Voices in the Static:

The False Perception of Patterns in the Noise of Everyday Life

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Dissertation Proposal

OVERVIEW

To navigate our environment we are often required to quickly and accurately derive simplified patterns from the complexity of life. This proposal seeks to understand when the process of pattern perception goes awry and individuals falsely or inaccurately perceive patterns. I have structured the proposal into three sections. The **first section reviews the literature** on various types of pattern perception, including superstitions, conspiracies, and magical thinking. I suggest that even though many areas of pattern perception are talked about as if they were separate phenomena, there is actually an underlying fundamental relationship among them all. **The second section presents four preliminary studies** that investigate potential causal forces behind false pattern perception, specifically looking at uncertainty and lack of control over one's environment. Together the studies demonstrate that lack of control, both primed through a recall task (Study 1) and experimentally manipulated through a response task (Studies 3 and 4), results in greater false pattern perception in terms of seeing conspiracies and finding order in random static. Similarly, uncertainty (Study 2) also resulted in greater false pattern perception as participants were more likely to perceive superstitious patterns. Finally, **the third section presents three proposed studies**. Study 5 illustrates the effect of false pattern perception in a micromanaged and uncertain workplace. Study 6 shows the effects that false pattern perception can have on one's performance in the stock market. Finally, Study 7 seeks to find an intervention that will reduce the perception of false patterns.

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> *Events... achieve, in their happening, a symmetry and order that would be frightening if assigned to Chance. Things that happen here intersect with things that happen elsewhere, as if there were a plan. Coincidence makes way for correlation which, in its turn, bespeaks the intimate consortium of cause and effect – first in whispers, then in the full blushless voice of certainty: because it says, because. Eventually everything is suspect: I wash the car, it rains; she wears that perfume, he is dizzy with desire; as long as you whistle that tune no tigers appear. Ironies? Happenstance? Or is it that tune that keeps the tigers at bay?*
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> - Thomas Lynch

Many years ago an interesting observation was made about tribes who depend on fishing to survive: Those who fish out in the deep sea, where storms are likely to come up and it is easier to get lost, have far more rituals associated with fishing than those who fish in shallow waters or harbors (Malinowski & Redfield, 1948). Fishing in the deep sea is rife with uncertainty, and fishermen there have far less control over their environment than those who choose shallow waters, suggesting that there may be an association and deep connection between a lack of control on the one hand and the perception of patterns in one's environment on the other.

A CEO looks over the latest market data, trying to understand the environment in which her organization must survive. A newly hired manager hears two of his subordinates talking in the hallway, but they stop as he approaches – are they plotting against him? An analyst tries desperately to discover why a set of particularly dependable benchmarks has suddenly plunged

in value. To safely navigate life, we are often called upon to quickly and accurately comprehend our environments – to derive from the chaos of everyday experience a few basic precepts. We seek to make sense of the data, whether that data are a set of numbers or a social situation, choosing the data and connections between them that best explain the whole. We use this sensemaking to help us predict what may happen in the future, or how one change we make may affect others.

In short, we search for patterns.

Baumeister (1991) described this development of meaning as "a matter of associations – of connecting things up into broad patterns." Studies of pattern perception have taken many forms. Some research, such as causal attribution (how we connect causes to effects), looks at how we correctly derive patterns from our environment. However, much of the pattern perception literature focuses on sensemaking gone wrong – e.g., sympathetic magic (connecting things that have no connection), conspiracy theories (the illusion that people and events have a sinister connection), illusory correlation (seeing two things as more correlated than they really are). Each type of pattern perception has been the topic of extensive research, its mechanisms, effects, and causes thoroughly fleshed out. However, each area has developed largely independently of the others. As a result, even though the data in these areas of research bear some striking similarities, a root phenomena underlying all forms of pattern perception has yet to be found. The current research seeks to examine pattern perception itself, exploring when people are more likely to perceive patterns.

The Search for Patterns

In this dissertation, I seek to examine whether there is an underlying cause to pattern perception, and whether certain situations and motivations increase the search for, and false perception of, patterns.

I turn first to what leads to the perception of patterns in general. All of human history can be encapsulated as an attempt to make sense of our world – to experience our environment and extract knowledge from it. Sensemaking is the process people use to transform the unknown into the known (Huber and Daft 1987; Waterman 1990), often conceptualized as involving "placing stimuli into some kind of framework" (Dunbar 1981; Starbuck and Milliken 1988; Goleman 1985). For Weick (1995), "literally, it means the making of sense."

Once we have made sense of an event, it can acquire meaning for us, and suggest which actions may be appropriate to further our goals. Pattern perception is a type of sensemaking. With sensemaking we can explain an event, make attributions about its cause, extrapolate how various actions may affect it, and predict how it may develop (Starbuck and Milliken 1988). While much of the sensemaking literature attends to organizational sensemaking, there are those that consider it an individual activity (e.g., Gioia and Chittipeddi 1991), as "a process in which individuals develop cognitive maps of their environment" (Ring and Rands 1989).

One of the major drivers of sensemaking behavior that emerges from the literature is uncertainty. Uncertainty demands a response, because, left unaddressed, one cannot estimate the consequences of possible actions (March and Heath 1994). The key is to figure out the effects one's actions might have on the future (Burns and Stalker 1961; Milliken 1990). In fact, Louis (1980) views sensemaking as a compensatory mechanism to review surprises one has experienced and to find a way to explain them. Sensemaking is a compensatory mechanism.

This view of sensemaking as a device to deal with uncertainty has often been viewed through an evolutionary lens. The logic suggests that, without sensemaking, humans never would have survived long enough to develop civilization. For instance, this evolutionary perspective would argue that sensemaking allowed our ancestors from millions of years ago on the African savanna to understand what happened when a group member suddenly disappeared into the tall grass. Sensemaking helped our ancestors to estimate if it was a lion, and that the proper response was *to run*.

As a result, the need to make sense of our environment is central to our survival. However, like all instincts rooted far back in our fight for survival, sensemaking may not operate in the most rational and controlled of manners. And when sensemaking goes awry, the results can be catastrophic, such as when thirteen people died in the space of ten minutes attempting to fight the Mann Gulch fire in Montana in 1949 (Weick 1993). One of the outcomes when sensemaking falters is the perception of false patterns. However these false patterns – the illusory correlations, the superstitions, the magical thoughts – are not inexplicable failures of the system. Rather, they derive from the same need to understand the world that has led to the invention of electricity, the airplane, and antibiotics. It is the visceral need, especially under conditions of uncertainty, to make sense of the world that leads to the perception of patterns – at any cost.

Pattern Perception Across Literatures

Thus, it is particularly important to understand *when* people are likely to perceive patterns that do not exist – when sensemaking, so integral and useful a process, is likely to go awry and lead to the creation of false patterns. The research on pattern perception has explored a number of different causal factors and I review them below to see if they point to the existence of a root,

underlying causal force to pattern perception, particularly *false* pattern perception. One variable in particular emerges suggestively across a range of studies that touch on pattern perception: uncertainty appears to be an important and encompassing force behind the search for patterns.

Causal attribution. Observers make causal attributions when they determine the cause of an event they have just observed, or make "interpretations and inferences about what causes what" (Kelley 1973). Causal attributions are connections between two events – cause and effect – that simplify a complex set of environmental data. In making causal attributions, people make sense of an event such that they see a cause that acted in a particular way to create an effect, perceiving a pattern to the event. Weiner (1985) found that negative events such as losses or failures (as in sports games or goal achievement) would sometimes lead to more spontaneous causal attribution. However, an even greater predictor of spontaneous causal attribution was *unexpected* events. When a team wins a game unexpectedly, or when one fails where one expected to succeed, more causal attributions are made. Unexpected events are likely to illustrate to those who experience them that they are not in control of their environment. If they were in control of their environment, they would be able to plan for or prevent the event so that it would no longer be unexpected. Unexpected events thus motivate a search for explanation and understanding that will provide a sense of control and make the future less uncertain (Clary (Clary and Tesser 1983; Hastie 1984; Pyszczynski and Greenberg 1981).

Similarly, Kanazawa (1992) illustrated that, by controlling for negative versus unexpected events, only the unexpected has an independent effect on spontaneous causal thinking. Because people usually expect to succeed (Irwin 1953; Marks 1951), instances in which failure was found to lead to an increase in causal attribution were really driven by the *unexpectedness* of the failure. Hence, it seems that one of the major drivers of causal attribution

is uncertainty. But not all sensemaking results in seeing patterns that accurately describe the world. Let us now turn to false perceptions of patterns.

