, there is no *obtained* reinforcer for going to parties. As a result, the temporary relief via cessation of physiological and cognitive responses produced by avoidance of feared stimuli, although resulting in long-term negative effects, continues to have greater relative obtained value than party attendance.

Rule-Governed Behavior

In addition to its applicability to initial instances of behavior, rule-governance also may be used to explain the persistence of ineffective patterns of behavior. Research has shown that under certain conditions, individuals will continue to

behave in accordance with an initially provided rule despite the fact that the rule may no longer provide for the most conducive pattern of behavior. For example, Galizio (1979) found that when given a "strategy" for successful participation in a contrived game situation, participants would use these strategies and often not ever contact the actual contingencies, even when the provided strategy was not optimal. Nonetheless, the influence of rules should not be considered independently of the associated environmental contingencies. That is, an individual who follows a rule that is contrary to the environmental contingencies often does so because the potential reinforcers available in the avoided situation have not been contacted. Thus, when Galizio's participants engaged in a strategy (often by accident on its first instance of use) that was more effective than the strategy given to them, the influence of rule governance was weakened and new strategies were developed.

For reasons related to rule-governance, exposure therapy has value beyond extinction of conditioned fear responses. For example, if an individual avoids a situation because of a rule and not because the situation is actually dangerous or threatening, repeatedly exposing the individual to the situation will allow for contact with the reinforcers available in that situation. For example, an individual with circumscribed public speaking phobia may operate under a rule that indicates: "I am poor at delivering speeches, so I should make every effort to avoid formal speaking opportunities, even if my career is hurt in the long-term." Either with or without the presence of significant public speaking skills deficits, systematic therapeutic exposure should help to counteract this rule. More sophisticated speaking skills may be developed, and positive comments from the therapist (and, through modeling and shaping, the individual himself) should result in greater reinforcement for public speaking, first in the therapy situation and later in the natural environment. As discussed regarding the matching law, this increase in obtained reinforcers should increase the likelihood of the socially positive behavior in question. It should be noted, however, that repeated exposure to positive consequences of new (healthy) behavior patterns often is necessary to counteract previous longstanding patterns of old (unhealthy) behavior, especially considering that these old patterns of behavior may be strengthened by coincidental instances of intermittent reinforcement (e.g., occasional subtle negative facial expressions in some audience members).

In addition to rule governance, other factors may possibly explain the occurrence of less adaptive behavior. Basic operant studies in the area of delay and certainty of reinforcement (also referred to as self-control and impulsivity) provide possible answers to this question.

Delay, Amount, and Certainty of Reinforcement

Delayed events (positive or negative) impact behavior less than immediate events (Bjorkman, 1984; Renner, 1964; Tarpy & Sawabini, 1974). Preference for small immediate rewards as opposed to delayed larger rewards has been defined as impulsivity (Ainslie, 1975; Rachlin & Green, 1972). Although not explicitly outlined in any current theory of social anxiety disorder, this definition

of impulsivity can be used to better understand some of the variables controlling socially mediated phobic avoidance and escape. Specifically, phobic avoidance and escape result in immediate negative reinforcement through terminated or prevented contact with a feared stimulus, whereas entering or remaining in an anxiety-provoking situation may produce a larger, but considerably more delayed reinforcer. For example, a phobic individual may avoid going to parties because of the potential for negative evaluation, even though such avoidance prevents the attainment of a variety of social reinforcers including engaging in rewarding conversations and possibly developing friendships. To obtain such reinforcers, the individual must endure any pre-party anxiety that may increase as the time of the party approaches. Furthermore, many social reinforcers often are not immediately obtained. For instance, it may take lengthy conversations and numerous encounters before a comfortable relationship is developed between the phobic individual and another person. Thus, the larger, more delayed rewards obtained by going to parties often are less preferred compared to the immediate, yet small and temporary negative reinforcement provided by avoidance. Initial experimental evidence suggests that such a delay discounting paradigm may inform our understanding of the etiology and maintenance of social anxiety. Rounds, Beck, and Grant (2007) found that highly socially anxious individuals demonstrated increased discounting of delayed reinforcement, compared to less socially anxious participants, in an experimental delay discounting task involving non-threatening social stimuli. Though replication of this study finding is warranted, there is early indication that delay discounting is useful for conceptualizing social anxiety and phobia.

Although less empirical support has been provided, the same general processes also appear to be evident for punishment. Regarding punishment, self-control involves the choice of an immediate small punisher as opposed to a delayed large punisher (Deluty, 1978). For example, an individual with social anxiety disorder may prematurely terminate a presentation that is proceeding poorly, and then leave the room abruptly. Although the consequences of leaving may be greater than finishing the presentation, the consequences in the former (e.g., ultimate loss of job) are delayed whereas the consequences for the latter are occurring at that moment (e.g., negative nonverbal feedback from audience members). This process, specifically with regard to punishment, has relevance not only to the perpetuation of anxious or phobic behavior, but also to the treatment of social anxiety disorder. Hope, Heimberg, and Turk (2006, p. 13) have suggested that treatment for social anxiety requires one to "invest anxiety in a calmer future." In exposure and other treatments for anxiety disorders (including social anxiety disorder), acceptance of a relatively small immediate punisher (i.e., anxiety that accompanies exposure exercises) as opposed to the delayed larger punisher of long-term distress and functional impairment, is key to successful treatment (McNeil et al., 2012).

Organisms often behave impulsively in regard to both reinforcement and punishment, but these outcomes can be changed. Firstly, the value of a delayed

reinforcer can be increased. For example, a phobic individual is less likely to avoid a public speaking presentation if a substantial promotion, as opposed to only employer praise, eventually will result following completion of the task. Secondly, the value of a delayed reinforcer can be increased if the delay to the more immediate reinforcer is increased. Grusec (1968) examined the behavior of third grade children given actual choices between immediate and delayed reinforcers and punishers. As the delay to reinforcement for the immediate reward was increased, participants preferred the larger, more delayed reinforcers over the smaller, less delayed reinforcers. Additionally, participants preferred the smaller, more immediate punisher to the larger, more delayed punishers, after the delay to the larger punisher was shortened. Not surprisingly, increasing the delay of a smaller reinforcer will limit impulsivity; however, the same result may be obtained by increasing the delay to both reinforcers by the same absolute amount (Rachlin & Green, 1972).

