The Effects of Causal Search and Attributional Retraining on Achievement Motivation and Performance

by

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A thesis submitted to the Faculty of Graduate Studies in partial fulfillment of the requirements for the degree

of

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"If I have seen further, it is by standing on the shoulders of giants." – Sir Isaac Newton

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Abstract

The present longitudinal study had two main objectives. First, to determine which event characteristics, or precursors, outlined in Weiner's (1985) attribution theory (unexpected, negative, and/or important events) elicit the greatest amount of causal search. Causal search levels were assessed following: 1) hypothetical scenarios, and 2) an actual university test, for 710 university students. Results indicated unexpected and negative events increase causal search, and event importance interacts with unexpectedness and negativity to influence causal search levels. The second objective was to determine if causal search impacts the efficacy of attributional retraining (AR) on students' academic performance. AR was administered to half of the participants. A significant interaction between AR and causal search indicated students high in causal search who received AR had higher grades compared to students high in causal search who did not receive AR. The importance of these results for causal search and attributional retraining research are discussed.

The Effects of Casual Search and Attributional Retraining on Achievement Motivation and Performance

Introduction

Too frequently, the early experiences of college students embody disappointment with tests and disengagement from desired goals. Consider the case of an eighteen-year-old student coming to university shortly after graduating from high school. Several days have past after he wrote his first ever university exam, he walks up to his introductory psychology professor's door, looks at his grade and responds:

> "WHAT! An F! That can't be right. There must be some kind of mistake! I've never failed a test in my life! How could this have happened? Maybe I'm not cut out for this place."

Unfortunately, experiencing unexpected failures at university is a common occurrence and many do more than just consider leaving. In fact, surveys of U.S. postsecondary institutions show that at the end of the first year of college over 25% of entering students drop out, and of those remaining less than 55% graduate within five years (Desruisseaux, 1998; Geraghty, 1996). Consequently, psychologists have been studying bright, enthusiastic high school students who experience surprising, harmful, and critical events in college for some time now, in the hopes of better understanding why so many of these students drop out instead of persevering to graduation.

Weiner's theory of achievement motivation and emotion (1985, 1995) has been widely used to explain such behavior. In Weiner's model, the initial component involves experiencing an unexpected, negative, and/or important event (such as receiving an F on a university exam) that 'kick starts' a search for why the event occurred, eventually resulting in a causal attribution. This initial analytic process is called '*causal search*' and

is the focus of the current study. The process of causal search has been researched to some degree in the past (e.g., Bohner, Bless, Schwarz, & Strack, 1988; Gendolla & Koller, 2001; Kanazawa, 1992; Moller & Koller, 1999; Wong & Weiner, 1981), however, the three event characteristics specified in Weiner's model that initiate the search for attributions, namely unexpectedness, negativity, and importance, known as *precursors* to causal search, have not yet been systematically tested together. As a result it is still unknown which of Weiner's three precursors, or what combination of the precursors, leads to the greatest amount of causal search.

Moreover, an important application of Weiner's (1985) attribution theory is Attributional Retraining (AR) which is a cognitive intervention widely used to improve students' performances in achievement settings. It is designed to enhance student motivation and achievement by changing the way they think about their successes and failures (Forsterling, 1985; Perry, Hechter, Menec, & Weinberg, 1993). Since causal search is a central mechanism of Weiner's theory, it seems reasonable to determine whether the amount of causal search students are engaged in when they receive attributional retraining has an effect on their performance following the intervention. Before pursuing this objective, however, it is important to more thoroughly understand the process of causal search by identifying the strongest precursors to causal search.

The Literature

An Attributional Perspective on Causal Search

Weiner's (1985, 1995) theory of achievement motivation and emotion states that when an event occurs that is perceived as unexpected, negative and/or important by a person, such as failing a university test, a causal search takes place resulting in an

explanation of the event. According to the theory, the ensuing attributions can be classified into three orthogonal dimensions: locus of causality (internal/external), stability (stable/unstable), and controllability (controllable/uncontrollable). The unique combination of these three dimensions for a particular attribution determines the emotional, motivational, and behavioral consequences for the individual. Weiner's theory has had a major impact on several areas of psychology, including clinical, educational, social, developmental, and learning (cf. Fiske & Taylor, 1991).

A major criticism of attributional research early on was that the methodology being used to study the attributional process was reactive, meaning the measurement procedure provoked causal thoughts in the subjects that would not otherwise have occurred in its absence (Weiner, 1983). Weiner rebutted these criticisms with a review of 17 studies, all of which used highly unobtrusive methods, demonstrating that people make spontaneous causal attributions. Weiner concluded the review by stating it is no longer necessary merely to demonstrate spontaneous attributional activity and suggested that we should turn our attention to exploring new directions in causal search.

Since that time, a literature has evolved focusing on the impact that event characteristics have on the amount of spontaneous causal search people engage in for causal attributions. These event characteristics have been called preconditions for attributional search (Wong & Weiner, 1981), causal antecedents (e.g., Kanazawa, 1992; Moller & Koller, 1999), and numerous other names, but for this study they will be referred to as *precursors to causal search.* Some of the suggested precursors include an event being unexpected (Wong & Weiner, 1981; Kanazawa, 1992), negative (Wong & Weiner, 1981), important (Gendolla & Koller, 2001; Weiner, 1985), ambiguous or novel

(Weiner, 1983), stressful (Keinan & Sivan, 2001), and/or surprising (Gendolla & Koller, 2001). Personality factors have also been suggested as precursors to causal search, such as desire for control (Burger & Hemans, 1988; Keinan & Sivan, 2001).

Because relatively few studies have examined the different variables that affect the amount of causal search people elicit *concurrently*, the debate over which event characteristics produce the greatest amount of causal search remains unresolved. There has also been disagreement over *how many* factors instigate causal search, as some researchers suggest only one factor (e.g., unexpectedness, as proposed by Kanazawa, 1992) while others propose several factors interact to create the greatest increase in causal search (e.g., negative and unexpected events, proposed by Wong & Weiner, 1981; or important, surprising, negative events, as proposed by Gendolla & Koller, 2001). The current study addressed the issue of which event characteristics, or combination of event characteristics, elicit the greatest degree of causal search. In doing so, it is important to note that this study did not explore what factors contribute to which *specific attribution* is made, but investigated what event characteristics (unexpected, negative, and/or important) determine the *onset of causal search.* Weiner (1985) specifies in his model that a variety of other factors referred to as causal antecedents determine the specific attribution that is selected, which include personality traits, whether the person is an actor or an observer to the event, and so on, and examining these factors was not an objective of the current study.

Precursors to Causal Search

Since the introduction of attribution theory by Heider (1958), there has been general consensus that the process of attributional activity begins with people asking

"why?" A related and more profound question, "why do people ask why?", explores the broader issue of why people make causal attributions. Heider suggested people make attributions in order to understand their environment and render it *predictable* in the future. Weiner (1985) proposed attributions are made to determine the causes of *failure* in order for people to increase the likelihood of success in the future. Keinan and Sivan (2001) suggest that attributions are a coping response that people have to *stressful* situations and are made in order to obtain or maintain a sense of control over the environment. All of these explanations for attributions hint at reasons why people might engage in causal search.

Two of the most well documented precursors to causal search are event *valence*, which refers to whether an event is negative or positive, and event *predictability*, referring to whether or not an event is expected (Weiner, 1983). Weiner's review of articles noted seven studies that found negative events lead to more causal search than positive events, and six studies that found unexpected events lead to more causal search than expected events. Furthermore, Wong and Weiner (1981) discovered an interaction of event characteristics (negative and unexpected event) lead to an increase in causal search. However, since Weiner's review there have been several advances in research on the precursors to causal search in terms of event unexpectedness, valence, and importance.

Event unexpectedness. Heider (1958) suggested people seek to understand their environment and make it *predictable*. Logically, if an event is unexpected, the attributor would engage in a causal search to comprehend the reasons for that event's occurrence. Kanazawa (1992) provided empirical evidence that the unexpectedness of an event is the most critical precursor of causal search. In two experiments, subjects were asked to listen

to and then retell a story as if they were telling it to a friend who had not heard it before. Attributional activity was measured by counting the number of causal attributions that subjects spontaneously reported as they retold the story. Stories that involved an unexpected event were found to elicit more spontaneous causal attributions. Surprisingly, whether the story was positive or negative had no impact on the number of causal attributions that were made. The experiments by Kanazawa showed that events only need to be unexpected to elicit attributional activity, and that event valence did not have an effect. However, because unexpected and negative events tend to occur simultaneously (Gendolla & Koller, 2001), it is difficult to unravel which of the two factors makes the strongest contribution to causal search.

Other studies have also found evidence of unexpected events eliciting causal search; some of which occurred in non-achievement settings (Bettman & Weitz, 1983; Lau & Russell, 1980). This evidence provided additional support for the proposition that event valence does not have an effect on the activation of causal search (Clary & Tesser, 1983; Hastie, 1984; Pyszczynski & Greenberg, 1983). My hypothesis follows Kanazawa (1992) and others (Bettman & Weitz, 1983; Clary & Tesser, 1983; Gendolla & Koller, 2001; Hastie, 1984; Lau & Russell, 1980; Pyszczynski & Greenberg, 1983), who found unexpected events to be stronger precursors of causal search than expected events.