Superstition and Magical Thinking. Nancy Reagan consulted an astrologer in San Francisco for nearly every aspect of her husband Ronald Reagan's presidency. Negative readings could lead to results as extreme as cancellations of the President's speeches or press conferences; on occasion, he would not travel at all for days at a time (Regan 1988). People believe in the effects of the lunar cycle on childbirths and crime (e.g., Trapp 1937), in psychokinesis and ESP (e.g., Benassi, Sweeney, and Drevno 1979; Mcgarry and Newberry 1981) in astrology (e.g., Glick, Gottesman, and Jolton 1989), and in the ill luck associated with walking beneath a ladder (Pole et al. 1974).

It is likely that we are all familiar with examples of superstition – knocking on wood, carrying a lucky charm, refusing to open an umbrella indoors – and more than likely engage in them ourselves at one time or another. Superstitions are the perception of false connections between some action and an outcome. When a child sees (or fears) a pattern between whether or not he has stepped on a sidewalk crack and the health of his mother's back, he is being superstitious.

As phenomena, superstition and magical thinking are virtually indistinguishable, but they have been studied very differently. Those who term the phenomenon 'superstition' derive their research methodology from the operant learning tradition. Those who refer to it as magical thinking tend to concentrate on the rules that dictate the forms superstitions take.

Because much of the research examining superstitious belief has grown out of the operant learning tradition, a superstitious belief is operationally defined as the perception of a false correlation between one's behavior and one's outcomes where no such correlation exists. The

origin of this branch of the literature lies in Skinner's famous experiment on superstitious responding in pigeons. Skinner created superstitious behavior in the birds through one simple technique. The pigeons received food at a fixed interval schedule - every 15 seconds – irrelevant of their actions. Often, the pigeons would happen to be performing a particular action when the 15 seconds was up. Thereafter the bird associated that action with receiving food, and would repeat the action even though, in reality, its behavior had no effect whatsoever on whether it received food (Skinner 1948). While some controversy exists about what exactly Skinner found (Killeen 1977; Timberlake and Lucas 1985; Staddon and Simmelhag 1971), several studies have demonstrated superstitious conditioning with human participants under similar conditions (Ono 1987; Wagner and Morris 1987), and superstitious rules are observed in many human participants exposed to fixed interval schedules (Schwartz 1982; Catania and Cutts 1963; Vyse 1991). Although people will also form superstitious rules under conditions of variable interval reinforcement (similar to reinforcement delivered at fixed intervals, except the intervals are, of course, variable) (Catania and Cutts 1963; Heltzer and Vyse 1994; Vyse 1991), the key is that, whether appearing at fixed or variable intervals, at some point the reinforcement co-occurs with an action one has taken. The point at which a superstition is born is the point at which one's action is perceived as having caused the reinforcement, rather than as coinciding with it by chance.

A few variations in this area of research are noteworthy. *Concurrent superstitions* are the superstitious pairing of an effective with an ineffective act. For example, before every major meeting with his board of directors, a CEO reviews his speech while wearing his lucky tie. Reviewing his speech *does* have a salutary effect on how the speech will be received (as he will be more familiar with it). The lucky tie, however, has no effect. By pairing these two actions, the

CEO is displaying a concurrent superstition (Catania and Cutts 1963). Equally important is the *type* of reinforcement delivered. All of the previously discussed studies depend on positive reinforcement – participants or subjects are always rewarded. Recently, the effects of negative reinforcement – when participants lose rewards – and of punishment have begun to be explored. The results thus far are inconclusive. Studies show both that negative reinforcement causes greater levels of superstitious belief than positive reinforcement (Aeschleman, Rosen, and Williams 2003) and the reverse, that positive reinforcement causes greater levels than negative (Bersabe and Arias 2000).

In all of these studies, participants have no control over the reinforcement schedule, and thus their outcomes. They are uncertain as to how to affect the situation, and this uncertainty causes them to perceive patterns of action and result that do not exist. They then attempt to regain control by engaging in behaviors they feel affect the reinforcement schedule. In situations of low control (and thus high uncertainty), it seems likely that people will make more use of superstitions in an attempt to restore certainty and control. Thus, there is a clear association with control and uncertainty, although a direct causal link has not been demonstrated.

Another area of the literature deals with *magical thinking*, i.e., less on the formation of superstitious beliefs, and more on the rules those beliefs tend to follow. It is magical thinking that led to the slaughter of 600 black bears in the Great Smoky Mountains over a three-year period. Their gall bladders fetch a high price in Korea, where they are believed to cure indigestion, as bears' omivorousness allows them to eat many things without ill effect (Elkins 1989; cf. Gilovich 1991). Magical thinking is also apparent in the actions leading to the death of 7 year-old Rhea Sullins. When Rhea became sick, her father, a strong believer in 'natural' cures such as water and fruit instead of drugs, put her on a 18-day water-only fast, followed by a 17-

day fruit-juice only fast. The regimen came to a halt when Rhea died of malnutrition (Deutsch 1977; cf. Gilovich 1991). Magical thinking is a way of making sense of the world that doesn't always agree with contemporary science. This type of thinking is usually defined by two basic laws – the law of similarity and the law of contagion – both intuitive and universal aspects of human thinking.

The law of similarity can be defined as "like produces like" (Frazer 1959), "the image equals the object" (Mauss 1972), or, "appearance equals reality" (Nemeroff and Rozin 2000). When betrayed teenagers burn a photograph of their ex-boy- or girlfriend, or someone makes a voodoo doll, they are using the law of similarity, believing that hurting someone's representation is the same as hurting that person. Participants react to replicas of disgusting objects (such as fake plastic vomit) just as they would to the objects themselves (Rozin, Millman, and Nemeroff 1986). Another example of magical aversion is that, despite knowing that both glasses contained sugar water, participants preferred a glass labeled “sucrose” over one labeled “sodium cyanide, poison” (Rozin, Millman, and Nemeroff 1986; Rozin, Markwith, and Ross 1990). Like many instances of false pattern perception, the law of similarity draws a connection between two objects, which is unwarranted.

The law of contagion assumes that physical contact between two objects can result in the transfer of some effect or quality from one object to the other. For example, members of one gender getting 'cooties' from touching members of another gender in kindergarten (Nemeroff and Rozin 2000). The qualities transferred between objects can be physical, mental, or moral; they can be both negative or positive in valence. People treat brief contact between disgusting things and food as transforming the food into something disgusting itself (Rozin, Millman, and Nemeroff 1986). Similarly, the moral stain of bad food can be transferred to the one who

consumes it (Stein and Nemeroff 1995). Accordingly, individuals avoid the clothes of the damned as they believe that clothing worn by an evil person can infect the wearer, just as clothing worn by a good person can make the wearer better (Rozin, Markwith, and McCauley 1994; McCauley, Rozin, and Markwith 1997). Similarly, people see physical affliction, a tangibly negative state, as having intangibly (such as moral or mental) negative implications for those who suffer from it (Rozin, Markwith, and Ross 1990; Rozin, Markwith, and McCauley 1994).

One of the things strongly associated with incidences of magical thinking and superstition is control – or, more accurately, the lack of it. When people are in situations or domains that feel uncertain or uncontrollable, magical thinking and superstitions can provide a sense of control they would otherwise lack (Ciborowski 1997; Shweder 1977; Malinowski and Redfield 1948; Padgett and Jorgenson 1982; Auchincloss and Weiss 1994; Matute 1995; Keinan 1994). That is, magical thinking and superstitions have been theorized as a coping mechanism, protection from the anxieties caused from inconstancy or uncertainty. One study of taxi drivers showed that superstition was positively correlated with the number of self-reported accidents the drivers had been involved in and the number of accidents they had witnessed (Peltzer, Renner, and Renner 2003). Players in different sports engage in personal rituals and superstitious behavior in direct proportion to the extent to which luck rather than skill is responsible for their outcomes (Gmelch 1971). The more that baseball players believed the game's outcome was influenced by luck, the more superstitions they engaged in (Burger and Lynn 2005). Participants in a high stress condition were more likely to 'knock on wood' for luck versus those in a low stress condition (Keinan 2002). Even on a national level, when times are economically uncertainty, superstition increases (Padgett and Jorgenson 1982; Sales 1973). So while superstitions and magical thinking

can take many forms, one of its major causes appears to be uncertainty, or lack of control over one's situation.

Illusory Correlation and Stereotypes. Illusory correlations are very similar to magical thinking but typically involve perceptions between categories (a trait and a group) rather than between one's own behavior and one's own outcomes. Illusory correlation was first identified by Chapman (1967), who defined it as, "the report by observers of a correlation between two classes of events which in reality a) are not correlated, or b) are correlated to a lesser extent than reported." Chapman asked participants to read a series of descriptions of people in various professions. Each person is described using traits that either are or are not stereotypically associated with the profession they belong to. Participants later estimated how frequently each of the traits had described members of each profession and they consistently overestimated the correlations between traits and professions that were stereotypically associated (Hamilton and Rose 1980; Hamilton, Dugan, and Trolier 1985). This illusory correlation effect also extends to other areas, from correlations between symptoms and conditions(Chapman and Chapman 1969; Chapman 1967; Chapman and Chapman 1967) to groups and attitudes (Hamilton and Gifford 1976).