This work on delay and amount of reinforcement may help to explain a common occurrence in which a commitment to a social engagement may be made a week or more prior to the event, yet as the event approaches, the avoidance option is selected, perhaps utilizing a socially acceptable excuse ("I'm not feeling well"). In such an example, a person with generalized social anxiety disorder may promise to attend a party with a strong, stated intention to follow through with this agreement to a casual friend. On an immediate basis, there is positive (e.g., enthusiastic encouragement) and negative (e.g., cessation of cajoling) reinforcement from the friend for agreeing to attend the event. Consequently, less reinforcement is then available for a stated decision to not attend (i.e., avoid) at that point. Yet, in the hours just before the party, reinforcement is then immediate for avoidance (e.g., through termination of the worry regarding adequacy of her social interactions at the party), and considerably delayed for attendance (e.g., through satisfying relationships potentially developing in the future), beyond the lesser negative social repercussions from the casual friend. Consequently, the individual is then considerably more likely to avoid. Although beyond the scope of this chapter, a quantitative model predicting choice based on reinforcer magnitude and delay duration is provided by Rachlin and Baum (1972). Additionally, a similar model is presented substituting aversive events for reinforcers (Deluty, 1978).

A less obvious method for decreasing impulsivity involves the presence of stimuli that signal reinforcement. Basic research suggests that impulsive behavior may be reduced if the delay to reinforcement is accompanied by a constant or reoccurring signal (e.g., Schaal & Branch, 1990; Schaal, Schuh, & Branch, 1992). The value of a repeated signal can be considered in the context of an individual with social anxiety disorder who is more likely to attend a party, given continued reassurance from friends as opposed to one discrete instance of reassurance. A signal may have an effect simply because it serves as a conditioned reinforcer and/or a discriminative stimulus for when reinforcement will occur. A signal acquires such stimulus functions, however, only if its presence

in the past has been paired with reinforcer delivery. For example, a person with social anxiety disorder may be more likely to attend a party if frequently told that several friends will be at the party; such information serves as a constant signal that reinforcers such as enjoyable conversation, although delayed, are very likely to be obtained by attending the party. Further, the signal itself may come to be valued assuming that such information has been accurate and has reliably been followed by reinforcer delivery. Similar to the discussion of rule-governed behavior, if such information in the past has not led to reinforcer delivery (e.g., although the individual is told that friends will be at a party, the friends never show up), such information in the future will most likely not serve as a discriminative stimulus or conditioned reinforcer, the delay will not be mediated, and most importantly the individual will not attend the party.

Although this discussion is focused on delay to reinforcement/punishment, it is difficult to consider delay irrespective of certainty and uncertainty. There is some inherent level of risk involved when reinforcement and punishment are uncertain, as is the case for many social situations. Anxiety, generally, is associated with low engagement in risky behavior across a number of contexts (Maner & Schmidt, 2006); social anxiety, specifically, is associated with a low degree of risk-taking behavior in an analog risk task (Maner et al., 2007). Thus, the uncertainty that is characteristic of social interactions may be a particularly salient component of contingencies that drive avoidance behavior for those who are dispositionally avoidant and/or otherwise have high social anxiety. Considering the prior examples, there often are no guarantees that going to a party will produce the desired reinforcers, even after a long delay. For example, attempts to interact with others at a party may be ignored or deflected, or may even lead to the delivery of punishers such as hurtful sarcasm, rudeness, or ridicule. In contrast, avoidance and escape almost always produce the removal of the feared stimulus and the resulting decrease in anxiety. As a result, the uncertainty of reinforcement may play a crucial role in the occurrence of escape and avoidance, thus further increasing the likelihood of future instances of such behavior. Although delay and certainty often are discussed independently, several researchers have suggested that these two processes are highly related (e.g., Mischel & Grusec, 1967). For example, as the delay to a reinforcer increases, the likelihood that the reinforcer will actually be presented is decreased. When considered together, these variables provide powerful clues to understanding impulsive and self-controlled behavior.

Although often considered solely as basic research phenomena, delay and certainty of reinforcement and punishment clearly are applicable to the understanding and treatment of social anxiety and phobia. Via systematic exposure to social situations, the individual may begin to notice particular cues that signal future reinforcer and punisher delivery. For example, a heterosexual phobic individual interacting with a member of the opposite sex that he finds interesting may notice particular facial gestures (e.g., smiling) or posturing (e.g., leaning closer) that are associated with a positive interaction. As such, the occurrence

of these behaviors from women may signal that a positive evaluation will follow. Thus, actually targeting these social cues from others in treatment might produce beneficial results in terms of increased awareness of delay and certainty of reinforcers.

Although such an approach may provide insight into the etiology and treatment of social anxiety disorder, it nevertheless remains somewhat of a mystery what variables control the discrimination and interpretation of subtle social cues. In the following section, signal detection theory will be reviewed as a potential explanation.

Signal Detection

Several theories have been proposed suggesting that individuals diagnosed with an anxiety disorder are better at detecting panic attack-related changes in physiological responding than individuals without such anxiety difficulties (Margraf & Ehlers, 1989; Rapee, 1987). Although mixed results have been provided, Ehlers and Breuer (1992) found that individuals diagnosed with panic disorder were better able to detect their own heart rate than controls. A similar hypothesis could be proposed regarding individuals with social anxiety disorder and their sensitivity to evaluative cues from others. Specifically, individuals with social concerns often are more sensitive to potential criticism than other individuals, and it may be this greater attention to cues from others that leads to avoidance and other social anxiety disorder behaviors (Rapee & Heimberg, 1997). "Attentional bias" has been extensively studied in social anxiety disorder. Recent data suggest that individuals with generalized social anxiety disorder, relative to controls, are more vigilant to angry faces relative to neutral faces in the first 500 milliseconds of a 5000 millisecond exposure, but this difference disappears thereafter (Gamble & Rapee, 2010).