Event valence. The most hotly debated precursor to causal search is event valence; that is, the degree to which an event is deemed by the participants to be positive or negative. The controversy has resulted from past research finding support both for and against valence being a precursor to causal search. For instance, Weiner (1985) justified event valence as a precursor to causal search using the law of effect (Thorndike, 1905),

which states that organisms are motivated to terminate or prevent a *negative* state of affairs. Several studies across a number of areas have found support for Weiner's proposition that negative events elicit more causal search than positive events, including sports (Lau, 1984), gambling (Gilovic, 1983), and marriage problems (Holtzworth-Munroe & Jacobson, 1985; Holtzworth-Munroe & Jacobson, 1988).

Alternatively, several researchers have argued that there is little evidence to suggest negative events prompt more causal attributions than positive events. Kanazawa (1992) supported this point with the second half of the law of effect (Thorndike, 1905) which states that organisms will be *equally* motivated to continue or increase a *positive* state of affairs. Moeller and Koeller (1999) provided additional support for the position that positive events can elicit causal search by showing that receiving either success or failure feedback on an exam produces evaluative thoughts in students. Research from other attribution theorists has also suggested that both positive and negative events can elicit attributional activity in people. Abramson, Garber, and Seligman (1980), for example, reviewed several studies and found both good and bad events produce the motivational and cognitive deficits of helplessness in animals and humans. They argued that the common difference between non-contingent positive and negative events is when people experience failure they develop a sad affect whereas those who experience success do not.

Debate on this issue may be due to the misunderstanding by some researchers that past studies have found *only* negative events to elicit causal search (Miller & Norman, 1979). In general, past research has supported the point that both negative *and* positive events elicit causal search, but that negative events elicit *more* causal search. For

instance, a study by Bohner et al. (1988) found that students spontaneously made attributions following both positive and negative exam feedback, but those who encountered negative events exhibited a higher intensity of causal search and made more attributions than those who encountered positive events. Supported by Bohner et al. and others, the prediction for this study was that negative events would elicit *more* causal search than positive events, however causal search would still occur for positive events.

Event importance. When Weiner (1979; 1985) introduced his theoretical model, he proposed an additional precursor to causal search, event *importance*, which is whether or not a person considers an event valuable or not. Surprisingly, event importance has often been disregarded in studies of causal search. For instance, studies reviewed by Weiner (1983) that involved coding of written material from newspaper articles, business reports, letters and personal journals, were assessed as to whether unexpected or negative events led to more causal search. The studies neglected to mention that it was highly unlikely for any of the articles or letters to have been written *unless the events were important*. A similar problem is found in studies where students are told to imagine themselves expectedly or unexpectedly succeeding or failing a test and are then asked, "What questions, if any, would you most likely ask yourself" (Kanazawa, 1992; Wong & Weiner, 1981). It seems unlikely students would ask questions about a test if it were unimportant, as would be the case the test did not count towards the final grade the students received in the course.

Only recently has the importance of events been taken into account when predicting the degree of causal search. Gendolla and Koller (2001) examined event importance in the causal search process, and found important, negative, and surprising

events elicited the highest degree of causal search. Thus, the hypotheses for the current study was that students would engage in more causal search for important events that were negative, unexpected, or both. However, students would engage in little or no causal search about unimportant events, even if they were negative or unexpected. The caveat of event importance as a precursor is that a high amount of importance alone was not predicted to be a sufficient precursor for people to engage in causal search, the event also had to be unexpected and/or negative. As such, importance was not believed to have a main effect, however was believed to interact with expectedness and valence to increase causal search.

Multi-factor theories. To date there have been few studies that have found evidence of several variables simultaneously impacting attributional activity. Wong and Weiner (1981) conducted one of the first studies to identify multiple factors by showing that spontaneous causal search is most likely when events are negative and unexpected. However, their study did not test the impact of event importance on causal search, nor did they use actual events, but instead asked students to imagine themselves in hypothetical situations. More recently, Gendolla and Koller (2001) used a path analysis to test a chain of events leading to causal search. Their results showed: 1) event importance enhanced the expectancy of success; 2) confirmation (success) or disconfirmation (failure) of this expectancy determined the intensity of surprise (unexpectedness); and 3) surprise intensity, in turn, predicted the motivation for causal search, but only in the case of failure and not in the case of success. To date, their study has provided empirical evidence for the largest number of variables that simultaneously impact causal search. Based on the study by Gendolla and Koller, it was hypothesized that unexpected,

negative, and important events, when occurring simultaneously, will initiate the highest level of causal search in college students.

Several other precursors to causal search have also been suggested (Burger & Hemans, 1988; Gendolla & Koller, 2001; Keinan & Sivan, 2001); however, only the precursors specified by Weiner (1985), namely event expectancy, valence, and importance were addressed in the present study. Other precursors were not considered because the alternative precursors are already largely accounted for by the variables suggested by Weiner. For instance, stress-causing events (Keinan & Sivan, 2001) are often both negative and important which makes them stressful by definition (Abramson et al., 1980; Miller & Norman, 1978). Similarly, "surprising" (Gendolla & Koller, 2001) events are generally brought on by something unexpected. Burger and Heman (1988) suggested that people exhibiting high desire for control would engage in more causal search; however, this is a personality factor and this study will focus solely on event characteristics.

Attributional Retraining

Weiner's attribution theory (1985) states that the explanations students use for their academic outcomes can significantly influence their subsequent learning-related emotions and cognitions, in turn affecting their achievement striving behaviors. For instance, when a student attributes failure on a test to internal, stable, and uncontrollable cause, such as "I am stupid", this attribution can harm the student's motivation and performance. Weiner's (1985) theory postulates these maladaptive attributions decrease expectations for future success, causing damaging academic emotions such as shame

which, in turn, make students feel helpless and develop low self-esteem. This process can lead students to failure on their next test or even to dropping out of courses.

Attributional retraining (AR) is a psychotherapeutic intervention designed to modify maladaptive causal attributions for academic performance by students to attributions that are conducive to achievement striving and high-quality scholastic performance (Forsterling, 1985; Perry et al., 1993, Perry, Hall, & Ruthig, 2005). The goal of this type of intervention is to increase students' motivation and perceptions of control over academic events, thereby improving their future performance. AR is based on Weiner's (1985) attribution theory and is designed to increase academic motivation and positive affect by encouraging students to attribute negative events to internal, unstable, and controllable factors. Returning to the previous example, if the student would have said "I need to put in more effort" or "I used a bad strategy" following his or her failure, Weiner's theory would predict that the student would experience sustained academic motivation, increased positive emotions such as pride, hope, and/or guilt for not working harder in the past. After AR the student might be expected to spend more time studying and attending classes, resulting in him or her obtaining a higher mark on the next exam. Thus, AR is designed to influence certain cognitions (causal attributions) that are directly linked to students' motivation, emotion, and behavior, which should lead to more productive and positive functioning.

Early attributional retraining research. In one of the first reviews of AR research, Forsterling (1985) explored some of early studies that tested the effectiveness of attributional retraining. One of the first AR studies was carried out by Andrews and Debus (1978) who presented AR to sixth grade pupils who infrequently made effort

attributions on a circle design task. AR was given in the form of positive social reinforcement (i.e., saying "Very good!" to the pupils) or positive social reinforcement plus tokens each time a pupil made an effort attribution. Pupils who received AR made more effort attributions to success and failure on posttests than did the control group. The majority of early AR studies involved attempting to encourage children to make effort attributions for success and failure on tasks such as arithmetic (Dweck, 1975; Schunk, 1983), reading (Chapin & Dyck, 1976; Fowler & Peterson, 1981), and visual discrimination (Medway & Vinino, 1982).

Several years later, Perry et al. (1993) showed support for the effectiveness of AR in achievement settings for *college students* in an examination of 12 attributional retraining studies involving academic performances. In one of the first studies, Wilson and Linville (1982) focused on freshmen who were concerned about their academic performances and who had done poorly in their first semester at college. These freshmen were informed that students generally improved their grades the longer they remained in college in order to convince them that their grades were changeable (i.e., grades are unstable in Weiner's theory). As predicted, students who received attributional retraining had a significantly greater increase in GPA than those who did not, performed better on a standardized achievement test, and were less likely to leave college by the end of their sophomore year.

In questioning several of the long-term achievement findings, Block and Lanning (1984) performed a secondary analysis of Wilson and Linville's (1982) data and found that the students who dropped out of college actually had higher GPAs than those who remained. Also, when looking at the difference between GPA's of the two groups, the

AR group began with lower GPA's (by chance) than did the no-AR group, so the AR group's increased grades could be due to regression toward the mean. Wilson and Linville (1985) responded to these criticisms by replicating their original study two times after controlling for the criticisms pointed out by Block and Lanning (1984). Overall, the three experiments provided much clearer evidence that AR leads to an increase in short-term and long-term academic performances in college students. Van Overwalle and De Metsenaere (1990) later replicated these results using a videotape intervention consisting of students presenting reasons for their failure such as lack of peer cooperation, lack of effort, or ineffective study strategy. Again, the AR intervention resulted in higher GPAs for the experimental group of students than for the control group.