Anxiety has been shown to increase illusory correlation (Baron et al. 1992). Additionally, participants, when confronted with thoughts of their own death, were far more likely to suffer from illusory correlation (Lieberman 1999). Death is, perhaps, the ultimate anxiety. Similarly, physiological arousal also increases illusory correlations (Kim and Baron 1988). Since uncertainty and lack of control often arouse anxiety (Dugas et al. 1998; Furnham 1994; Krohne 1989; Dugas, Gosselin, and Ladouceur 2001), these findings again suggest that uncertainty or lacking control drives illusory correlations.

The research on illusory correlations has focused on perceptions of correlations between people, traits, opinions, and groups. Yet a similar phenomenon exists in the field of visual perceptions, which has addressed the association of visual elements that do or do not belong together, and what happens when one sees unrelated visual elements as forming a pattern.

The visual perception of patterns is one of the simplest and most basic forms of pattern perception. Many of us have played games in which we attempted to discern images in dots on ceiling tiles, or in clouds. Gestalt psychologists discovered a number of rules which govern the way we perceive stimuli as grouped or unified. The studies of the perception of movement and of the perception of space (Kolers 1972; Wertheimer 1923) led to the principle of *proximity*. People have a tendency to fill in the gaps between incomplete lines: when a triangle has had several cuts taken from its sides, it is still perceived as a triangle (though broken). Overall, when visual stimuli are too close together they are perceived as a single object and when they are too far apart they are perceived as not connected at all. But if they are distinct while still being close to each other, they are perceptually grouped into a larger unit - a pattern is formed. When presented with an image of unstructured white noise and asked whether they perceived the letter S, or a smiley face, many observers firmly believed they did (Gosselin and Schyns 2003). The perception of groupings and patterns can also be true for non-visual stimuli. If six notes are played on a flute, with a pause between the third and fourth notes, they will be heard as two triads of notes.

Uncertainty and lack of control also appear to play a role in visual perceptions. For instance, participants engaging in a parachute jump (a situation over which people have very little control once free of the plane) were more likely to identify a nonexisting figure in a display of pure noise when they were about to jump than when the flight had just begun (Simonov et al. 1977). Despite the suggestive role of uncertainty and lack of control in visual perceptions, little

research has been done on independent causal forces, such as uncertainty, that may affect this perception of stimuli.

Illusory correlations also inform another stream of research. Though stereotypes are cultural artifacts, socially transmitted rather than created anew in each person, their root may lie in illusory correlation (Krieger 1995; Schaller and Maass 1989). Illusory correlation often results in the association of rarer events or opinions with rarer types of people. As a result, things with a low base rate, such as crime, become over-associated with smaller groups, such as African Americans. Since illusory correlation is often affected by uncertainty, it is worth examining the effects of uncertainty on the stereotyping of others.

Stereotypes allow us to categorize individuals (Bruner 1957) and make sense of the world (Allport 1954). A number of studies show that when participants are subjected to threat, their levels of stereotyping increase; stereotyping often functions as a way of making one feel more in control or as a way of having control (Fiske 1993; McGregor et al. 2001; Fein and Spencer 1997; Spencer et al. 1998). Similarly, uncertainty increases in group bias and differentiation between groups – when groups are clearly differentiated, it also easier to categorize individuals into them (Mullin and Hogg 1998).

Overall, illusory correlations, visual pattern perceptions, and stereotypes have been shown to increase in situations that bear a close relationship with uncertainty or lack of control.

Conspiracy theories. We daily must derive connections between people, actions, and events in the world around us. This form of sensemaking can turn into the perception of conspiracies which are "exaggerated perceptions ... [that] entail the *overperception* of temporal and social linkages" (Kramer and Gavrieli 2005). Such perceptions have been defined as, "persecutory delusions and false beliefs whose propositional content clusters around ideas of

being harassed... by malevolent others, either specific individuals or groups" (Colby 1981). Conspiracies involve linkages or patterns between people, actions, and events that do not exist.

Belief in conspiracies is usually attributed to people at the edge of society – cult members, separatist movements, and individuals who lock themselves into rooms papered with news clippings. However, belief in conspiracies appears not only in those loosely connected to the web of society, but also those in the center of it. Lyndon B. Johnson was certain that there was a conspiracy against his presidency; Hillary Clinton was quoted as saying that a "vast, right-wing conspiracy" explained the charges against her husband; Nixon, too, felt that there was a conspiracy against him (Kramer and Gavrieli 2005). In addition, survey findings reveal that, in milder forms, conspiracy beliefs are quite prevalent even among individuals in the general population. It is not uncommon for normal individuals to harbor perceptions that they have been the victim of a conspiracy involving a romance, friendship, school, or work (Goertzel 1994).

One explanation for a belief in conspiracies is that they proffer an explanatory function – that the perception acts to simplify complex sets of social information by attributing them to one force – that of the conspiracy (Hofstadter 1965; Zonis and Joseph 1994). Beliefs in conspiracies are associated with feelings of alienation, powerlessness, hostility, and being disadvantaged (Abalakina-Paap et al. 1999). These feelings implicate a lack of control over, or uncertainty in, one's environment. "Conspiracy theory is a way to make sense of the randomness of the universe. It gives causes and motives to events that are more rationally seen as accidents. By attributing motives to chance happenings, believers gain control of the uncontrollable, bringing the disturbing vagaries of reality under their control, enough to make accurate predictions and maybe even alter reality: omnipotence, or at least omniscience" (Pipes 1997). When things are

uncertain, it may be more comforting to make sense of the situation, to find patterns that explain it, rather than to acknowledge the uncertainty itself.

Social threat increases processing in the social arena (Gardner, Pickett, and & Brewer 2000). But research has shown that it is a particular sort of threat, and a particular sort of processing, that leads to conspiratorial beliefs. Extensive work by (Kramer and Wei 1999; Kramer and Gavrieli 2005; Kramer 1999; Kramer 1994; Kramer 1999; Kramer 2004) demonstrates that individuals who feel self-conscious or under evaluative scrutiny will overestimate the extent to which they are the target of others' attention (Fenigstein 1984; Fenigstein and Vanable 1992). They will, "overconstrue the behavior of other's in self-relevant terms" (Kramer 1999). It is this very lack of control over a situation – the feeling that one is being evaluated, that one's fate is in the hands of another – that causes heightened self-attributional behavior about the intentions of others For example, there is a correlation between unrecognized gradual hearing loss and the onset of paranoid-like ideation (Zimbardo, Andersen, and Kabat 1981). When those around you are suddenly whispering and muttering instead of speaking normally, and you have no idea *why,* the situation will be filled with uncertainty, resulting in paranoid and conspiratorial perceptions.

As a function of these attributions – that others have negative intention towards oneself - distrust results and the belief that others have hidden motives grows (Kramer 1994). "The results of numerous laboratory experiments and field studies have shown that paranoid cognitions arise from attempts by social perceivers to make sense of, and cope with, social situations they perceive as threatening. When those threats are adequately addressed or resolved, the paranoia diminishes" (Kramer and Gavrieli). Like other forms of false pattern perception, belief in conspiracies creates connections that do not exist to reduce the amount of uncertainty in one's

environment. As noted by Vyse (1997), "Conspiracy theories share a great deal with superstitions beliefs."

The final piece of the puzzle is that people often make the mistake of treating the actions of a single person as though they were representative of their social group as a whole (Kramer, coll paranoia, find the textual support). Therefore, when uncertainty causes overly personalistic attributions and perception of conspiracy in regard to one person, those perceptions are easily transferred to the group to which the person belongs (Kramer and Gavrieli 2005). Just as in magical thinking, it is easy to perceive a transfer of traits between two things that are in contact with each other – such a person and their group.

It is worth noting that some may believe that the above phenomena are simply the result of heuristic processing, and that the false patterns perceived are caused by the desire to reduce cognitive load when under stress by simplifying things. Research on the perception of conspiracies provides a good counterpoint to this belief, as the perception of conspiracies often does not have a simplifying effect at all. March (1995) concluded that the development and maintenance of a conspiracy theory is actually effort *intensive*. Fragmentary and ambiguous information must be drawn from diverse sources, interpreted, and then painstakingly integrated into a complex social cognition. Just as with common acts of knowledge generation, acts of both information assimilation and accommodation are required. Rather than a simplifying heuristic, the perception of conspiracies may in fact be a complex integration of available data. It appears that belief in conspiracies is not an answer to a situation with an abundance of complex information, but rather an answer to a situation in which one lacks control, or is uncertain.

Uncertainty and Control

The above review implies that the causal force behind pattern perception is the unexpectedness or inconstancy of one's environment. Much of our comfort and security derives from our ability to predict the future, or "know what comes next" and patterns allow us to do this. When the environment is uncertain, or we lack control over it, we feel insecure. One way to return things to their predictably certain state may lie in an instinctive, visceral hunger to find new patterns – a hunger so great it is willing to sup on falsehoods to satisfy itself.