Alternatively, it has been hypothesized that these individuals often are inattentive to social cues. Given the previously mentioned data, it may be that social cues capture attention early on, but then are relatively ignored if there is no immediate social threat. Beidel and Turner (1998) suggest that when in a group of people, an individual with social anxiety disorder may focus so much on his own behavior and what he might say, that he is oblivious to what is being said by others around him. As a result, these individuals appear uninterested in what others are saying or doing and miss important social cues. Considering these two hypotheses, two questions emerge for individuals with social anxiety disorder during or after social interactions: (a) "Did an evaluative cue occur?" and if so, (b) "Was the evaluative cue negative?"

To provide a more quantitative analysis of cue recognition and interpretation, an analysis based on signal detection theory may be used. Although the specifics of a signal detection analysis are beyond the scope of this chapter, it provides a mathematical method for determining both an individual's accuracy at interpreting social cues (i.e., sensitivity) and bias she or he may have towards over- or under-assuming that a particular cue is positive or negative. Once this

information is determined, the underlying principles maintaining social anxiety disorder for an individual may become clearer.

In general, a signal detection analysis poses the question: "Did something happen or not?" Specific to social anxiety disorder, the first question would be "Did an evaluation occur?" Answers to this question can be placed into one of four categories. When an evaluation has occurred, the correct identification of its occurrence is labeled a hit, whereas a failure to identify its occurrence is labeled a miss. When an evaluation has not occurred, the correct identification that no evaluation has occurred is labeled a correct rejection, whereas the incorrect identification of its occurrence is labeled a false alarm. In cases in which an evaluation is correctly (hit) or incorrectly (false alarm) identified, a second question becomes: "Was the evaluation negative?" Answers to this question also can be placed into one of four categories. If the evaluation was negative, the correct interpretation is labeled a hit, whereas interpreting it as neutral or positive is labeled a miss. When the evaluation is not negative, the correct interpretation (i.e., interpreting a cue as neutral or positive) is labeled a correct rejection, whereas the incorrect interpretation of a neutral or positive cue as negative is labeled a false alarm.

Regarding the identification and interpretation of evaluative cues, research has been conducted within a signal detection framework, in addition to the study by Gamble and Rapee (2010) mentioned earlier. Winton, Clark, and Edelmann (1995) found that high scorers on the Fear of Negative Evaluation Scale, compared to low scorers, showed a response bias towards interpreting facial expressions as negative despite no greater ability to detect negative facial cues (i.e., no difference in sensitivity). In a similar study, however, Veljaca and Rapee (1998) found that individuals reporting high social anxiety showed both a response bias towards interpreting facial expressions as negative and a greater ability to detect negative facial cues. Additionally, low socially anxious subjects showed a greater ability to detect positive facial expressions. According to Veljaca and Rapee, these results support cognitive models of social anxiety disorder that postulate a biased allocation of attentional resources to negative evaluation. Although these results can be taken as support for such an explanation, a simpler behavioral explanation also is possible. Specifically, individuals with social anxiety disorder likely have a history of negative social experiences. As such, the consequences of negative social evaluation may be more salient. Thus, these individuals may be more vigilant to social cues. Additionally, these individuals also may be more likely to interpret cues as negative because the consequences of incorrectly interpreting a cue as negative and then avoiding or escaping the situation may be less aversive (especially in the short term) than incorrectly interpreting a negative cue as positive, and remaining in the situation and experiencing further negative evaluation. Regardless of interpretation, the mathematical precision of such an analysis might be helpful for determining whether a particular individual's phobic difficulties are due to an inability to identify the occurrence of evaluative cues, or bias towards assuming particular cues are indicative of a negative evaluation (see Winton et al., 1995).

Therapeutic Change

Along the same lines, a signal detection analysis might be useful for treatment planning. If an individual is shown to be highly sensitive to the presentation of negative social cues, anxiety reduction techniques could be used to ameliorate the individual's anxiety-related vigilance. Further, if an individual is found to be insensitive to social cues, a form of skills training can be used to help the individual improve his/her ability to identify social cues (see Gambrill, 1995). Alternatively, anxiety reduction techniques might be necessary to limit "interference" that prevents the identification of these cues. In contrast, if an individual is shown to have a bias towards interpreting most or all social cues negatively, exposure with response prevention to social situations may be sufficient to allow the individual the opportunity to continue in a situation in which cues were incorrectly interpreted as negative and then experience that negative consequences do not occur. Similarly, the person who consistently avoids social encounters due to the negative thoughts and physiological responses that are evoked during them, and thus is engaging in experiential avoidance, also may benefit from exposure approaches. A signal detection analysis also can be used to distinguish the individual with a bias towards negative evaluation and the individual with poor social skills who receives and correctly identifies frequent negative evaluations. For the latter individual, anxiety may develop, but as social skills deficits are the primary concern, social skills training should be the principal treatment intervention.

In addition to signal detection, other principles related to initiation, generalization, and maintenance of social anxiety disorder generally apply to the processes of therapeutic change. Moreover, other mechanisms may uniquely illuminate processes affecting behavior change, either naturalistically or as a result of psychotherapy.

Behavioral Cusps

Initial, important changes in behavior often are crucial in the evolution of social (and other) functioning. These *behavioral cusps* (Bijou & Baer, 1961; Rosales-Ruiz & Baer, 1997) "open the door" to allow a broad array of responses to be emitted, including ones that may be temporally distant. The new behaviors may allow the person to encounter environments and contingencies of reinforcement that earlier were unavailable. In the case of a patient with social anxiety disorder who has social skills deficits, learning to listen and to remember what a conversation partner is saying, asking an appropriate number of open-ended questions, and sharing a reasonable amount of information about oneself, all may be examples of behavioral cusps that are critical to other, more complex social behaviors, including job-related and romantic interactions, among others. As another example, a patient learning to tolerate or accept physiological activation (e.g., heart racing), cognitive arousal (e.g., expectations of negative evaluation), and physical manifestations (e.g., hand trembling) associated with

exposure to social interactions may find that such reactions are not catastrophic and do not necessarily lead to social "disaster." This learning may represent a behavioral cusp that allows the individual to approach other novel social situations that historically have been perceived as threatening and/or impossible to successfully engage.