New directions in attributional retraining. More than a decade after the Perry et al. (1993) review, Perry et al. (2005) provided an updated of the recent attributional retraining research. They suggested past studies already showed AR to have a consistent, general effect for college students, a prominent objective of recent AR research has been to identify *distinct groups of students* who are most likely to benefit from AR. For example, early studies suggested that AR resulted in the greatest academic improvements for males (Wilson & Linville, 1985), those who received effective teaching (Menec et al., 1994), and those who were low in perceived success (Perry & Struthers, 1994). More recent studies found AR to interact with several other variables to increase academic performance, namely high optimism (Ruthig, Perry, Hall, & Hladkyj, 2004) and high elaborative learning strategies (Hall, Hladkyj, Perry, & Ruthig, 2004).

A major focus has also been on improving the performances of at risk students with AR, specifically students with low perceptions of control (Perry et al., 2005). A

pivotal study by Perry and Penner (1990) found that attributional retraining improved external, but not internal, locus of control students' performances on both lecture and homework assignments. This finding was buttressed by Menec et al. (1994) who found students with an external locus of control receiving effective teaching improved more than students who did not receive AR. More recently, Hall, Perry, Chipperfield, Clifton, and Haynes (in press) found students low in interpretive secondary control (i.e., positive reappraisal of negative events, Rothbaum, Weisz, & Snyder, 1982), who tend to be at-risk of academic failure, received more benefit from attributional retraining than students high in secondary control.

Attributional retraining and causal search. A main objective of this study was to determine whether the amount of causal search that students experience about their academic achievement relates to the effectiveness of the AR treatment intervention. Previous research has implied several linkages between causal search and AR; however these relationships have never been fully developed or tested. For instance, a study by Perry, Hladkyj, Pekrun, and Pelletier (2001) examined action control (i.e., preoccupation with failure), which pertains to the amount of attention students devote to their successes and failures arising from their goal striving, and perceived academic control, which concerns students' beliefs about the causes of their successes and failures. Using an academic control (moderate/high) by action control (low/high) 2 x 2 factorial design, a significant interaction was found for high-control and high-failure-preoccupied students who received higher final grades, a two-letter grade difference, in their introductory psychology course than students in the other three groups; moderate-control/high-failure

preoccupied, high-control/low-failure-preoccupied, moderate-control/low-failure-preoccupied.

One explanation Perry et al. (2001) suggested for the effect was that high-failure-preoccupied students are likely to be intensively focused on thinking about past failure experiences, a process they likened to engaging in higher levels of *causal search.* Also, Weiner (1985) suggested that controllable causes attributed to failure outcomes enhance achievement striving, which is what students high in perceived academic control do and what *AR* (a control-enhancing treatment) encourages in students. Therefore, the high failure preoccupation coupled with high academic control should intensify causal search and generate a type of causal attribution (controllable) believed by Weiner to optimally promote achievement striving in the presence of failure. This argument was tested in the current study, as students who were high in causal search were given a control-enhancing treatment (AR) that promoted controllable attributions, which should result in higher academic performance than students who did not receive AR and/or are low in causal search.

A rationale for a linkage between causal search and AR can also be found in a study by Hall et al. (2004) who examined the impact of AR on college students who either frequently or infrequently used elaborative learning strategies, or deep processing (e.g., paraphrasing, forming analogies or examples, and summarizing course materials in their own words). The authors found high elaborators who received AR showed improvements in perceptions of control, success, and emotions, as well as course-specific grades (i.e., introductory psychology final grade) and overall academic performance (i.e., grade point average). Causal search may be a comparable construct to elaborative

learning, as students high in causal search seem to be also engaged in deep processing of information, specifically with regards to identifying and labeling the causes of their failures. As such, an effect similar to that found by Hall et al. is hypothesized to be seen in the current study, whereby students high in causal search who receive AR will receive more benefits from AR than students who did not receive AR and/or are low in causal search. This is predicted because the high-causal search AR students will be more actively engaged in thinking about their past performance when AR is presented, and may be more likely to elaborate the material to their future performance.

Previous research has also found at-risk students have benefited the most from AR (Hall et al., in press; Menec et al., 1994; Perry & Penner, 1990). Students high in causal search may be at a higher risk of academic failure than students low in causal search because, according to Weiner's theory, they are experiencing more negative events (i.e., poorer test scores). The effectiveness of AR may be contingent on the amount of causal search students are engaged in at the time they are administered the intervention because causal search is an integral component of the attributional process that AR is based upon.

The hypothesized effect of causal search on AR was predicted to occur as follows: for students engaged in a high degree of causal search, it was expected they would be more receptive to the suggested controllable attributions AR presented to them; they would be more likely to use the attributions on past and subsequent tests; and consequently their academic performances would improve throughout the year. Alternatively, for students engaged in a low amount of causal search (or none at all), they would be looking less intensely for attributions for their performances; they would not

find the suggestions from AR valuable; they would be less likely to use the attributions AR suggested, and the effects of AR would be minimal. Specifically, AR students' introductory psychology grades would improve over the course of the year more than the grades of students in the control group because they were making more internal, controllable, and unstable attributions (e.g., to effort and/or strategy), which would result in more motivation and perceived control over their academic performance.

Overview: Precursors to Causal Search and Attributional Retraining

The present study addressed two main research questions. First, which precursor, or combination of precursors, to causal search proposed by Weiner (1985) will lead to the greatest amount of causal search for college students? This will be tested in two ways; *first*, hypothetical scenarios will be used to make students think about which types of events, unexpected, negative, and/or important, result in the most causal search, and *second,* measuring the unexpectedness, negativity, and importance of a real-life event, students first introductory psychology test, and testing the effects of the precursors on a measure of causal search. Based on the past research, the following hypotheses were made for both the scenario and real-life tests of the precursors to causal search:

1. Event unexpectedness was hypothesized to be the best predictor of students' causal search levels, with unexpected events eliciting more causal search than expected events (Wong & Weiner, 1981; Kanazawa, 1992).
2. Event valence was expected to be the second best predictor, with negative events eliciting more causal search than positive events (Gendolla & Koller, 2001; Wong & Weiner, 1981).

3. Event importance was predicted to be an essential element in eliciting causal search (Gendolla & Koller, 2001). For instance, for highly important events that are unexpected and negative causal search will be high. For an event of very low importance, however, only a low amount of causal search would occur, regardless of how unexpected or negative the event is to them.

4. Finally, it was predicted that a combination of all three precursors (an unexpected, negative, and importance event) would lead to the greatest amount of causal search by students (Gendolla and Koller. 2001).

The second research question in this study was: Does students' level of causal search during the AR treatment affect their reaction to the intervention as shown by their grades? Additionally, if causal search mediates the effectiveness of AR, what is the optimal amount of causal search for students to be engaged in to derive the most benefit from attributional retraining? These research questions will be tested by administering AR to half the students in the sample and testing the impact of the intervention on the final grades in their introductory psychology course. Based on previous research, the following hypotheses were made:

5. Students who receive AR would receive higher grades following the intervention (Perry et al., 2005).

6. Students engaged in more causal search would benefit to a greater extent from AR because they would be actively searching for attributions and be the most open to the suggestions made during the intervention (Weiner's, 1985).

Method

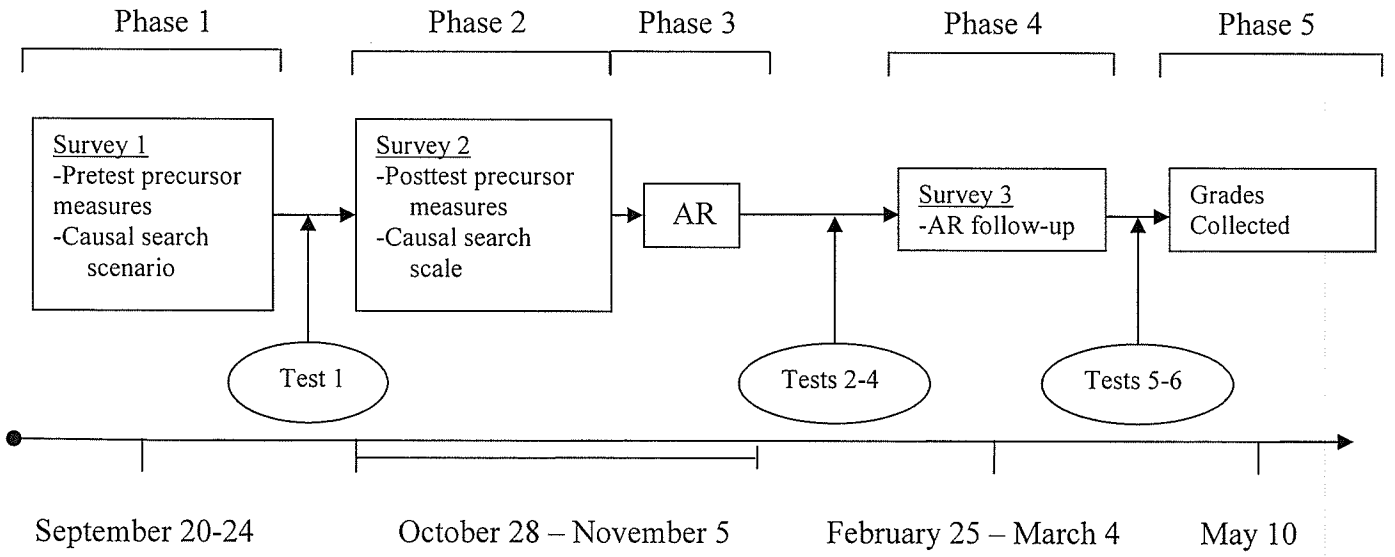
Participants

The participants were 710 university students enrolled in a large, mid-western Research-1 university. The students were recruited from five sections of a two-semester introductory psychology course to complete a four-phase experimental study assessing attitudes towards their university experiences. In exchange for their participation, students received credits towards their final grade in their introductory psychology course. This sample was seen as suitable for the research questions primarily because university students regularly encounter success and failure experiences in their courses that, according to Weiner (1985), force them to seek explanations.