In fact, the desire to combat uncertainty and maintain control has long been considered a major motivating force in human life. Adler (1930) suggested that the desire to persevere through events by way of one's competence and superiority is the individual's major motivational force. White (1959) discussed "effectance motivation," in which one was motivated to interact with the environment so as to be rewarded with the feeling of competence obtained when exerting control over one's world. People have been compared to scientists who match their expectancies against their perceptions in an attempt to obtain maximum predictability and control (Kelly 1955). Kelley (1967; 1971) suggested that the purpose behind causal attributions is that determining the cause for an event in one's world is the "effective exercise of control in that world." He also argued that the introduction of biases into our causal explanations are partially results of this desire for control – that the events we most desire control over will be those to which we attribute the most controllable sources. It has been stated that man's "primary motivational propensity is to be effective in producing changes in his environment. Man strives to be a causal agent, to be the primary locus of causation for, or the origin of, his behavior; he strives for personal causation" (deCharms 1969). The desire for control and the reduction of uncertainty are such a driving forces in life that it is little wonder how extensively they affect the sensemaking of our environment.

Numerous studies have examined individual differences in the innate desire for control on a plethora of social behaviors and personality traits that include conformity, achievement motivations, anxiety, health habits, and gambling (see Burger 1992 for a review). Those with a high desire for control display many fruitfully adaptive traits. They are assertive, decisive, and active, seeking to influence others and gain leadership positions. On the other hand, those with a low desire for control display traits that are less likely to result in positive outcomes. They are nonassertive, passive, and indecisive. They are also less likely to attempt to influence others, and often prefer that many of their decisions be made by others (Burger and Cooper 1979). A higher desire for control seems to lead to many adaptive traits whereas those with a low desire for control, who are less likely to try to understand their environment (and thus master it), seem destined for lesser results.

The effects of control on performance and mood have been extensively demonstrated. A lack of perceived control over aversive noise has been tied to decreases in performance and increases in frustration (Glass and Singer 1972). Brehm (1966) and his colleagues have demonstrated a "reactance effect" when participants perceive attempts to appropriate personal control. Studies in the area of learned helplessness have illustrated the debilitating effects that lack of control can have on a number of responses (Klein, Fencil-Morse, and Seligman 1976; Glass and Singer 1972). Experiencing a lack of control can clearly have a debilitating effect on the way one interacts with the world. To return to one's previous levels of performance, it may be imperative to regain a sense of control.

When studied as a general drive found throughout the population, there are numerous studies that suggest a relationship between uncertainty or control, and pattern perception. Attributional activity has been shown to be triggered by unexpectedness (Clary and Tesser 1983;

Wong and Weiner 1981; Hastie 1984; Pyszczynski and Greenberg 1981), and dependence on external forces for one's outcomes (e.g., Neuberg and Fiske 1987; Harkness, DeBono, and Borgida 1985; Erber and Fiske 1984). A high desire for control has also been associated with biases or distortions of "objective reality" (Burger and Hemans 1988; Burger 1986). Perhaps the stronger the drive for control, for certainty in one's environment, the more likely one is to perceive false patterns in order to create a sense of security.

There is some literature that suggests otherwise. In one study, participants who experienced a failure of control in a task diagnostic of their abilities, they employed ego-protective devices such as effort withdrawal when they entered a new situation that clearly required those very abilities (Snyder, Stephan, and Rosenfeld 1976; Jones and Berglas 1978). This withdrawal would naturally result in less information processing, and likely fewer perception of patterns. However, the experience of lack of control appears in situations throughout our lives, and is rarely considered diagnostic of our abilities. So while there are instances of reduced processing in lack of control, these are in very specific situations.

The desire for control is a universal drive (though its levels may vary from person to person). The desire for control, or experience of lack of control, increases the motivation to process information. But it remains to be examined *how* the information is processed – how sense is made of it, and to what use these explanations are given. This course of research seeks to determine whether uncertainty and lack of control causes an increase in the false perception of patterns.

Study 1

This study was designed to test three propositions: first, whether lack of control would cause a rise in the perception of patterns; second, whether the effect of lack of control would

only occur for a threatening experience; third, that this relationship between control and pattern perception would occur across disparate arenas of pattern perception. I selected two areas of pattern perception that were as little alike as possible to better test the universality of this rise in perception. The first area is that of the visual perception of patterns, the simplest of the areas in which people perceive patterns. The second area is that of conspiracies, one of the most complex social areas in which patterns (connections and associations between people) are perceived. To manipulate participants' experiences of control and the valence of their experience, I asked them to recall a negative or positive situation or event from their life in which they experienced control (or lack thereof). This experiential priming procedure – remembering a personally relevant experience – allows me to prime lack of control in a way that is meaningful to participants without differentially affecting cognitive capacity (such as would be caused by putting participants in a situation over which they had no control while they completed the dependent measures).

Method

Participants

Participants were 47 (31 women and 16 men) undergraduates who participated for $10.

Design and Procedure

The experiment had a 2 (control vs. no control) x 2 (positive event vs. negative event) between participants design.

Upon their arrival, participants were told that they would be completing several tasks. The first task comprised the manipulation of control. Participants were asked to write about an autobiographical experience. Half of the participants wrote about a positive experience and the other half wrote about a threatening or negative experience. Orthogonal to the manipulation of

threat, half the participants wrote about a situation in which they had control and half wrote about a situation in which they had no control. For instance, participants in the no control/negative experience condition saw the following instructions (control and positive experience manipulations appear in brackets):

> Please recall a particular incident in which something *threatening* [good] happened to you and you *did not have any control over* [were in complete control of] the situation. Please describe the situation in which *you were threatened* [the good thing happened] *and felt a lack of control* [but you felt complete control] over the situation – what happened, how you felt, etc.

Pattern Perception. I examined the participants' tendency to perceive patterns at two levels one social and one non-social.

Noise. To explore whether participants would see visual patterns, participants were given a packet to fill out. On each page was one picture of randomly generated noise. The pictures were of unstructured white noise, essentially a tightly-packed scattering of black dots on a white background that resembled static on an empty channel of a television set. After each picture, participants were asked if they saw an object in the picture and were given the option to answer 'yes' or 'no.' Participants viewed a total of ten pictures before moving onto the next measure. Since each picture was of random static, in which no pattern existed, any indication from a participant that they had seen an object in the picture is evidence of false pattern perception.

Conspiracy. Participants were next presented with two scenarios. One scenario described a positive outcome and one described a negative outcome. In each scenario, it was possible to interpret the behavior of the people around the protagonist as innocent or as conspiratorial and as

having caused the protagonist's positive or negative outcome. In each scenario, the facts of the situation made it ambiguous whether there was a conspiracy affecting the outcome.

In the first scenario, the protagonist experiences a good event and is asked to what extent that event may be due to the actions of people mentioned earlier in the scenario:

> Imagine that you buy stock in one of the three construction companies that service your area. One day, your spouse, who runs the local bed and breakfast, notes that the families of all three company owners have checked into the B&B recently. Later, the prices all three companies offer for their services have risen drastically.
>
> Because of the higher prices, all three companies post very high profits, and you make a lot of money off of the stock you own.
>
> To what extent do you think the visits to the bed and breakfast may be connected to the earnings you made off your stocks?

In the second scenario, the protagonist experiences a bad event and is asked to what extent the event may be due to the actions of people mentioned earlier in the scenario:

> Imagine that you are one of the top administrators in your organization. You are in charge of running a number of aspects of the organization, including tracking the hours of all employees and their email and internet usage. You will soon be up for promotion. The day before your scheduled meeting with your superiors, you notice that the number of emails between your boss and the coworker sitting next to you jumps precipitously.

When you meet with your boss, you are told you're not getting the promotion.

To what extent do you think your coworker may be connected to you not getting the promotion?

Participants rated to what extent the actions of the other people in the scenario were connected to the outcomes the protagonist experienced, from 1 (not at all) to 7 (a great deal).

After completing the dependent measures, participants were paid for their participation and debriefed.

Results

Visual pattern perception. The percentage of participants who saw a pattern in the pictures of noise was submitted to a 2 (negative experience vs. positive experience) x 2 (control vs. no control) x 2 (saw pattern: yes vs. no) log-linear analysis, revealing a significant three-way interaction $\chi^2(1) = 3.96$, $p < .05$. As can be seen in Figure 1, when participants recalled a negative experience over which they had no control, 82% saw patterns in the pictures of noise compared to the other three conditions (39% in the negative experience/no control condition, 34% in the positive experience/control condition, and 26% in the positive experience/no control condition).