Identifying relevant behavioral cusps may be a crucial task for the therapist in psychotherapy. The therapist may ask: "What specific initial behaviors (including cognitions as a private event) are necessary for the patient to first learn, to allow a broader range of behaviors to emerge?" Behavioral cusps provide the basis for new behaviors to compete with and potentially displace "archaic behaviors," ones that may be socially dysfunctional. Social escape, for example, may be displaced by the person remaining for a longer period of time in social situations, thus potentially encountering naturalistic positive reinforcers. Behavioral cusps can promote "generativeness" (Bosch & Fuqua, 2001) in which new, more complex social behaviors can emerge, allowing for richer (and potentially more positively reinforcing) experiences with others.

Behavioral Momentum

This conceptualization can apply to both adaptive (e.g., behavioral approach to social encounters) and pathological (e.g., avoidance of interactions) social (and other) behaviors. Considering the shaping of patient adaptive behavior by a psychotherapist, particularly early in the process, clinicians typically seek to ensure that patients encounter successes and positively-reinforcing outcomes when attempting new social behaviors. Initial in-session or homework assignments may best be ones for which there is a high probability of patient adherence. An initial series of high probability requests with which the patient is likely to adhere may lead to *behavioral momentum* (Mace et al., 1988), after which a more challenging request (for which there is a lower probability of adherence) is more likely to be successful. The successes associated with the tasks earlier in the sequence are likely to be positively reinforcing, and thus enhance response strength of adherent behaviors. Similarly, in considering problem behaviors such as "camouflage" (making oneself "invisible" in social situations; cf. Marks, 1987), there also is momentum which is associated with resistance to change (Nevin & Shahan, 2011). One of the tasks of psychotherapy for social anxiety disorder, then, may be identifying the positively reinforcing aspects of "being a wallflower" and arranging discriminative stimuli (which may be cognitive ones, such as logically restructured thoughts) that will reduce the avoidance and establish durable approach behaviors. One of the difficulties that may be encountered, however, is the *resurgence* of avoidance behavior. Even after it is extinguished, avoidance behavior can reappear in new environmental conditions (i.e., resurgence), which argues for including relapse prevention procedures in treatment for social anxiety disorder.

SUMMARY AND CONCLUSIONS

Basic behavioral principles can illuminate the mechanisms involved in how social anxiety disorder develops, continues to affect individuals in developmental periods across life, and can be changed either naturalistically or therapeutically. Moreover, these behavioral principles are heuristic for broader conceptualizations that incorporate genetic and other biological factors, and cognitive ones as well. There is a wealth of both basic and applied research establishing principles that may be applicable to the understanding and treatment of social anxieties, social fears, and social anxiety disorders. Although the current theories of social anxiety disorder are theoretically consistent and effective when applied to its treatment, many of the underlying mechanistic principles of these theories have not been developed nor highlighted adequately. The learning principles discussed here are underutilized in terms of problem conceptualization and treatment. For example, behavioral theories of social anxiety disorder always focus upon reinforcers available for phobic and nonphobic behavior, yet few place this conceptualization within a matching law framework. As a result, the principles have heretofore been used only within a loose approximation, thus limiting their potential precision.

Presently, from a behavioral perspective, exposure and skills training are standard treatment components, yet there has not been much theoretical guidance provided as to the situations in which these treatments work, and what to do in cases in which they do not work. For example, both a signal detection analysis and the matching law have been implicated in the treatment of several psychological disorders and would be useful to guide treatment when more basic approaches such as exposure and removing negative reinforcement do not reduce the behavior to the desired levels. In such a case, the matching law might guide treatment to additionally focus on increasing available reinforcement for non-phobic behavior.

Within the last decade, there has been renewed interest in returning to behavioral principles to treat psychopathology, most notably with treatment focus shifting to the functional aspects of behavior (e.g., Hopko, Lejuez, Ruggiero, & Eifert, 2003); however, basic behavioral principles have received relatively little attention within the social anxiety disorder literature, specifically. Still, principles such as equivalence and impulsivity have begun to be incorporated and tested within other disorders via general packages applicable to psychopathology in general, such as Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 1999), and Functional Analytic Psychotherapy (Kohlenberg & Tsai, 1991; Tsai et al., 2009), as well as more specific treatment packages for problems such as substance use disorders (Azrin, 1976; Higgins et al., 1995). It is our hope that future theories and treatments will begin to incorporate these principles, thereby providing a firm theoretical and empirical basis.

Behavioral formulations of psychopathology often are thought to be both oversimplified and unable to capture the richness of human experience. Related

to social anxiety disorder, exclusion of cognitive variables limits the potential usefulness of a behavioral approach. It is our opinion, however, that such a view is applicable to behavioral theories that acknowledge only basic conditioning as the process that influences the development and maintenance of social anxiety disorder. As such, we have attempted to provide a variety of more complex behavioral principles that should be useful in developing a comprehensive understanding of the disorder. Furthermore, although cognitive variables are not recognized as causal agents, their existence and importance is acknowledged. In sum, we believe that a behavioral conceptualization of social anxiety disorder can be comprehensive, and also may provide information on the etiology and treatment of the disorder that may not be possible from other theoretical perspectives.

REFERENCES

Aderka, I. M., McLean, C. P., Huppert, J. D., Davidson, J. R. T., & Foa, E. B. (2013). Fear, avoidance and physiological symptoms during cognitive-behavioral therapy for social anxiety disorder. *Behaviour Research and Therapy*, *51*, 352–358.