At *Phase 1* (see Figure 1), approximately one month into the first semester, the sample consisted of 710 students, 438 females and 267 males (5 students did not indicate gender), most between the ages of 17 and 22 (89.8%), with the majority reporting English as their first language (86.7%). At *Phase 2*, approximately one month after Phase 1, the sample was reduced by 16.5% to 593 students, which may have been due to a variety of factors including forgetfulness, illness, unavailability during session times, and students withdrawing from the course or leaving university entirely. No attrition was seen at *Phase 3* as it occurred immediately following Phase 2.

Figure 1

Study Timeline



At *Phase 4*, approximately two months into the second semester, the sample was further reduced by 32.5% to 400 students (a 43.6% reduction from Phase 1). This reduction may have been due to the reasons mentioned above and because this phase was later in the year resulting in more students who had completed the experimental credits they required for the introductory psychology course. This Phase 2 to Phase 4 attrition rate is within the range of other studies conducted by this laboratory (e.g., 26% in Hall et al., 2004; 17% in Hall et al., in press). Chi-square analyses revealed no significant differences in attrition between the AR and no-AR groups, $\chi^2(1, N = 589) = .48, p > .05$, demonstrating that the proportion of students who attended Phase 4 was the same for the experimental and control groups.

Attrition also occurred in *Phase 5* when final grades were collected from introductory psychology professors at the end of the year, but to a much lesser extent. The total number of final grades received was 650, which is 91.5% of the original Phase 1 sample.

The low rate of attrition from Phase 1 to Phase 2/3 (16.5%) and from Phase 1 to Phase 5 (8.5%) is favourable because the three main analyses used data from these phases. The data involving the highest attrition rate, 32.5% from Phase 3 to Phase 4, was still lower than the rates in previous studies by researchers from this laboratory (e.g., 55% in Perry et al., 2001), and was only used in one analysis that was supplementary to a main analysis. As a result, attrition was believed to have very little impact on the studies results.

Causal Search Scenarios

This study used both hypothetical scenarios and real-life events to examine the impact event characteristics have on the amount of causal search students engage in. First, students were given scenarios to test what event characteristics they will *report* as eliciting the most causal search. This scenarios were created with the goals of replicating and expanding previous studies that have used scenarios to test how much causal search students engage in (e.g., Gendolla & Koller, 2001; Kanazawa, 1992; Wong & Weiner, 1981).

During Phase 1 students completed the Determinants of Causal Search exercise (see Appendix A) that contained two sets of four scenarios (eight scenarios in total). In the *first set* of scenarios, each student was asked to: "Imagine receiving a grade on a test worth 40% of your final course grade. After reading each statement, please rate how much time you would spend thinking about why you got the mark you did using the scale provided." This description was followed by four scenarios representing unexpected or expected and negative or positive events, which were derived from scenarios previously used by Wong and Weiner (1981). An example of one scenario is "You failed the exam, and it was unexpected because you usually do well in that subject", which is the unexpected failure condition. A key addition to this exercise was manipulating event importance, which was *not* done in the original study by Wong and Weiner (1981). For this set of scenarios, the *high contribution* of the test to their final grade (40%) is intended to make this an important event for most students. Students responded to the scenarios on a seven-point Likert scale (1 = *No time*, 7 = *Lots of time*) with higher scores signifying more causal search.

In the *second set* of scenarios, each student was again asked to imagine receiving a grade on a test, however, the test was worth "only 5%" of his or her final course grade. The relatively small contribution of this test towards the final grade was intended to make this a relatively *unimportant event* for most students. The description of this situation was followed by the same four scenarios representing unexpected or expected and negative or positive events, which they are asked to respond to on the same seven-point Likert scale (1 = *No time*, 7 = *Lots of time*).

Predictor Measures

The second method of examining Weiner's (1985) precursors to causal search was to analyze students' causal search levels following an unexpected, negative, and/or important event that they *actually experienced* (see Appendix B for all items). The event used was student's first test in their introductory psychology course. Students were asked questions about their expectations, perceived success, and perceived importance regarding their first test in order to examine: 1) a real life situation of how event characteristics impact causal search; and 2) how causal search affects the impact of attributional retraining on academic achievement. Very few past studies have used actual events that participants are experiencing to examine the factors that elicit causal search, as such this represents a significant advancement in causal search research (e.g., Moller & Koller, 1999).

Event unexpectedness. Prior to their first test (Phase 1) students were asked, "What exact percentage do you expect to get on your first introductory psychology test?" Responses that ranged from 0% to 36% (19 scores equalling 2.6% of the sample) were considered outliers as they were clearly separated from the other responses based on

visual inspection of the distribution. These scores were recoded as missing data and excluded from further analyses. Students mean expected grade was 81.24% (*SD* = 8.23%) and, when taken together, the responses formed a fairly normal distribution ranging from 55% - 100% (Skewness = -.39, Kurtosis = .36).

Students' responses to the expectation item were subtracted from their first test score resulting in a difference score that reflected the *unexpectedness* of their test score. For this variable, a high positive number indicated an unexpected positive first test score, numbers close to zero indicate an expected first test score, and a negative number indicates an unexpected negative first test score. Finally, because the difference score contained an element of event valence (how positive or negative students' first tests were) the absolute value of the difference score was taken, resulting in low scores indicating an expected event and high scores indicating an unexpected event (*M* = 14.87, *SD* = 11.85, range = .00 – 54.70). As expected, the distribution was positively skewed (Skewness = .94, Kurtosis = .20) because most students achieved grades close to their expectations and extremely unexpected scores were less common. To account for the non-normality of the variable, a square-root transformation was performed which reduced the positive skewness and made the distribution much more normal (Skewness = .13, Kurtosis = -.76). The resulting transformed variable was used in all further analyses (*M* = 3.38, *SD* = 1.64, range = .00 – 7.40).

As the measure of unexpectedness for this study was a newly created variable, the concurrent (or criterion) validity of the item was tested using a second measure of unexpectedness that was taken *after* the students first test (Phase 2). The post-test item was "How unexpected was your grade on your first introductory psychology test?" (1 =

Exactly what I expected, 7 = *Very unexpected*; $M = 3.92$, $SD = 1.68$, range = 1-7). The pre- and post-test unexpectedness items correlated at $r = .39$, which was significant at the $p = .01$ level, suggesting the pre-test item was measuring what it was supposed to be measuring: the unexpectedness of the first test. A low but significant correlation was expected as students' expectations of their test score may have changed after writing the test for several reasons, such as saying they actually expected a lower grade to protect their self-perception in case of failure, or this may have been the *very first* test in university for some students and they may have had little experience to base their expected grade on.

Event valence. Event valence was assessed by students' subjective estimates of what they considered to be a failure on their first test. Based on an item used by Wong and Weiner (1981), prior to students' first test (Phase 1) they were asked "With regards to your first introductory psychology test, for you personally doing poorly means a grade of _____ or less" (1 = *50%*, 2 = *55%*,…, 10 = *95%*). Once scores were recoded into the actual percentages (i.e., 1 recoded to 50, 2 recoded to 55, etc.), the $M = 67.70$, $SD = 9.63$, range = 50-95, and the responses formed a distribution close to normal (Skewness = .01, Kurtosis = -.39). Students' first test scores were subtracted from the failure estimate item, resulting in a scale where high positive numbers indicate the first test was a very negative event, high negative numbers indicated it was a very positive event, and numbers near zero indicated a neutral event ($M = -3.12$, $SD = 14.56$, range = -44.30 to 46.40, Skewness = .46, Kurtosis = .17).

As the measure of valence for this study was also a newly created item, the concurrent validity of this item was also tested with a second measure of valence that was

given *after* the first test (Phase 2). Event valence was assessed using the item, "How successful do you feel you are in your introductory psychology course this year?" on a 10-point Likert scale (1= *Very unsuccessful*, 10 = *Very successful*), $M = 6.66$, $SD = 1.93$, range = 1-10. This pre- and post-test valence items correlated at $r = -.46$, which was significant at the $p = .01$ level. The negative correlation was expected because the pre-test item measured how negative the first test was and the post-test item measured how positive. Once again the correlation between the pre- and post-test measures was not very high because students may change their opinion of what they consider to be a success or failure after writing the test (for example, if the test was difficult and the student passed they may consider it a success because the test was very challenging).