Conspiracy perceptions. The conspiracy perception measures were submitted to a 2 (positive experience vs. negative experience) x 2 (control vs. no control) x 2 (positive outcome vs. negative outcome) mixed model ANOVA with repeat measures on the last factor. There was a main effect for positive vs. negative experience, $F(1,46) = 4.056$, $p = 0.01$, with participants more likely to perceive a conspiracy when they recalled a negative experience. There was also a main effect for outcome, $F(1,46) = 4.056$, $p = 0.018$, with participants more likely to perceive a

conspiracy when the outcomes they experienced were negative. Most importantly, there was a significant experience valence x control interaction, $F(1,46) = 4.056$, $p < 0.1$. Participants were significantly more likely to perceive a conspiracy when they had recalled a threatening event over which they had no control.

Discussion

Study 1 demonstrated that, having recalled a negative experience event over which they had no control, participants were far more likely to perceive patterns in both pictures of static or complex social situations. The effects appeared in both the simplest, most basic area of pattern perception and one of the most complex areas.

Taken as a whole, these dependent measures tap into an array of aspects of pattern perception in different areas of life. The perception of patterns in noise captures the perception of patterns within simple sets of data. The perception of conspiracy is the perception of social patterns, connections between people, which may not exist. The above measures provide data on the perception of patterns across several different types of situations – from basic cognitive tendencies in data processing, to the comprehension of more complex social milieus.

Study 2

This study was designed to test whether participants experiencing uncertainty show the same increase in false pattern perception as those experiencing lack of control, as well as to expand the number of areas of pattern perception tested. If participants experience an increase in pattern perception, credence is lent to the hypothesis that there is an underlying force that causes an increase in the false perception of patterns.

A recall task similar to the one used in the previous study was employed. All participants recalled a situation from their life in which they either did or did not experience a lack of control,

or did or did not experience uncertainty. This task was again designed to cause participants to thoroughly re-experience this situation from their lives, without causing the attendant cognitive load.

Participants

Participants were 77 (47 women and 30 men) undergraduates who participated for $10.

Design and Procedure

The experimental design was 2 (prime: control vs. certainty) x 2 (present vs. absent).

Upon their arrival, participants were told that they would be completing several tasks. The first task participants completed was the recall task that comprised the prime. Just as in the previous study, they were asked to write about an autobiographical experience.

Half of the participants completed a certainty prime (present or absent). The other half of the participants completed a control prime (present or absent). The text of the recall prompt was similar to that used in the previous study. However, the passages about threatening or good situations had been removed, and the control or no control text was, for half of the participants, replaced with certainty or uncertainty text. The certainty prime read as:

> Please recall a particular incident in which something happened and you were completely *certain* [uncertain] in the situation. Please describe the situation in which you were completely *certain* [uncertain] – what happened, how you felt, etc.

The control prime read as:

> Please recall a particular incident in which something happened and you *were in complete control of* [did not have any control over] the situation. Please describe the situation in which you *felt in complete control* [a complete lack of control] – what happened, how you felt, etc.

Superstition. Participants were next presented with four scenarios. In each scenario an event (or significant non-event, such as an expected promotion not materializing) was preceded by an action that could not be objectively connected to it. For example:

> Imagine that you work in the marketing department of a large firm and have an excellent record of getting your marketing ideas accepted in meetings. Before every meeting in which you pitch an idea, you always stomp your feet three times before entering the room. However, today you were running late and forgot to stomp your feet three times.
>
> At the meeting your ideas were completely ignored.
>
> How much do you feel not stomping your feet is connected to your ideas not being accepted?

They were asked how connected they felt one event was to the other from 1 (certain) to 11 (impossible). They were also asked how worried they were about performing or not performing the action that 'led' to the event in the future, from 1 (definitely worried) to 11 (definitely not worried). After completing all of the dependent measures, participants were paid for their participation and debriefed.

Results

I summed the superstition measures in which participants were asked how connected they felt the two events in the scenario were. I submitted this measure to a 2 (certainty vs. control) x 2 (present vs. absent) ANOVA. The ANOVA revealed a non-significant trend for certainty vs. control, $F(1,75) = .006$, $p = .94$. The interaction was also non-significant, $F(1,75) = .80$, $p = .37$. A marginally significant trend was revealed, $F(1,75) = 2.25$, $p = .13$ with those in the no control/uncertainty condition ($M = 29.13$, $SD = 9.4$) seeing more patterns than those in the control/certainty condition ($M = 32.48$, $SD = 9.1$) (the lower the number the greater the superstitious perception). I next summed the superstition measures in which participants were

asked how worried they were about performing (or not performing) the behavior that had 'led' to an event in the scenario. I submitted the resulting measure to a 2 (certainty vs. control) x 2 (present vs. absent) ANOVA. The ANOVA revealed a non-significant trend for certainty vs. control $F(1,75) = .000$, $p = .98$. The interaction was also non-significant, $F(1,75) = 1.31$, $p = .27$. A significant trend for control/certainty vs. no control/uncertainty was revealed, $F(1,75) = 4.09$, $p = .05$ with those experiencing in the control condition ($M = 30.7$, $SD = 9.5$) seeing more patterns than those in the certainty condition ($M = 26.0$, $SD = 9.8$). Participants in the no control/uncertainty condition were significantly more worried about their future behavior based on a superstitious connection they had made between two unrelated events.

Discussion

Because there was no two-way interaction, participants' perception of patterns in superstitions did not differ between those who recalled an uncertain situation versus those who recalled a situation that lacked of control. Both situations create an environment in which it is hard to know what will happen next. Uncertainty often springs from lack of knowledge about the future. Similarly, when one is not in control, it is rare that one knows for certain what will happen next. Both of these states are, in the layperson's world, functionally the same. They also lead to the same responses – an increase in the perception of false patterns.

In the previous two studies, participants' experiences of control have been manipulated through the use of recall tasks. By asking participants to recall a particular past experience, I was able to prime lack of control in a way that is meaningful to participants. In the next study I wanted to manipulate lack of control directly, with an event participants experience in the lab. If the same increase in false pattern perception appears after a direct experience with lack of

control, it would add further weight to the idea that lack of control and uncertainty directly influences the perception of patterns.

Study 3

The purpose of this study was to create and test a direct manipulation of control. Experience with lack of control has been directly manipulated, most notably by researchers drawing from the learned helplessness literature. *Control motivation* has been defined as a motivational state created by a prior experience with deprivation of control (Pittman and D'Agostino 1989). Control motivation is often created by running participants through a concept-identification task in which they had no control over the outcomes and often results in greater levels of attributional activity on a later task (Pittman and Pittman 1980; Liu and Steele 1986; Pittman, Scherrer, and Wright 1977; Pittman and Pittman 1979). This result has been replicated in studies in which the experimental concept-identification manipulation was replaced with naturally occurring variations in desire for control (Burger and Hemans 1988). I thus considered this to be the perfect manipulation of control for use in the next study.

Methods

This study was designed to test a direct manipulation of control.

Participants

Participants were 29 undergraduates who participated for a payment of $10.

Design and Procedure

The experiment had 2 condition (baseline vs. no control) between participants design.

Upon their arrival, participants were told that they would be completing several tasks. The first task participants completed comprised the manipulation of control. Participants were

exposed to the control deprivation task. They then completed several measures and scales intended to test the efficacy of the manipulation.

Control manipulation. Subjects engaged in a 'concept identification' task drawn from Pittman and Pittman (1979), briefly described below. Participants were told that they would be completing a concept identification task, and given the following instructions:

> This is a concept identification task. The computer will select a concept, and through the feedback the computer provides, it is your job to determine what this concept is.
>
> You will be presented with pairs of symbols. In each pair of symbols, one correctly represents the concept the computer has selected, and one incorrectly represents the concept. It is your job to decide which side of the screen displays the correct symbol (see Figure 2 for screenshots of the symbol pairs).
>
> Each time you select a symbol, the computer will tell you if you are correct or incorrect, and present you with another pair. You will be exposed to ten pairs in total. You should learn the correct answer from the computer's feedback and choose correctly as often as possible.
>
> First, you will participate in a practice trial with ten pairs of symbols (just like the real trials). This is to give you a chance to get used to the task.

After the practice trial (with ten pairs of figures), participants completed another four trials (each with ten pairs of figures).

In the baseline condition, participants were told that, in order to get a 'base rate' of responses, they would answer without receiving computer feedback, making their best guess as to what concept the computer had selected. We told them their performance did not matter, and that we simply wanted their instinctive responses.

In the no control condition, participants *did* get computer feedback. However, the feedback was random and noncontingent to their responses – 50% of the time the computer told them their response had been correct, and 50% of the time that their response had been incorrect. There was no concept to identify, and in trial after trial, participants were unable to correctly intuit an answer. As much as they tried to interact with their environment, it would remain out of their control and uncertain.

Dependent variables. In order to test the effectiveness of the manipulation we included several different measures. We drew from the scale provided by Mano (1991) in order to measure affect. Participants were asked to respond how strongly they felt each affect state, from 1 (not at all) to 11 (very much).