Ainslie, G. (1975). Specious reward: A behavioral theory of impulsiveness and impulse control. *Psychological Bulletin*, *82*, 463–496.

Anderson, C. M., Hawkins, R. P., & Scotti, J. R. (1997). Private events in behavior analysis: Conceptual basis and clinical relevance. *Behavior Therapy*, *28*, 157–179.

Askew, C., & Field, A. P. (2008). The vicarious learning pathway to fear 40 years on. *Clinical Psychology Review*, *28*, 1249–1265.

Augustson, E. M., & Dougher, M. J. (1997). The transfer of avoidance evoking functions through stimulus equivalence classes. *Journal of Behavior Therapy and Experimental Psychiatry*, *28*, 181–191.

Azrin, N. H. (1976). Improvements in the community reinforcement approach to alcoholism. *Behaviour Research and Therapy*, *14*, 339–348.

Barlow, D. G. (2002). *Anxiety and its disorders: The nature and treatment of anxiety and panic* (2nd ed.). New York: Guilford.

Barnes, D. (1994). Stimulus equivalence and relational frame theory. *Psychological Record*, *44*, 91–124.

Barrett, P. M., Rapee, R. M., Dadds, M. M., & Ryan, S. M. (1996). Family enhancement of cognitive style in anxious and aggressive children. *Journal of Abnormal Child Psychology*, *24*, 187–203.

Beck, A. T., & Emery, G. (1985). *Anxiety disorders and phobias: A cognitive perspective*. New York: Basic Books.

Beidel, D. C., Morris, T. L., & Turner, M. W. (2004). Social phobia. In T. L. Morris, & J. S. March (Eds.), *Anxiety disorders in children and adolescents* (2nd ed., pp. 141–163). New York: Guilford.

Beidel, D. C., & Turner, S. M. (1998). *Shy children, phobic adults: Nature and treatment of social anxiety disorder*. Washington, DC: American Psychological Association.

Bijou, S. W., & Baer, D. M. (1961). *Child development: A systematic and empirical. theory*. New York: Appleton-Century-Crofts.

Bjorkman, M. (1984). Decision making, risk taking, and psychological time: Review of empirical findings and psychological theory. *Scandinavian Journal of Psychology*, *25*, 31–49.

Bögels, S. M., Alden, L., Beidel, D. C., Clark, L. A., Pine, D. S., Stein, M. B., & Voncken, M. (2010). Social anxiety disorder: Questions and answers for the DSM-V. *Depression and Anxiety*, *27*, 168–189.

Catania, A. C., Matthews, B. A., & Shimoff, E. (1982). Instructed versus shaped human verbal behavior. *Journal of the Experimental Analysis of Behavior*, *38*, 233–248.

Clark, D. M., & Wells, A. (1995). A cognitive model of social anxiety disorder. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social anxiety disorder: Diagnosis and treatment* (pp. 69–93). New York: Guilford.

Conger, R., & Killeen, P. (1974). Use of concurrent operants in small group research: A demonstration. *Pacific Sociological Review*, *17*, 399–416.

Deluty, M. Z. (1978). Self-control and impulsiveness involving aversive events. *Journal of Experimental Psychology: Animal Behavior Processes*, *4*, 250–266.

Dougher, M. J., & Markham, M. (1994). Stimulus equivalence, functional equivalence and the transfer of function. In S. C. Hayes, L. H. Hayes, M. Sato, & K. Ono (Eds.), *Cognitive and verbal events: A behavior analytic view*. Reno, NV: Context Press.

Eelen, P., & Vervliet, B. (2006). Fear conditioning and clinical implications: What can we learn from the past? In M. G. Craske, D. Hermans, & D. Vansteenwegen (Eds.), *Fear and learning: From basic processes to clinical implications* (pp. 17–35). Washington, DC: American Psychological Association.

Ehlers, A., & Breuer, P. (1992). Increased cardiac awareness in panic disorder. *Journal of Abnormal Psychology*, *101*, 371–382.

Eifert, G. H., & Plaud, J. J. (1998). From behavior theory to behavior therapy: An overview. In G. H. Eifert, & J. J. Plaud (Eds.), *From behavior theory to behavior therapy* (pp. 1–14). Needham Heights, MA: Allyn & Bacon.

Eifert, G. H., Schulte, D., Zvolensky, M. J., Lejuez, C. W., & Lau, A. M. (1997). Manualized behavior therapy: Merits and challenges. *Behavior Therapy*, *28*, 499–510.

Emmelkamp, P. M. G., & Mersch, P. P. (1982). *Cognition and exposure* in vivo *in the treatment of agoraphobia: Short term and delayed effects*. *Cognitive Therapy and Research*, *6*, 77–90.

Feske, U., & Chambless, D. L. (1995). Cognitive-behavioral versus exposure treatment for social anxiety disorder: A meta-analysis. *Behavior Therapy*, *26*, 695–720.

Fields, L., Reeve, K. F., Adams, B. J., & Verhave, T. (1991). Stimulus generalization and equivalence classes: A model for natural categories. *Journal of the Experimental Analysis of Behavior*, *55*, 305–312.

Forsyth, J. P., Eifert, G. H., & Barrios, V. (2006). Fear conditioning in an emotion regulation context: A fresh perspective on the origins of anxiety disorders. In M. G. Craske, D. Hermans, & D. Vansteenwegen (Eds.), *Fear and learning: From basic processes to clinical implications* (pp. 133–153). Washington, DC: American Psychological Association.

Friman, P. C., Hayes, S. C., & Wilson, K. G. (1998). Why behavior analysts should study emotion: The example of anxiety. *Journal of Applied Behavior Analysis*, *31*, 137–156.

Galizio, M. (1979). Contingency-shaped and rule-governed behavior: Instructional control of human loss avoidance. *Journal of the Experimental Analysis of Behavior*, *31*, 53–70.