Event importance. Four questions asked students how important they considered their first test in their introductory psychology course. Prior to taking their first test (Phase 1), to quantify the importance of the first test, students were asked, "How important do you consider your first introductory psychology test grade?", on a seven-point Likert scale (1 = *Not at all important*, 7 = *Very important*; $M = 6.25$, $SD = .99$, range = 1-7, Skewness = -1.61, Kurtosis = 3.22). Students were also asked, "How important do you consider your introductory psychology course?", on the same seven point scale ($M = 5.67$, $SD = 1.18$, range = 1-7, Skewness = -.77, Kurtosis = .34). The reason students were asked how important their first test and their introductory psychology course is separately was because students may place importance on their first test score for different reasons. For example, students who are performance oriented may consider their grade important only because getting high grades gives them approval from

others. Alternatively, students who are mastery oriented may consider the course, and not the test, important because they consider the course content to be useful and valuable.

The second set of importance measures gave students a relative context to gauge how important the test was. Prior to their first test, students were asked, "How important do you consider your first introductory psychology test grade compared to your first test grade in other courses?", on a seven-point Likert scale (1 = *Not very important*, 4 = *Equally important*, 7 = *Very important*), $M = 4.34$, $SD = 1.00$, range = 1-7, Skewness = .87, Kurtosis = 1.58. The second comparative importance question was, "Compared to other courses you are taking, how important do you consider your Introductory Psychology course?", which was measured the same seven point scale ($M = 4.24$, $SD = 1.13$, range = 1-7, Skewness = .33, Kurtosis = .77).

Several preliminary analyses were completed to decide which importance item, or what set of importance items, were to be used in the main analyses. First, the four importance items were correlated with each other (see Table 1). The two items involving comparisons with other tests or courses were the most strongly correlated ($r = .66$), while the other two importance items were also positively correlated ($r = .38$). Next, a factor analysis was conducted and the results of the scree plot and factor eigenvalues (1.92, 1.19) suggested two factors (see Table 2). An oblique oblimin rotation showed that the first factor was comprised of the two 'comparative importance' items and the second factor of the two non-comparative or 'direct importance' items. An oblique factor rotation was used because the two factors were expected to be correlated with each other.

Table 1

Zero-order Correlations among Importance Variables

Variable	1	2	3	4
1. Importance test grade	-			
2. Importance course	.38**	-		
3. Importance test grade compared to	.07	.19**	-	
4. Importance course compared to	.03	.39**	.66**	-
Mean	6.25	5.67	4.34	4.24
Standard deviation	0.99	1.18	1.00	1.13

* $p < .05$ ** $p < .01$

Table 2

Oblimin Pattern and Structure Matrix for Importance Items

	Pattern Component		Structure Component	
Variable	1	2	1	2
1. Importance test grade	-.173	.895	-.017	.865
2. Importance course	.266	.747	.397	.793
3. Importance test grade compared to	.895	-.054	.886	.102
4. Importance course compared to	.909	.060	.920	.219

The two sets of importance items were summed to create two scales, a direct importance scale (M = 11.92, SD = 1.82, range = 2-14, Skewness = -1.14, Kurtosis = 2.29) and a comparative importance scale (M = 8.58, SD = 1.93, range = 2-14, Skewness = .66, Kurtosis = .99). The two scales were significantly positively correlated (r = .24, p < .01, two-tailed), suggesting the two scales are similar. When the distributions of the two scales were visually examined, a major problem with the comparative importance scale was immediately recognized, which was 46% of the scores were at the midpoint of the scale. This result occurred due to a large number of students considering the importance of their first test and their introductory psychology course to be equally important to their first test in other courses. The same four importance items were also given to student's after their first test during Phase 2. By correlating the pre-test combined items with the post-test combined items it provided a measure of concurrent validity. The post-test scales showed a significant positive correlation with each of the pre-test scales (r_{direct} = .49, $r_{compare}$ = .51), suggesting both scales are valid measures of importance.

The direct importance scale was chosen for the main analyses for two reasons. First, statistically the above analyses suggest that the two scales are very similar; however, the comparative importance scale has a limited range due to almost half of the students' responses equalling the midpoint. Second, logically the direct importance scale provides a parallel measure to the other measures of the precursor to causal search. For instance, an alternative measure of event unexpectedness could have been, "How unexpected was your first test score compared to your first test scores in other courses?" For these reasons, the direct importance scale was chosen for the main analyses. Prior to

the analyses the direct importance scale was transformed by squaring the values to reduce the scale's negatively skewed distribution (M = 145.35, SD = 40.08, Skewness = -.52, Kurtosis = -.19).

Attributional retraining. Following the post-test questionnaire measuring the precursors to causal search (Phase 2), attributional retraining was administered to approximately half (n = 288) of the students in the study (i.e., AR group). The no-attributional retraining (i.e., no-AR, n = 305) group received no treatment following the questionnaire to balance the effects of the attributional retraining session as past AR research from this laboratory on the effects of a filler treatment session for the control group has no effect (Perry et al., 1993).

The AR for this study consisted of five main components. *First*, the *pre-testing* component took place during Phase 1 when students completed a questionnaire asking them about their academic experiences in their introductory psychology course and in university in general. In this phase, important information regarding the precursors to causal search was obtained. *Second*, students' first introductory psychology course test was used for *causal search activation* and at Phase 2 they are asked to reflect on their performance on that course test. Together, these first two AR components were intended to get students thinking about their academic performance so far that year and their explanations and attributions for that performance. All students completed the first two components of AR.

The following two components make up the treatment portion of the cognitive intervention and take place at Phase 3, immediately following causal search activation. Only the students selected to receive AR completed the following two components. The

third component is considered *induction* during which students are explicitly encouraged to make adaptive rather than maladaptive attributions for their academic performances. For this, students were administered a one-page hand-out describing maladaptive attributions for poor performance listed in a column on the left side, and more adaptive attributions listed on the right side (see Appendix C). The researcher discussed the material, citing an example of changing a maladaptive attribution for poor performance (e.g., "I am stupid) to a more adaptive attribution (e.g., "I didn't study enough"). The researcher also informed the participants that past research has shown that students who change their negative explanations about poor performance on the left-hand side to positive explanations on the right side tend to achieve higher grades in their courses. The participants were then instructed to read the hand-out carefully on their own.

The *fourth* component is considered a *consolidation* exercise and is intended to have students apply the AR information to their own academic experiences. This took place once the students were finished reading the handout and were asked to complete a writing exercise dealing with personal attributions and experiences (see Appendix D; Hall et al., in press; Pennebaker, 1997). The students were given 15 minutes to complete the writing exercise after which they left the room.

Finally, the *fifth* component, called the *follow-up*, took place several months after the treatment at Phases 4 and 5. All of the students in the study completed this component. The component took place at Phase 4 when students completed a self-report questionnaire which assessed academic attributions and various other academic perceptions. The component also took place at Phase 5 when academic achievement

measures such as students test grades, final percentage, and overall letter grades for the introductory psychology course were obtained from the professors who taught the course.

Criterion Measures

Causal search. During Phase 2 (after first test) students completed a seven item scale measuring the amount of causal search they engaged in after their first test in their psychology course. The scale involved six thoughts or ideas students who are engaging in causal search may consider when their test score is returned. The scale began with, "The following is a list of things people sometimes *think* after they get a test score back. When you learned your *first introductory psychology test score*, did you *think about* any of the following? If you did, for how long?" A few example items are "I didn't study hard enough" and "I don't have the right skills to make it through the course". Students responded to each item on a seven-point Likert scale (1 = *Not at all*, 7 = *For a long time*) such that high scores indicated a high amount of causal search. The scale included one distracter item, "I'll do better next time", which was removed prior to analysis.

Several preliminary analyses were conducted to explore if the six items could be appropriately combined to form a causal search scale. First, an exploratory factor analysis was conducted to uncover the underlying structure of the items. The results suggested the items represent a single factor based on visual inspection of the scree plot, a single eigenvalue greater than one (3.28), and all six items strongly loading on the first factor (factor scores ranged from .64 to .84). Second, a reliability analysis revealed a Cronbach's $\alpha = .81$ and the corrected item-total correlations were all positive and moderately high (ranged from .51 to .71). Results from this analysis suggest the six items are consistently measuring the same construct. Following this analysis the six items were

summed to form the causal search scale (M = 15.97, SD = 6.84, range = 6-37) and was found to have a near normal distribution (Skewness = .39, Kurtosis = -.43). Finally, a check of the scale's concurrent validity was conducted by correlating the scale with a separate measure of causal search. In Phase 2 students were asked to respond to the item, "I have spent a great deal of time and effort searching for the reason(s) why I received the mark I did on my first introductory psychology test", on a seven-point Likert scale (1 = *Not at all true of me*, 4 = *Moderately true of me*, 7 = *Very true of me*) (M = 3.13, SD = 1.67, range = 1-7). This single item was intended to be a direct measure of causal search. The scale correlated with the item at r = .51, which was significant at the p = .01 level, suggesting the scale had concurrent reliability and was, in fact, measuring students' level of causal search regarding their first test.