Participants were also asked to rate the extent to which they agreed with the statement, "Even when I tried, I was not able to get my way in this task" from 1 (strongly disagree) to 7 (strongly agree). Also included was the Personal Need for Structure Scale (Thompson, Naccarato, and Parker 1989).

After completing the tasks, participants were paid and debriefed.

Results

The affect measures were collapsed into four scales and submitted to an ANOVA. The four scales were (*reverse coded* in italics): Aroused (aroused, astonished, surprised, *quiet, still*); Anxious (anxious, fearful, nervous, *calm, at rest, relaxed*); Elated (elated, active, excited, *sleepy*,

sluggish, drowsy); Pleased (pleased, satisfied, happy, *unhappy, sad, blue*). We submitted the measures to a 2 (baseline vs. no control) condition ANOVA. A significant trend emerged for arousal, $F(1, 27) = 4.47$, $p = .04$ with participants in the no control condition ($M = 29.4$, $SD = 8.2$) significantly more aroused than those in the baseline condition ($M = 23.1$, $SD = .7.7$). A marginally significant trend also emerged for the anxiousness measure, $F(1, 27) = 3.38$, $p = .077$ with participants in the no control condition ($M = 34.4$, $SD = 10.8$) more anxious than those in the baseline condition ($M = 27.2$, $SD = .10.1$). The elated measure was not significant, $F(1, 27) = 2.38$, $p = .14$, but the pleased measure was, $F(1, 27) = 4.71$, $p = .04$ with participants in the no control condition ($M = 35.6$, $SD = .8.9$) significantly less pleased than those in the baseline condition ($M = 40.0$, $SD = .8.7$). All these support a lack of control – participants were not only unhappy, but also aroused and anxious, not just passively displeased. Their affect is what one would expect in a situation in which one lacked control but desired it.

I also submitted participants' extent of agreement with the statement, "Even when I tried I was not able to get my way," to an ANOVA. A marginally significant trend emerged, $F(1, 27) = 2.89$, $p = .10$ with participants in the no control condition ($M = 5.87$, $SD = .98$) agreeing significantly more than those in the baseline condition ($M = 5.08$, $SD = 1.55$), illustrating that they were also cognitively aware that they did not have control over their situation.

I next submitted the Personal Need for Structure Scale to an ANOVA, and an interest effect emerged. The trend was significant, $F(1,27) = 4.43$, $p = .045$ with participants in the no control condition ($M = 44.9$, $SD = .6.3$) scoring higher on the scale than those in the baseline condition ($M = 38.2$, $SD = 10.7$). As the Personal Need for Structure Scale is a trait-based scale, it is particularly notable that the scale was influenced by the manipulation of control used in this study.

Discussion

Participants completing the manipulation felt a lack of control over their situation. They also exhibited a higher need for structure, which supports the idea that patterns are perceived to structure and predict one's world. Interestingly, as the Personal Need for Structure Scale is not intended to be affected by experimental manipulations, it seems meaningful that the control manipulation was powerful enough to change participants' responses. In the next study, I will apply the direct control manipulation to the perception of patterns.

Study 4

This study was designed to examine the effects of a direct manipulation of control on the tendency to perceive patterns. However, one aspect of pattern perception that has gone unexamined is the *correct* perception of patterns. While previous studies have illustrated that a lack of control increases the perception of patterns in noise, what happens when the pictures of noise are interspersed with pictures that *do* contain an actual pattern? In addition, noting the effects seen on the last scale, I decided to further explore further the ability of one's uncertainty to affect scale responses.

Methods

This study was designed to test two propositions: first, that a direct manipulation of control deprivation would cause participants to perceive false patterns, and second, that those subjected to a lack of control would also be more likely to *misperceive* patterns that are present.

Participants

Participants were 47 (32 women and 15 men) undergraduates who participated for a payment of $10.

Design and Procedure

The experiment had a 2 condition (baseline vs. no control) between participants design. Upon their arrival, participants were told that they would be completing several tasks.

Control manipulation. The first task participants completed comprised the manipulation of control. They completed the manipulation drawn from Pittman and Pittman (1979) as described above in Study 3.

Manipulation check. After completing the manipulation of control, participants were once again asked to what extent they agreed with the statement, "Even when I tried, I was not able to get my way in this task," from 1 (strongly disagree) to 7 (strongly agree).

Visual pattern perception. The participants completed a modified form of the Snowy Pictures Task (Ekstrom et al. 1976). The task is drawn from aptitude literature, and was originally used to test perception. It consisted of a series of 'snowy' pictures – pictures so grainy and granulated as to very difficult to make out. For the purposes of this study, half of the pictures were taken and manipulated using digital media software such that no traces of the original picture remained. Participants were asked to look quickly at each picture and write beneath it either what they saw in the picture or, if the picture was simply noise, the word 'none.' Using this task, it is possible to measure not only the extent of false pattern perception, but the effects of lack of control on the perception of patterns that actually do exist.

Scales. The participants once again completed the Personal Need for Structure Scale (Thompson, Naccarato, and Parker 1989), as well as a modified form of the Rational-Experiential Inventory (Epstein et al. 1996).

Results

I submitted participants' extent of agreement with the statement, "Even when I tried I was not able to get my way in the task," to an ANOVA. A significant trend emerged, $F(1,45) =$

27.27, p = .000 with participants in the no control condition (M = 5.79, SD = 1.2) agreeing more than those in the (M = 3.48, SD = 1.8), Once again, participants were clearly aware of when they were not in complete control of their situation.

The visual pattern perception data was analyzed in two ways. In this task there were two different kinds of pictures – those that had no pattern, and those that did have a pattern. For the pictures with no pattern, participants' answers fell into two possible categories: correctly perceiving no pattern and incorrectly perceiving a pattern. For the pictures with a pattern, participants' answers fell into *three* possible categories: incorrectly perceiving no pattern, correctly perceiving that a pattern existed but incorrectly identifying what that pattern was, and correctly perceiving and correctly identifying a pattern. I first summed that data such that the more often one had correctly perceived and identified a pattern when a pattern existed, and correctly perceived no pattern when no pattern existed, the higher one's score. This measure was submitted to an ANOVA and a significant trend emerged, $F(1,45) = 4.24$, $p = .045$ with participants in the no control condition (M = 13.04, SD = 3.4) less able than those in the baseline condition (M = 15.17, SD = 3.7) to make the correct differentiation between the presence or absence of a pattern. The data was also summed in order to examine the number of patterns misperceived such that the more one had correctly perceived but incorrectly identified a pattern, or incorrectly perceived a pattern where there was no pattern, the higher one's score. This measure is most similar to that used in previous studies in regard to visual pattern perception – it is a measure of seeing patterns that are not there, or not properly seeing patterns that are there. I submitted this measure to an ANOVA. While not significant, $F(1,45)=2.25$,$p=.14$ the trend does follow the expected pattern, with participants in the no control condition (M = 9.46, SD = 3.9) on

average more likely to misperceive patterns than those in the baseline condition (M = 7.83, SD = 3.6).

I next submitted the participants' scores on the Personal Need for Structure Scale to an ANOVA. The effects seen in the previous study replicated, $F(1,45) = 3.57$, $p = .065$ with participants in the no control condition (M = 43.25, SD = 3.2) scoring marginally higher in their personal need for structure than those in the baseline condition M = 40.91, SD = 5.0). Once again, a lack of control in one's environment heightens the need for structure.

In addition, an interesting pattern of results emerged in the Rational-Experiential Inventory (REI). The REI breaks down into two subscales – Faith in Intuition (FI) and Need for Cognition (NFC). I ran a 2 (baseline vs. no control) × 2 (REI-FI vs. REI-NFC) mixed model analysis of variance (ANOVA) with repeated measures on the second factor. There was a significant Condition × Repeated Measures interaction, $F(1, 44) = 5.21$, $p = .027$. Participants in the no control condition (M = 38.26, SD = 5.4) were lower in Need for Cognition than those in the baseline condition (M = 41.30, SD = .6.7). Moreover, participants in the no control condition (M = 22.83, SD = 4.5) had more Faith in Intuition than those in the baseline condition (M = 21.13, SD = 4.3). As soon as people experience a lack of control, their need for structure increases, just as their need for cognition decreases. This offers some suggestive insight into how the perception of false patterns is likely to occur.

Discussion

In conclusion, participants in the no control condition were more inaccurate in perceiving patterns. In addition, those in the no control condition experienced a rise in personal need for structure and a drop in need for cognition as compared to those in the baseline condition. It is

just such a combination that is likely to produce the illusory perception of patterns seen in the previous studies.

When people experience a lack of control, they are less likely to be able to differentiate between whether a pattern is or is not there, and are more likely to misperceive the patterns they see when they have no control. This is likely because their need for structure has increased. They want to fill this need, while their dependence on cognition has dropped and their faith in intuition has increased, exacerbating their natural tendency to perceive patterns even when there are none.