Gamble, A. L., & Rapee, R. M. (2010). The time-course of attention to emotional faces in social phobia. *Journal of Behavior Therapy and Experimental Psychiatry*, *41*, 39–44.

Gambrill, E. (1995). Helping shy, socially anxious, and lonely adults: A skill-based contextual approach. In W. O'Donohue, & L. Krasner (Eds.), *Handbook of psychological skills training: Clinical techniques and application* (pp. 247–268). Needham Heights, MA: Allyn & Bacon.

Greco, L. A., & Morris, T. L. (2002). Parental child-rearing style and child social anxiety: Investigation of child perceptions and actual father behavior. *Journal of Psychopathology and Behavioral Assessment*, *24*, 259–267.

Grusec, J. E. (1968). Waiting for rewards and punishments: Effects of reinforcement value on choice. *Journal of Personality and Social Psychology*, *9*, 85–89.

Guerin, B. (1994). *Analyzing social behavior: Behavior analysis and the social sciences*. Reno, NV: Context Press.

Hayes, S. C., Kohlenberg, B. S., & Hayes, L. J. (1991). The transfer of specific function and general consequential functions through simple and conditional equivalence relations. *Journal of the Experimental Analysis of Behavior*, *56*, 119–137.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York: Guilford.

Hayes, S. C., Strosahl, K., Wilson, K. G., Bissett, R. T., Pistorello, J., Toarmino, D., & McCurry, S. M. (2004). Measuring experiential avoidance: A preliminary test of a working model. *Psychological Record*, *54*, 553–578.

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, *64*, 1152–1168.

Hayes, S. C., Zettle, R. D., & Rosenfarb, I. (1989). Rule-following. In S. C. Hayes (Ed.), *Rule-governed behavior* (pp. 191–220). New York: Plenum.

Herrnstein, R. J. (1961). Relative and absolute strength of a response as a function of frequency of reinforcement. *Journal of the Experimental Analysis of Behavior*, *4*, 267–272.

Herrnstein, R. J. (1970). On the law of effect. *Journal of the Experimental Analysis of Behavior*, *13*, 243–266.

Higgins, S. T., Budney, A. J., Bickel, W. K., Badger, G. J., Foerg, F. E., & Ogden, D. (1995). Outpatient behavioral treatment for cocaine dependence: One year outcome. *Experimental and Clinical Psychopharmacology*, *3*, 205–212.

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy*, *36*, 193–207.

Hofmann, S. G., & Barlow, D. G. (2002). Social phobia (social anxiety disorder). In D. G. Barlow (Ed.), *Anxiety and its disorders: The nature and treatment of anxiety and panic* (2nd ed., pp. 454–476). New York: Guilford.

Hofmann, S. G., Ehlers, A., & Roth, W. T. (1995). Conditioning theory: A model for the etiology of public speaking anxiety? *Behaviour Research and Therapy*, *33*, 567–571.

Hofmann, S. G., Heinrichs, N., & Moscovitch, D. A. (2004). The nature and expression of social phobia: Toward a new classification. *Clinical Psychology Review*, *24*, 769–797.

Holt, C. S., Heimberg, R. G., Hope, D. A., & Liebowitz, M. R. (1992). Situational domains of social phobia. *Journal of Anxiety Disorders*, *6*, 63–77.

Honig, W. K., & Urcuioli, P. J. (1981). The legacy of Guttman and Kalish (1956): 25 years of research on stimulus generalization. *Journal of the Experimental Analysis of Behavior*, *36*, 405–445.

Hope, D. A., Heimberg, R. G., & Bruch, M. A. (1995). Dismantling cognitive-behavioral group therapy for social anxiety disorder. *Behaviour Research and Therapy*, *33*, 637–650.

Hope, D. A., Heimberg, R. G., & Turk, C. L. (2006). *Managing social anxiety: A cognitive-behavioral therapy approach*. New York: Oxford University Press, Inc.

Hopko, D. R., Lejuez, C. W., Ruggiero, K. J., & Eifert, G. H. (2003). Contemporary behavioral activation treatments for depression: Procedures, principles, and progress. *Clinical Psychology Review*, *23*, 699–717.

Hopko, D., McNeil, D. W., Zvolensky, M. J., & Eifert, G. E. (2001). The relation between anxiety and skill in performance-based anxiety disorders: A behavioral formulation of social phobia. *Behavior Therapy*, *32*, 185–207.

Kohlenberg, R. J., & Tsai, M. (1991). *Functional analytic psychotherapy: Creating intense and curative therapeutic relationships*. New York: Plenum.

Lawson, J., Banerjee, R., & Field, A. P. (2007). The effects of verbal information on children's fear beliefs about social situations. *Behaviour Research and Therapy*, *45*, 21–37.

Lejuez, C. W., Schaal, D. W., & O'Donnell, J. (1998). Behavioral pharmacology and the treatment of substance abuse. In J. J. Plaud, & G. H. Eifert (Eds.), *From behavior theory to behavior therapy* (pp. 116–131). Needham Heights, MA: Allyn & Bacon.

Lewinsohn, P. M. (1974). A behavioral approach to depression. In R. J. Friedman, & M. M. Katz (Eds.), *The psychology of depression: Contemporary theory and research* (pp. 157–178). Oxford, England: Wiley.

Liebowitz, M. R., Gorman, J. M., Fyer, A. J., & Klein, D. F. (1985). Social anxiety disorder: Review of a neglected anxiety disorder. *Archives of General Psychiatry*, *42*, 729–736.

Mace, F. C., Hock, M. L., Lalli, J. S., West, B. J., Belfiore, P., Pinter, E., & Brown, D. K. (1988). Behavioral momentum in the treatment of noncompliance. *Journal of Applied Behavior Analysis*, *21*, 123–141.

MacCorquodale, K., & Meehl, P. E. (1948). Hypothetical constructs and intervening variables. *Psychological Review*, *55*, 596–611.