Academic achievement. The introductory psychology professors were contacted at the end of the year to retrieve the test grades and final course grades for all consenting students. Having actual achievement measures was a tremendous advantage to this study because it increased the generalizability to other achievement settings, which is a claim the majority of past studies cannot make as they have predominantly used scenarios to simulate achievement settings. Final course grades are the weighted averages of the students' performances on all tests, assignments, and papers, as well as their participation in psychology experiments (including this study) throughout the year. As this study was interested in student's achievement *after* they received attributional retraining, the achievement measure used in the main analysis was the students average test score after they received AR, which were those tests after their first test (M = 70.12, SD = 13.09, range = 16.88 – 100.00, Skewness = -.14, Kurtosis = -.42).

Causal attributions. At Phase 4, several months after AR was administered, students completed two 7-point Likert scale measures (1 = *Not at all*, 7 = *Very much so*) assessing the extent to which they attributed university performances they considered poor, or less than they were expecting, to a lack of *effort* ($M = 5.04$, $SD = 1.57$, range = 1 - 7), and a lack of *strategy* ($M = 4.17$, $SD = 1.49$, range = 1-7).

Procedure

Data collection was broken down into five phases (see Figure 1): Phases 1, 2 and 3 took place early in the first semester, Phase 4 in the second semester, and Phase 5 at the end of the academic year. *Phase 1* occurred shortly before students wrote their first test in introductory psychology (September 20 to 24). Students completed a brief questionnaire (approximately 20 to 25 minutes) containing items that measured demographic characteristics of the students (gender, age, first language, number of years in university), the Determinants of Causal Search exercise, the pre-test measures of the precursors to causal search, and a number of distracter scales.

At the conclusion of Phase 1 students signed up for *Phase 2* sessions. Once all the students in the study had signed up for Phase 2 they were randomly selected to either receive attributional retraining (AR group) or no attributional retraining (no-AR group). Phase 2 took place shortly after the students received feedback on their first test (October 28 to November 5). The performance feedback provided students with an appraisal of their academic capabilities within the university context, in contrast to their recent high school experiences, and in many cases was expected to encourage a "causal search" for attributions for their performance (Weiner, 1985). During the sessions, all students filled out another set of questions that included the post-test precursors of causal search

measures, the causal search scale, and a number of distractor scales not related to the main research questions of this study. *Phase 3* took place following the completion of the questionnaire, at which time students in AR (experimental) group sessions remained to receive attributional retraining, while students in the no-AR (control) group sessions were free to leave.

Phase 4 occurred at approximately the half-way point of the second semester (February 25 to March 4) at a time when students had completed approximately four tests in introductory psychology. Students from both the AR and no-AR groups completed a follow-up questionnaire comprised predominantly of items measuring their attributions, emotions, and perceived control. *Phase 5* took place at the end of the academic year when test scores and overall final grades were obtained from the introductory psychology professors of consenting students.

Results

Determinants of Causal Search Exercise

Rationale for the analyses. An expectation (expected/unexpected) x valence (positive/negative) x importance (low/high) 2 x 2 x 2 within-subjects ANOVA was used to examine the impact of Weiner's (1985) three precursors to causal search and to examine the factors students believe elicit the highest amounts of causal search. Three main effects and a three-way interaction were predicted. Specifically, it was hypothesized that students believe unexpected, negative, and important events elicit the most causal search both alone and together. Partial eta squared (η^2) was used as the measure of the amount of total variance accounted for by each main effect and interaction effect, taking into account sample size, and was used as a measure of the practical significance (as

opposed to statistical significance) of each effect. No attrition was present for these analyses because the data were collected at Phase 1. However there was some missing data as 19 students incorrectly gave responses to the scenarios outside the seven-point Likert scale (e.g., eight or nine) and had to be eliminated from the analysis. As a result the sample was reduced from 710 to 691 students.

Main analyses. Three significant main effects revealed students believed each of the three precursors would impact the amount of causal search they engage in (see Table 3). Event unexpectedness had the largest effect on reported causal search, $F(1,690) = 319.15$, $p < .001$, $\eta^2 = .32$. Students said they would think more about a test result if it was an unexpected result (*M*s = 4.21 vs. 3.22). Event importance had the second largest effect, $F(1,690) = 239.59$, $p < .001$, $\eta^2 = .26$. Students said they would think more about the result of a test that was worth 40% compared to 5% of their final course grade (*M*s = 4.02 vs. 3.42). Event valance had the smallest main effect, $F(1,690) = 108.33$, $p < .001$, $\eta^2 = .14$. Students said they would think more about a negative event than a positive event (*M*s = 4.02 vs. 3.41).

The three two-way interactions and the three-way interaction were all significant at the $p < .001$ level; however, based upon η^2, one interaction was of greater practical significance than the other three. The event unexpectedness by valence was the strongest two-way interaction, $F(1,690) = 170.21$, $p < .001$, $\eta^2 = .20$ (the other interactions ranged from $\eta^2 = .04$ to $\eta^2 = .02$; see Figure 2). To probe the interaction all possible paired-samples t-tests were computed using a bonferroni adjusted alpha level ($\alpha = 6 / .05 =$

Table 3

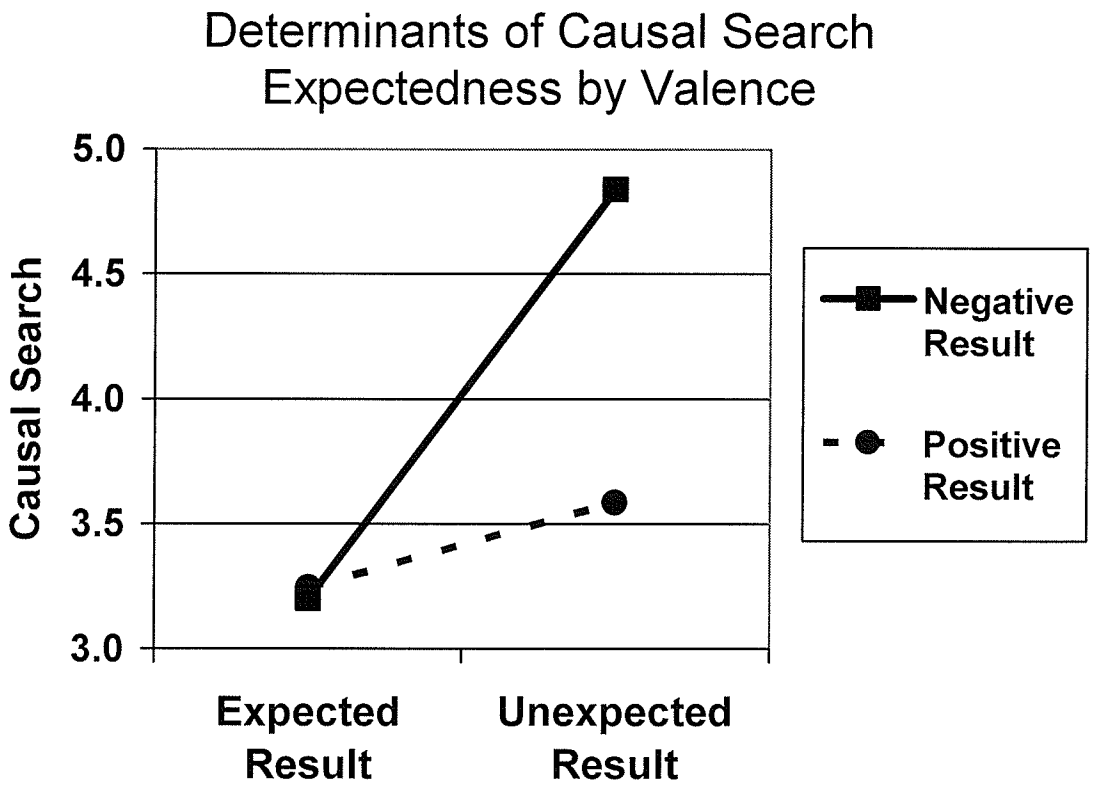
F Table for Determinants of Causal Search Main Effects and Interactions

Measure	*MSE*	*MSW*	*F*	*p*	*Partial* η^2
Unexpectedness (UNEXP)	4.24	1352.16	319.15	.000	.32
Valence (VAL)	4.66	504.50	108.33	.000	.14
Importance (IMP)	2.06	493.69	239.56	.000	.26
UNEXP X VAL	3.43	583.51	170.21	.000	.20
UNEXP X IMP	0.97	27.51	28.42	.000	.04
VAL X IMP	0.95	12.80	13.46	.000	.02
UNEXP X VAL X IMP	0.76	12.23	16.14	.000	.02

Note: Numerator $df = 1$ and denominator $df = 690$ for all tests.

Figure 2

Determinants of Causal Search Expectation by Valence Two-way Interaction



.008). Overall, students reported that unexpected/negative events resulted in more causal search than unexpected positive events ($M_{unexpneg}$ = 4.84 vs. $M_{unexppos}$ = 3.58), $t(690)$ = 17.71, $p < .008$, and that expected events were not affected by valence (M_{expneg} = 3.20 vs. M_{exppos} = 3.24), $t(690)$ = -.56, $p > .008$.