The above studies explored the role of uncertainty and lack of control in inducing the perception of patterns. The results clearly showed that across multiple types of stimuli, social and non-social, experiencing uncertainty produced a tendency to see patterns in subsequent stimuli. Lack of control and unpredictability in events is one of the causal forces behind pattern perception. When our comfort and security is threatened, we are willing to generate false patterns in our attempt to return things to a predictable and secure state.

It is also important that the phenomenon of false pattern perception reaches across different *levels* of analysis. People are more likely to falsely perceive patterns when exposed to negative situations in which they lack control, not only on the very basic, perceptual level of objects appearing in static, but also on the far more complex and social level of the perception of conspiracies. This points to a root desire for sensemaking that, once activated, will work with any material it is given, whether that material is visual stimuli or one's social milieu.

These findings have important implications for the way we make sense of the world around us. It seems that just when events are at their worst – out of control and uncertain – is when we are most likely to perceive patterns that do not exist. While this may have salutatory effects on our mood and sense of safety, it does not bode well for our ability to successfully

interact with the environment. The very environment that makes us feel threatened, over which we may need to gain control, is the one about which we are most likely to generate false patterns. This has implications for such disparate arenas as the analysis of stock markets during times of chaos or uncertainty, the perception of how one's industry should respond to the introduction of uncertain or revolutionary new technologies, and even decisions made about who should succeed one as CEO when the organization is undergoing massive reconstruction.

Several things remain to be examined. Study 5 takes false pattern perception into the organizational environment, and looks at how our increasingly micromanaged and interruption-plagued lives may affect our perception of false patterns in the workplace. Study 6 examines the effect of the uncertainty on the way we perceive and interact with the stock market, and seeks to show that lack of control can affect our tendency to see nonexistent trends in stocks. Study 7 is designed to explore whether an intervention exists that will decrease the illusory perception of patterns.

Proposed Studies

Study 5

Today's workplace is increasingly micromanaged. It is possible to monitor employees in a number of intrusive ways – video cameras, keystroke trackers, web usage monitors – and to use that information in an attempt to improve workplace productivity. When employees are micromanaged to this extent, they may feel little control over their environment. Employees are also increasingly interrupted at work – email, instant messaging, and text messaging, have all added to the interruptions already wrought by drop-in office visits and the telephone. With the uncertainty and lack of control endemic to this environment, it is likely that employees will be far more likely to look for and perceive false patterns. The next study is intended to test this

hypothesis – I expect to find greater levels of false pattern perception in the micromanaged, or lack of control, condition.

Methods

Participants

Participants will be 40 undergraduate students paid $10 for their participation.

Design and Procedure

The experiment will have a 2 condition (micromanaged vs. laissez-faire) between participants design.

Participants will be brought into the lab and told they will be completing a number of different tasks. They will each be taken to an individual room.

Control manipulation. Upon entering the room the experimenter will tell the participant that it is their job to complete a number of tasks during the course of the experiment, and that they must do their best, because their performance matters. In the *laissez-faire condition*, participants will be told that it is only the quality of their end product that matters, and that it is of only tangential interest what processes they use to achieve it. This will establish the baseline condition. In the *micromanaged condition*, participants will be told that not only does the quality of their end product matter, but also the processes they use to get there, and that we will be closely monitoring them and rating them on the efficiency of the processes they use. They will be told that they will be filmed and that a keystroke tracker has been installed on the computer to monitor what and how fast they type. This sense of being constantly observed and evaluated will establish an experience of lack of control in participants, much like that observed in the modern workplace.

The tasks they have been given to complete comprise the dependent measures in the experiment.

Conspiracy scenarios. For the purposes of this study, participants will read a scenario in which they are a funder at a large firm with many employees. One of the other employees seems to dislike them, though they don't remember having done anything negative to them. After performing particularly well on an assignment just before one of their performance reviews, they are still turned down for a promotion. After being turned down, they recall the other employee talking with the person in charge of performance reviews.

After reading the scenario, participants will be asked several questions. They will be asked to what extent they trust their coworkers in general. They will be asked how likely they are to share sensitive information with their coworkers in the future. They will be asked to what extent they would like to work with their coworkers in teams in order to complete important projects. All questions will be answered on a 7-point scale, from 1 (not at all) to 7 (very much). I expect to find participants in the micromanaged condition far less trusting, less likely to share information, ad less likely to want to work with their coworkers in the future.

Conspiracy recall. At the end of the study, participants will be asked to recall the scenario they read in as much detail as possible. They will be prompted with one of two words – either 'funder' or 'conspiracy'. I expect those prompted with the word 'conspiracy' to be able to remember more detail from the scenario, and that they will remember even more detail from the scenario when they are in the micromanaged vs. laisez-faire condition. Coders will later rate the recalled scenario for how accurate, and how extensive, the recall was. is likely.

This measure draws from the spontaneous causal inferences literature (Hassin, Bargh, and Uleman 2002), which assessed whether causal attributions were made without directly

asking participants and finds that participants remember more detail when prompted with causal inference words than with actual words used in the scenario. This work builds off the the principle that the way information is encoded determines when it is likely to be recalled (Tulving and Thomson 1973).

Illusory correlation. The purpose of this task is to measure the amount illusory correlation participants engage in, and to illustrate the negative effects such false pattern percpeption may have in a business environment. Participants will be told that, as a project manager, they have $120,000 dollars to distribute between two companies that have taken on projects for their organization.

Before making their decision, however, they will need to read 'summarized' performance reports for each company. To this end, they will be asked to carefully read each of 36 statements, because their memory of them will be tested later. Each statement will describe 'Company A' or 'Company B' performing either well or badly. One third of the statements describes company B, and, orthogonally, one third of the statements describes a bad performance on the part of one of the companies. Thus the ratio of positive and negative information about both companies is the same. Both company B and negative information are rarer.

After they have finished reading the performance reports, participants will be asked their opinion of both companies. They will be asked to what extent each company could be described by a number of different traits (both positive and negative) on a 7-point scale, from 1 (never) to 7 (always).

They will then be told that the current funds distribution between the two companies is $80,000 at the projects run by Company A, and $40,000 at the projects run by Company B, and asked if they would like to redistribute the funds for the coming year, and if so, how they would

redistribute the funds. They would also be asked how likely they would be to hire each of the companies for any new projects that come up, on a 7-point scale, from 1 (not at all likely) to 7 (very likely).

I expect to find that Company B is associated with negative performance, given less money, and would be less likely to be hired for new jobs, particularly in the micromanaged condition.

Overall, I expect that those in the micromanaged condition will be more distrustful of their coworkers in the conspiracy scenario, more likely to suffer from illusory correlation, and better able to recall the conspiracy scenario when primed with the word 'conspiracy'. Should this be so, a number of effects important to workplace life have been discovered. When experiencing a lack of control, employees would be more likely to perceive conspiracies in the day-to-day human interactions around them, and more likely to suffer from the perception of false patterns that could affect expensive business decisions.

Study 6

This study seeks to examine how the phenomenon of false pattern perception applies to the stock market. A recent bestseller (Taleb 2004) touched directly on how random the stock market can be, while all those participating in it still expect to be able to 'figure it out' and succeed against all odds. Those who are successful in the stock market often attribute their success to some particular business acumen or intuition, when the true cause behind their fortune is often simply luck.

This doesn't prevent us from trying to do well on the stock market; confidence in one’s ability to correctly gauge its fluctuations leads individuals to trade more and as a result to lose more money (Barber and Odean 2001, 1999). I contend that people who think they see patterns

in the stock market will cause people to trade more, and sadly to be more likely to lose money. Predictable patterns in the stock market, like Ahab's white whale, have become an obsession with many, for in finding these patterns, they will become rich beyond their wildest dreams. Yet the stock market remains stubbornly unpredictable.

Thus it seems likely that, just when the economy is uncertain and the stock market more likely to be variable, people will be more likely to perceive false patterns in it. I expect that after experiencing uncertainty, participants will be more likely to display false pattern perception in their stock market behavior. Also, that these false patterns will lead to greater losses in the stock market, and greater inaccuracy in predictions.

Methods

Participants

Participants will be 40 undergraduate students paid $10 for their participation.

Design and Procedure

The experiment will have a 2 condition (uncertainty vs. certainty) between participants design. Participants will be subjected to a manipulation of control and then asked to make stock marked predictions and buying decisions.

Participants will be brought into the lab and told they will be completing a number of different tasks. They will each be taken to an individual breakout room.

Control manipulation. Control will be manipulated within the context of the stock market itself. Participants will be provided with information about how the stock market has been performing lately. In the lack of control condition, they will be told that the stock market has been highly variable lately, and even analysts admit it is hard to predict what it will do next. In the control condition, participants will be told that the stock market has been highly stable lately,

and even analysts admit that it is easy to predict what it will do next. This manipulation is advantageous because it will be integrated directly into the participant's decision-making environment.