Maner, J. K., Richey, J. A., Cromer, K., Mallott, M., Lejuez, C. W., Joiner, T. E., & Schmidt, N. B. (2007). Dispositional anxiety and risk-avoidant decision-making. *Personality and Individual Differences*, *42*, 665–675.

Maner, J. K., & Schmidt, N. B. (2006). The role of risk avoidance in anxiety. *Behavior Therapy*, *37*, 181–189.

Margraf, J., & Ehlers, A. (1989). Etiological models of panic: Psychophysiological and cognitive aspects. In R. Baker (Ed.), *Panic disorder: Theory, research and therapy* (pp. 205–231). Oxford, England: Wiley.

Marks, I. M. (1969). *Fears and phobias*. New York: Academic Press.

Marks, I. M. (1970). The classification of phobic disorders. *British Journal of Psychiatry*, *116*, 377–386.

Marks, I. M. (1985). Behavioral treatment of social anxiety disorder. *Psychopharmacology Bulletin*, *21*, 615–618.

Marks, I. M. (1987). *Fears, phobias, and rituals: Panic, anxiety, and their disorders*. New York: Oxford.

Marks, I. M., & Gelder, M. G. (1966). Different ages of onset in varieties of phobia. *American Journal of Psychiatry*, *123*, 218–221.

Masia, C., McNeil, D. W., Cohn, L. G., & Hope, D. A. (1999). Exposure to social anxiety words: Treatment for social phobia based on the Stroop paradigm. *Cognitive and Behavioral Practice*, *6*, 248–258.

Masia, C. L., & Morris, T. L. (1998). Parental factors associated with social anxiety: Methodological limitations and suggestions for integrated behavioral research. *Clinical Psychology: Science and Practice*, *5*, 211–228.

McDowell, J. J. (1982). The importance of Herrnstein's mathematical statement of the law of effect for behavior therapy. *American Psychologist*, *37*, 771–779.

McNeil, D. W., Kyle, B. N., & Nurius, P. S. (2012). *Exposure therapy and strategies: Imaginal,* in vitro, in vivo, *and intensive*. In S. Cormier, P. S. Nurius, & C. J. Osborn (Eds.), *Interviewing and change strategies for helpers* (7th ed., pp. 475–512). Belmont, CA: Brooks/Cole.

Miller, N. E. (1977). The effects of learning on visceral functions. *New England Journal of Medicine*, *296*, 1274–1278.

Mineka, S., & Öhman, A. (2002). Born to fear: Non-associative versus associative factors in the etiology of phobias. *Behaviour Research and Therapy*, *40*, 173–184.

Mineka, S., & Sutton, J. (2006). Contemporary learning theory perspectives on the etiology of fears and phobias. In M. G. Craske, D. Hermans, & D. Vansteenwegen (Eds.), *Fear and learning: From basic processes to clinical implications* (pp. 75–97). Washington, DC: American Psychological Association.

Mineka, S., & Zinbarg, R. (1995). Conditioning and ethological models of social anxiety disorder. In R. G. Heimberg, M. R. Liebowitz, D. A. Hope, & F. R. Schneier (Eds.), *Social anxiety disorder: Diagnosis, assessment, and treatment* (pp. 134–162). New York: Guilford.

Mineka, S., & Zinbarg, R. (1996). Conditioning and ethological models of anxiety disorders: Stress-in-dynamic-context anxiety models. In D. A. Hope (Ed.), *Nebraska symposium on motivation* (pp. 135–210). Lincoln, NB: University of Nebraska Press.

Mischel, W., & Grusec, J. (1967). Waiting for rewards and punishments: Effects of time and probability on choice. *Journal of Personality and Social Psychology*, *5*, 24–31.

Moscovitch, D. A. (2009). What is the core fear in social phobia? A new model to facilitate individualized case conceptualization and treatment. *Cognitive and Behavioral Practice*, *16*, 123–134.

Mowrer, O. H. (1947). On the dual nature of learning - a re-interpretation of "conditioning" and "problem-solving". *Harvard Educational Review*, *17*, 102–148.

Muris, P., & Field, A. P. (2010). The role of verbal threat information in the development of childhood fear: "Beware of the Jabberwock!". *Clinical Child and Family Psychology Review*, *13*, 129–150.

Nevin, J. A., & Shahan, T. A. (2011). Behavioral momentum theory: Equations and applications. *Journal of Applied Behavior Analysis*, *44*, 877–895.

Newman, M. G., Hofmann, S. G., Trabert, W., Roth, W. T., & Taylor, C. B. (1994). Does behavioral treatment of social anxiety disorder lead to cognitive changes? *Behavior Therapy*, *25*, 503–517.

Ohman, A., Dimberg, U., & Ost, L. -G. (1985). Animal and social anxiety disorders: Biological constraints on learned fear responses. In S. Reiss, & R. R. Bootzin (Eds.), *Theoretical issues in behavior therapy* (pp. 123–178). Orlando, FL: Academic Press.

Öhman, A., & Mineka, S. (2001). Fears, phobias, and preparedness: Toward an evolved model of fear. *Current Directions in Psychological Science*, *12*, 5–9.

Öst, L. -G., & Hugdahl, K. (1981). Acquisition of phobias and anxiety response patterns in clinical patients. *Behaviour Resarch and Therapy*, *16*, 439–447.

Pavlov, I. (1927). *Conditioned reflexes*. London: Oxford University Press.

Rachlin, H., & Baum, W. M. (1972). Effects of alternative reinforcement: Does the source matter? *Journal of the Experimental Analysis of Behavior*, *18*, 231–241.

Rachlin, H., & Green, L. (1972). Commitment, choice, and self-control. *Journal of the Experimental Analysis of Behavior*, *17*, 15–22.

Rachman, S. J. (1976). The passing of the two-stage theory of fear and avoidance: Fresh possibilities. *Behaviour Research and Therapy*, *14*, 125–131.

Rachman, S. J. (1977). The conditioning theory of fear acquistion: A critical examination. *Behaviour Research and Therapy*, *15*, 375–387.