Precursors to Causal Search

Rationale for the analyses. Multiple regression analyses were used to determine the precursors and the combination of precursors that had the greatest effect on the onset of causal search. The dependent variable for this analysis was the causal search scale. In the first step, age, gender, and English as a first language (yes or no) were included in the regression as covariates to account for any differences that may result from these demographic factors. These demographic factors were included as the impact of the different precursors to causal search may be affected by students who have had more life experience, who are male or female, or who are from different cultural backgrounds. The covariates were followed by the three precursors (event expectedness, event valence, and event importance) were included individually to measure first-order effects and to answer the question of which precursor has the largest individual effect on causal search. In the second step the three two-way interactions were included, and in the third step the three-way interaction was included to test if some combination of precursors provided a strong prediction of causal search. The simple slopes of all significant interactions were tested to examine the nature of the effects.

It was hypothesized that unexpected events would elicit the greatest amount of causal search. Furthermore, the valence by unexpected interaction was expected to be the most significant two-way interaction, because the other two interactions contained

importance which was believed to be a mitigating variable as opposed to a catalyst on its own. It was also predicted that the three-way interaction would be significant, where unexpected, negative, and important events would be elicit the most causal search.

Correlations. As a preliminary analysis, correlations were conducted between all the variables used in the model (see Table 4). The largest correlation was between event unexpectedness and valence ($r = .71$), which was predicted because negative events tend to be unexpected. Both event unexpectedness and valence had relatively small correlations with event importance ($r = .17$ and $r = .14$, respectively), suggesting the perceived importance of an event is relatively orthogonal to how unexpected and negative an event is. The small correlations also suggest event that importance is a more autonomous precursor to causal search from both event unexpectedness and valence. Event unexpectedness and event valence both had moderately strong positive correlations with causal search ($r = .44$ and $r = .50$, respectively), suggesting unexpected and negative events elicit more causal search. As predicted, event importance did not significantly correlate with causal search ($r = .04$), suggesting that importance is not a strong precursor to determine if causal search will occur. English as a first language was the only demographic variable that was significantly correlated with causal search ($r = .15$), suggesting that students who did not learn English as a first language engaged in more causal search.

Main analyses. In the *first step* of the multiple regressions, three covariates (age, gender, and English) and three main effect variables (event unexpectedness, valence, and importance) were included in the analyses to examine the individual effects of the three

Table 4

Zero-order Correlations among Precursors to Causal Search Variables

Variable	1	2	3	4	5	6	7
1. Age	-						
2. Gender	.04	-					
3. English	.14**	.03	-				
4. Unexpectedness	.09*	.02	.14**	-			
5. Valence (negative)	.05	.05	.15**	.71**	-		
6. Importance	.08*	-.16**	.06	.17**	.14**	-	
7. Causal search	-.03	-.05	.15**	.44**	.50**	.04	-
Mean	1.91	1.38	1.13	3.38	-3.12	145.35	15.97
Standard deviation	1.28	0.49	0.34	1.64	14.56	40.08	6.84

* $p < .05$ (2-tailed) ** $p < .01$ (2-tailed)

Note. Cell sizes differ (n = 707 – 474) as a function of the point in time at which the measures were collected and due to missing values for some measures.

precursors to causal search (see Table 5). The three covariates and the importance variable were centered prior to being entered into the analysis because these variables did not have meaningful zero points, a procedure based on the recommendation of Cohen, Cohen, Aiken, and West (2003). This was done in order to yield more straightforward and meaningful interpretations of each first-order regression coefficients, and has no effect on the estimates of the interactions. The unexpectedness and valence variables were not centered prior to being entered into the first step because zero was a meaningful value for both variables.

Event valence was the largest predictor of causal search ($\beta = .37, p < .001$), as more negative events led students to engage in more causal search. Event unexpectedness was also a significant predictor of causal search ($\beta = .19, p < .001$), as more unexpected events led students to engage in more causal search. As hypothesized, event importance did not significantly predict causal search ($p < .05$), which again supported the hypothesis that event importance alone is not a powerful enough precursor to provoke causal search on its own. None of the three covariates, age, gender, or English as a first language, significantly predicted causal search.

In the *second step* of the analysis, the three two-way interactions were entered along with the previously mentioned variables. The multiplicative interaction terms were created using centered variables for event unexpectedness, valence, and importance to reduce multicollinearity (Cohen et al., 2003). With the inclusion of the interaction terms, event valence and event unexpectedness still predicted causal search individually ($\beta = .44, p < .001$; $\beta = .18, p < .01$, respectively). As hypothesized, the strongest two-way interaction was between event unexpectedness and event valence ($\beta = -.13, p < .05$)

Table 5

Regression Coefficients and R^2s for Regressions on Causal Search

	Step 1			Step 2			Step 3		
Variable	*B*	*SE B*	β	*B*	*SE B*	β	*B*	*SE B*	β
Age	-.28	.23	-.05	-.26	.23	-.05	-.25	.23	-.05
Gender	-.66	.57	-.05	-.52	.58	-.04	-.55	.57	-.04
English	1.26	.82	.06	1.59	.83	.08	1.76	.83	.09*
Unexpectedness	.81	.23	.19***	.77	.23	.18**	.76	.23	.18**
Valence (negative)	.18	.03	.37***	.22	.03	.44***	.23	.03	.47***
Importance	-.01	.01	-.08	-.01	.01	-.07	-.003	.01	-.01
EXP X VAL	-	-	-	-.03	.01	-.13*	-.03	.01	-.13*
EXP X IMP	-	-	-	-.01	.01	-.04	-.01	.01	-.06
VAL X IMP	-	-	-	.001	.001	.11*	.002	.001	.17**
EXP X VAL X IMP	-	-	-	-	-	-	-.001	.000	-.12*
Adjusted R^2			.27			.28			.28

* $p < .05$ ** $p < .01$ *** $p < .001$

Note. $\Delta R^2 = .012$ from step 1 to step 2 is significant at $p < .05$, and $\Delta R^2 = .007$ from step 2 to step 3 is significant at $p < .05$.

meaning the relationship between causal search and event valence depends on the level of unexpectedness.

To further examine the interaction, three simple slopes of the unstandardized regression coefficient were calculated. Three values of event valence were chosen, one to represent a negative event (one standard deviation above the mean = 10.05), a neutral event (0.00), and a positive event (one standard deviation below the mean = -18.19). These three values were entered into the regression equation with the minimum and maximum values of event unexpectedness which represented an expected event (0.00) and a highly unexpected event (7.40). The positive and neutral event lines each had slopes significantly different from zero [$t(459) = 4.1776, p < .001$; $t(459) = 3.386, p < .001$, respectively], however the slope of the negative event line was not significant (see Figure 3). Overall the interaction suggested students engaged in more causal search for negative expected events than positive expected events; but as events became more unexpected students engaged in causal search about positive events to the same extent as they engaged in causal search about negative events.

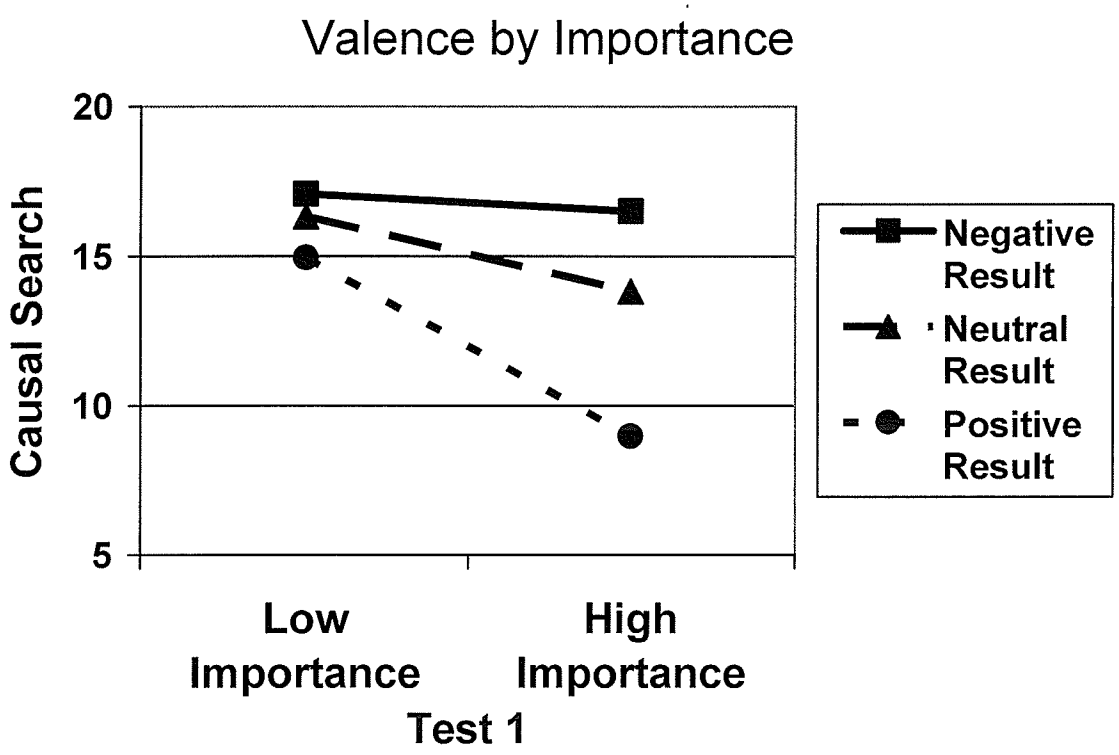
Surprisingly, a significant interaction was found between event valence and event importance ($\beta = .11, p < .05$). The simple slopes of this interaction were tested in the same manner, with the same three event valence values, and the minimum value of event importance representing an event of low importance (-141.38), and the maximum value of event importance representing a highly important event (50.62). The positive event lines had a significant slopes [one-tailed $t(459) = -1.86, p < .10$] and the neutral event line approached significance [one-tailed $t(459) = -1.60, p = .11$], however the negative event line was clearly non-significant (see Figure 4). Overall this interaction suggests students

Figure 3

Two-way Expectation by Valence Interaction on Causal Search

Figure 4

Two-way Valence by Importance Interaction on Causal Search



engaged in the most causal search about negative events, regardless if the event was considered important or not. Interestingly, students who experienced more positive events engaged in less causal search as those events become more important events.