Stock market measures. The participants were then exposed to the stock market methodology used in Torngren and Montgomery's work (2004) to measure experimental manipulations of stock market performance.

> The questionnaire used twenty stocks from well-known blue-chip companies (Ericsson, Volvo, etc.) and from a broad spectrum of industries listed on the Stockholm stock exchange. Participants were given the name, industry, and monthly percent price change for each stock for the previous twelve months and asked to predict the rate of change for the share price over the next thirty days. They also picked one of two stocks shown on each page that they expected to perform better during the same period, and they estimated the probability (between 50%-100%) that they would choose the best performing stock. Participants rated on a ten-point scale the extent to which they used each of four strategies (previous monthly results, other knowledge, intuition, or guessing), with "not at all" and "to a very high degree" as extremes. Finally, participants estimated the mean errors of their own predictions (in percent), as well as the collective mean errors of the professionals and laypeople.

I would expect that those in the uncertain condition would: select the wrong stock more often, be more confident in their choices, underestimate to a greater extent the mean errors of their own predictions, be likely to lose more. Most interesting will be the results in the participants' estimated mean errors for their own predictions – for those who saw patters will likely be more confident in their accuracy at predicting the stock market.

Study 7

All of the previous studies have illustrated the connection between lack of control and pattern perception. If the perception of patterns is a compensatory mechanism, attempting to account for a negative state experienced by the individual, this suggests that an intervention addressing that state should reduce the tendency to see patterns. Rothbard, Galinsky, & Medvec (2005) suggests that negative feedback can cause people to take compensatory actions, but that self-affirmations will alleviate this response. Similarly, since the perception of false patterns is a response to an uncertain or out of control environment, an intervention that increases participants' sense of control is likely to reduce the perception of false patterns.

Once way one's sense of control might be affected is through the use of counterfactuals. Because counterfactuals influence causal attributions (Wells and Gavanski 1989), self-relevant counterfactuals should influence personal causal attributions, or perceptions of one's own control. This idea was experimentally supported (McMullen and Markman 1994; cf. McMullen, Markman, and Gavanski 1995) - when participants focused their counterfactuals on their own decisions, they perceived themselves as significantly more in control than when they focused their counterfactuals on an external factor.

Therefore, in order to create a sense of control, the participants will be asked to counterfactually undo an antecedent that they were responsible for, thus heightening the

connection between their action and that outcome (e.g., "If I hadn't thought to buy that ticket, I wouldn't have won $1000"). Another group of participants will be asked to counterfactually undo an antecedent that they *were not* responsible for (e.g., "If the basket had been spun faster, I wouldn't have won $1000") (Thompson, Armstrong, and Thomas 1998). The latter method would make one feel less control, and more uncertainty.

This study seeks to provide an intervention that reduces the illusory perception of patterns by increasing participants' sense of control. In addition, it will continue to tie several forms of pattern perception to the experience of lack of control. I expect that a lack of control will result in greater levels of false pattern perception, and that the counterfactual intervention will work to increase one's sense of control, and thus the perception of false patterns.

Methods

Participants

Participants will be 40 undergraduate students paid $10 for their participation.

Design and Procedure

The experiment will have a 2 condition (baseline vs. no control) x 2 (no intervention vs. intervention) between participants design.

Participants will be brought into the lab and told they will be completing a number of different tasks.

Control manipulation. Participants will first complete the manipulation of control. They will complete the control deprivation manipulation drawn from Pittman and Pittman (1979) as described above in Study 3.

After they have completed the control manipulation they will be asked to complete a series of tasks. They will be told that each of these tasks are unrelated to the part of the study they have just completed.

Counterfactual Intervention. Half the participants in the no control condition will be asked to create a counterfactual designed to instantiate a feeling of uncertainty or lack of control, while the other half will be asked to create a counterfactual designed to instantiate a feeling of certainty, or control. Participants in the control intervention condition will be asked to respond to the prompt:

> Devise a scenario in which in the past, if you had not performed a particular action, you would not be in this room now. Describe the scenario, and list the thoughts running through your mind in response to it.

Participants in the lack of control condition will be asked to respond to the prompt:

> Devise a scenario in which in the past, if someone else had not performed a particular action, you would not be in this room now. Describe the scenario, and list the thoughts running through your mind in response to it.

Hot hand. Participants will next engage in a task similar to that in Gilovich's hot hand research (1985). They will watch a video of an NBA basketball player making three-point shots. After each shot the player takes, the video will stop, and participants will predict what the percent chance is that the player will make the next shot. Of course, the percentage should be the same every time – however, I expect to find that participants will believe the player is more likely to make the next shot if he made the previous one, and less likely to make the next shot if

he missed the previous one. Furthermore, I expect this trend to be stronger in the no control condition.

V*isual pattern perception.* Participants will complete the modified version of the Snowy Pictures Task (Ekstrom et al. 1976) as used in Study 4.

Superstitious responding. This dependent measure is adapted from the superstition literature based on operant conditioning. Participants will be told that for the next task, they must use the computer keyboard in order to gain points. They must discover how to use the keys F, G, H, and J so that the computer will award them points. They will have three minutes for the task, and they must get as many points as possible.

In reality, the keys will have no affect on when the computer gives them points. They will be awarded a point at variable intervals, between 2-10 seconds. A program will track their keystroke sequences and the periods at which they receive points. After completing the exercise, participants will be asked an open-ended question "What do you have to do to earn points?" I expect to find that those who are experiencing a lack of control will be more likely to create superstitious sequences of keystroke, and less likely to realize the there is nothing they can do to earn points, because the points are awarded randomly.

I expect overall to find that the counterfactual intervention will reduce false pattern perception in the no control condition, possibly even returning it to the levels found in the baseline condition.

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Figure 1

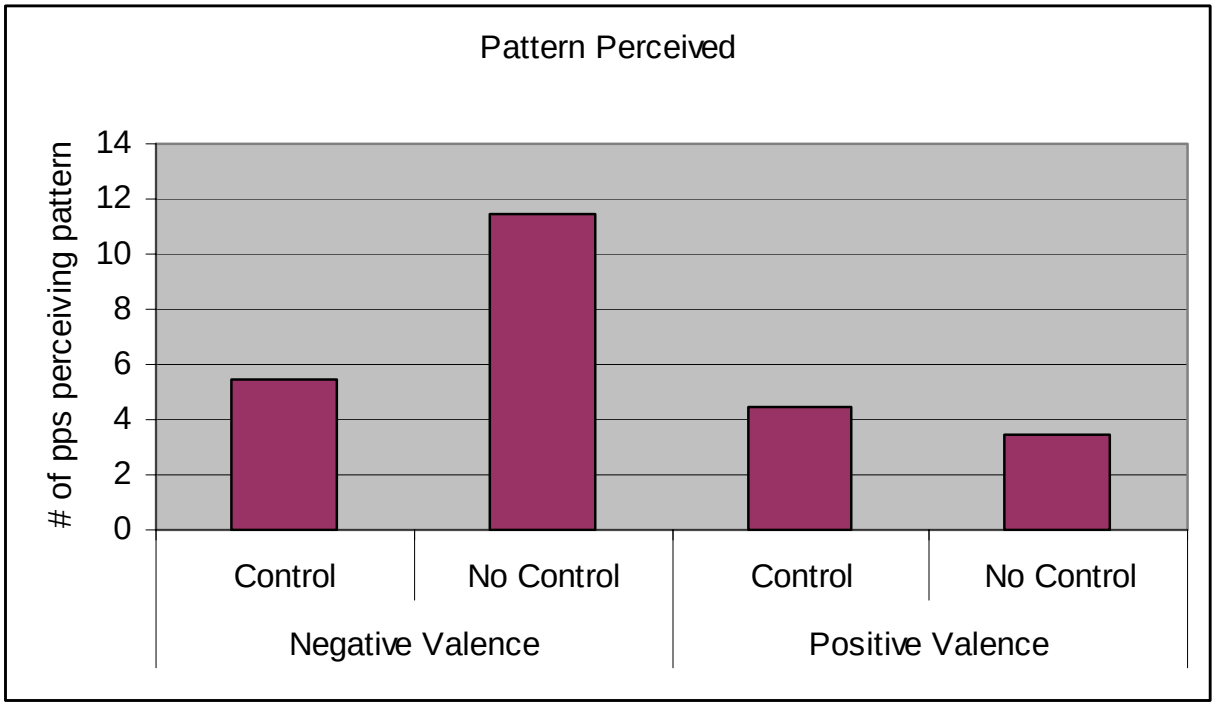
Pattern Perceived
# of pps perceiving pattern
14
12
10
8
6
4
2
0
Control
No Control
Control
No Control
Negative Valence
Positive Valence

Figure 2