Rapee, R. M. (1987). The psychological treatment of panic attacks: Theoretical conceptualizations and review of evidence. *Clinical Psychology Review*, *7*, 427–438.

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social anxiety disorder. *Behaviour Research and Therapy*, *35*, 741–756.

Renner, K. E. (1964). Delay of reinforcement: A historical overview. *Psychological Bulletin*, *61*, 341–361.

Rodebaugh, T. L., Shumaker, E. A., Levinson, C. A., Fernandez, K. C., Langer, J. K., Lim, M. H., & Yarknoi, T. (2013). Interpersonal constraint conferred by generalized social anxiety disorder is evident on a behavioral economics task, *Journal of. Abnormal Psychology*, *122*, 39–44.

Rosales-Ruiz, J., & Baer, D. M. (1997). Behavioral cusps: A developmental and pragmatic concept for behavior analysis. *Journal of Applied Behavior Analysis*, *30*, 533–544.

Rounds, J. S., Beck, J. G., & Grant, D. M. (2007). Is the delay discounting paradigm useful in understanding social anxiety? *Behaviour Research and Therapy*, *45*, 729–735.

Schaal, D. W., & Branch, M. N. (1990). Responding of pigeons under variable-interval schedules of signaled–delayed reinforcement: Effects of delay–signal duration. *Journal of the Experimental Analysis of Behavior*, *53*, 103–121.

Schaal, D. W., Schuh, K. J., & Branch, M. N. (1992). Key pecking of pigeons under variable–interval schedules of briefly signaled delayed reinforcement: Effects of variable–interval value. *Journal of the Experimental Analysis of Behavior*, *58*, 277–286.

Schneier, F., & Welkowitz, L. (1996). *The hidden face of shyness: Understanding and overcoming social anxiety*. New York: Avon.

Scholing, A., & Emmelkamp, P. M. G. (1996). Treatment of generalized social anxiety disorder: Results at long-term follow-up. *Behaviour Research and Therapy*, *34*, 447–452.

Schwartz, C., Snidman, N., & Kagan, J. (1999). Adolescent social anxiety as an outcome of inhibited temperament in childhood. *Journal of the American Academy of Child and Adolescent Psychiatry*, *38*, 1008–1015.

Sidman, M., Wynne, C. K., Maguire, R. W., & Barnes, T. (1989). Functional classes and equivalence relations. *Journal of the Experimental Analysis of Behavior*, *52*, 261–274.

Skinner, B. F. (1953). *Science and human behavior*. New York: The Free Press.

Stein, M. B., Gelernter, J., & Smoller, J. W. (2004). Genetic aspects of social anxiety and related traits. In B. Bandelow, & D. J. Stein (Eds.), *Social anxiety disorder: More than shyness* (pp. 197–214). New York: Marcel Dekker.

Stein, M. B., Jang, K. L., & Livesley, W. J. (2002). Heritability of social-anxiety related concerns and personality characteristics: A twin study. *Journal of Nervous and Mental Disorders*, *190*, 219–224.

Stemberger, R. T., Turner, S. M., Beidel, D. C., & Calhoun, K. S. (1995). Social anxiety disorder: An analysis of possible developmental factors. *Journal of Abnormal Psychology*, *104*, 526–531.

Strahan, E., & Conger, A. J. (1998). Social anxiety and its effect on performance and perception. *Journal of Anxiety Disorders*, *12*, 293–305.

Tancer, M., Lewis, M. H., & Stein, M. B. (1995). Biological aspects. In M. B. Stein (Ed.), *Social anxiety disorder: Clinical and research perspectives* (pp. 229–257). Washington, DC: American Psychiatric Press.

Tarpy, R. M., & Sawabini, F. L. (1974). Reinforcement delay: A selective review of the last decade. *Psychological Review*, *81*, 984–997.

Trower, P., & Gilbert, P. (1989). New theoretical conceptions of social anxiety and social anxiety disorder. *Clinical Psychology Review*, *9*, 19–35.

Trower, P., Gilbert, P., & Sherling, G. (1990). Social anxiety, evolution, and self-presentation. In H. Leitenberg (Ed.), *Handbook of social and evaluation anxiety* (pp. 11–45). New York: Plenum.

Trower, P., & Turland, D. (1984). Social anxiety disorder. In S. M. Turner (Ed.), *Behavioral theories and treatment of anxiety* (pp. 321–365). New York: Plenum.

Tsai, M., Kohlenberg, R. J., Kanter, J. W., Kohlenberg, B., Follette, W. C., & Callaghan, G. M. (Eds.). (2009). *A guide to functional analytic psychotherapy: Awareness, courage, love, and behaviorism*. New York: Springer.

Vaughan, W., Jr. (1988). Formation of equivalence sets in pigeons. *Journal of Experimental Psychology: Animal Behavior Processes*, *14*, 36–42.

Veljaca, K. A., & Rapee, R. M. (1998). Detection of negative and positive audience behaviors by socially anxious subjects. *Behaviour Research and Therapy*, *36*, 311–321.

Vollmer, T. R., & Hackenberg, T. D. (2001). Reinforcement contingencies and social reinforcement: Some reciprocal relations between basic and applied research. *Journal of Applied Behavior Analysis*, *34*, 241–253.

Watson, J. B., & Rayner, R. (1920). Conditioned emotional reactions. *Journal of Experimental Psychology*, *3*, 1–14.

Weeks, J. W., Rodebaugh, T. L., Heimberg, R. G., Norton, P. J., & Jakatdar, T. A. (2009). To avoid evaluation, withdraw: Fears of evaluation and depressive cognitions lead to social anxiety and submissive withdrawal. *Cognitive Therapy and Research*, *33*, 375–389.

Winton, E. C., Clark, D. M., & Edelman, R. J. (1995). Social anxiety, fear of negative evaluation, and the detection of negative emotions in others. *Behaviour Research and Therapy*, *33*, 193–196.

Wolpe, J. (1958). *Psychotherapy by reciprocal inhibition*. Stanford, CA: Stanford University Press.