In the third and *final step* of the multiple regression, the two first-order effects remained significant, the two second order effects also remained significant, and a significant three-way interaction emerged ($\beta = -.12$, $p < .05$). To examine the three-way interaction, subjects were divided into two groups using a median split on event importance, resulting in one group representing lower event importance ($n = 164$) and one group representing higher event importance ($n = 305$). The split was based upon two factors; 1) a median split resulted in the closest approximation to equal group sizes, and 2) visual examination of the distribution of the importance variable suggested two groups, one high in importance and one low. Event importance was chosen to divide the subjects because it was hypothesized this variable moderates the relationship between event unexpectedness and valence. A one-step multiple regression was then run separately for each group (see Table 6). The regressions contained the three covariates, event unexpectedness and valence entered as first-order effects, and the unexpectedness by valence two-way interaction term.

For low importance students, event unexpectedness and valence where both significant ($\beta = .24$, $p < .01$; $\beta = .25$, $p < .01$, respectively); and the interaction was not significant (see Figure 5). For high importance students, event unexpectedness approached significance ($\beta = .12$, $p = .07$), event valence was highly significant ($\beta = .61$, $p < .001$), and there was a significant expectedness by valence interaction ($\beta = -.22$, $p = .001$; see Figure 6). These analyses suggest that students who experienced an event they

Table 6

Regression Coefficients and R^2s for Regressions on Causal Search Split on Event Importance

	Low Event Importance			High Event Importance		
Variable	*B*	*SE B*	β	*B*	*SE B*	β
Age	-1.52	.48	-.22***	.12	.25	.02
Gender	-.95	.95	-.07	-.31	.71	-.02
English	2.57	1.68	.11	1.36	.93	.07
Unexpectedness	1.05	.38	.24**	.50	.28	.12
Valence (negative)	.13	.05	.25**	.30	.04	.61***
EXP X VAL	.003	.02	.01	-.05	.02	-.22**
Adjusted R^2			.23			.33

* $p < .05$ ** $p < .01$ *** $p < .001$

Figure 5

Low Importance Expectation by Valence Interaction on Causal Search

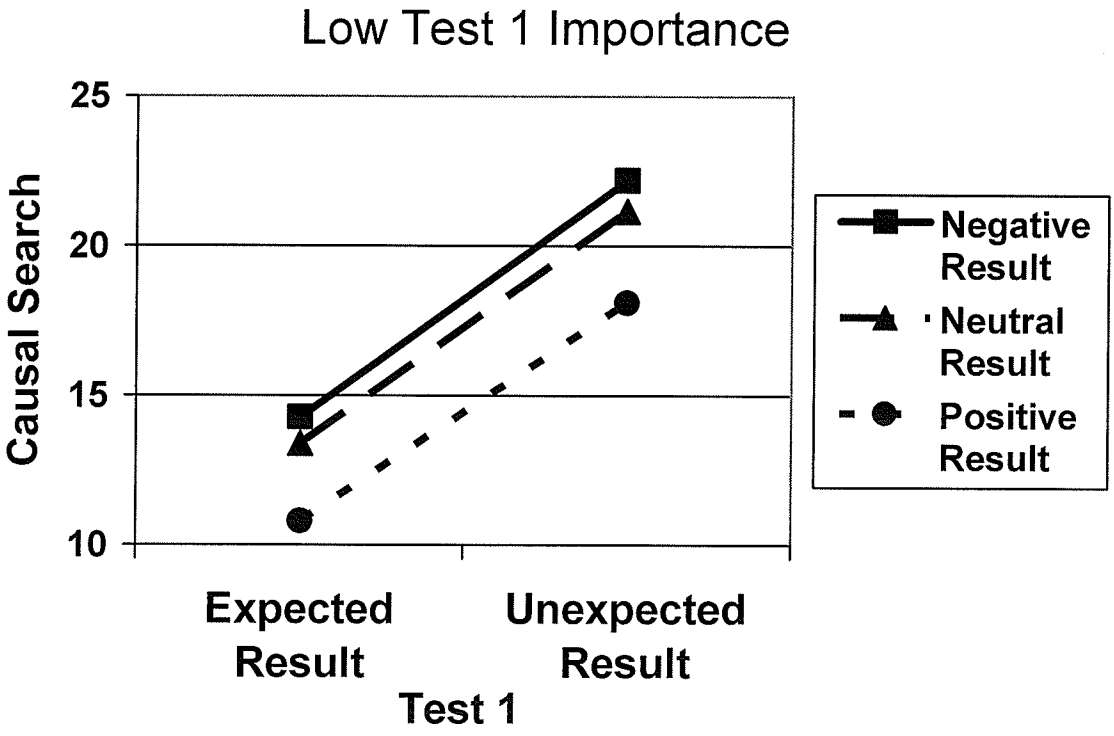
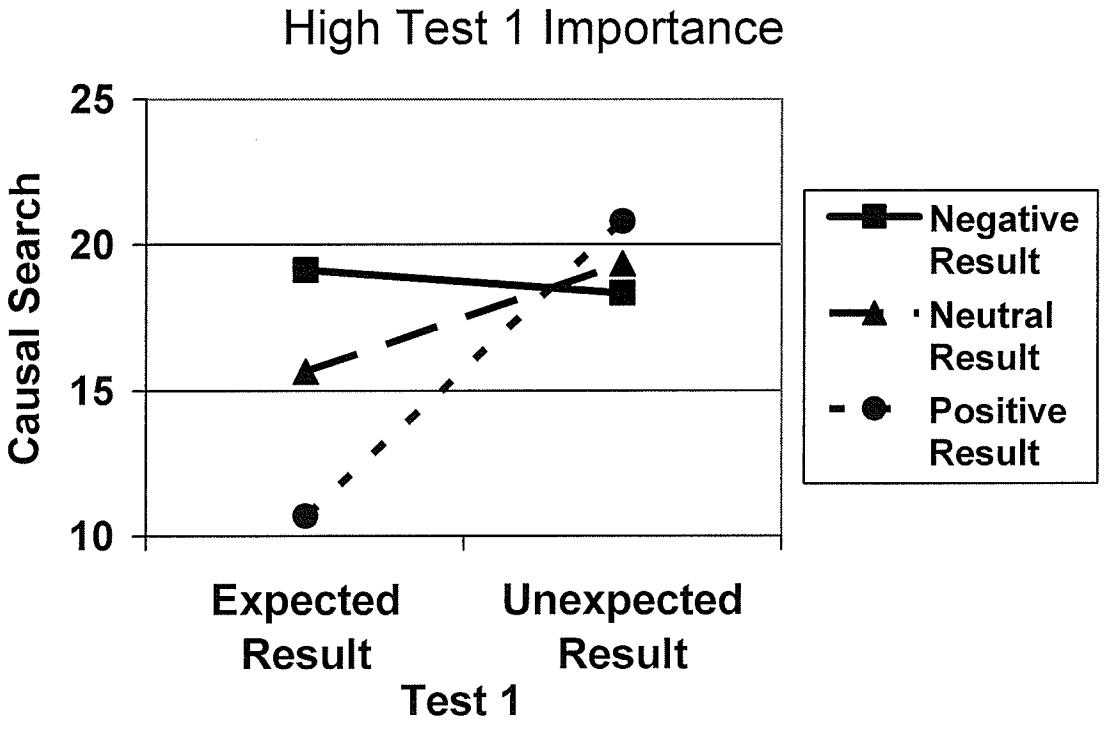


Figure 6

High Importance Expectation by Valence Interaction on Causal Search



considered important, they engaged in more causal search for negative expected events than for positive expected events. Furthermore, as events became more unexpected, these students engaged in causal search about positive events to the same extent as they engaged in causal search about negative events. This interaction was of the same nature as the two-way unexpectedness by valence interaction seen in step 2 of the original multiple regressions.

Causal Search and AR.

Rationale for analyses. To determine if causal search had an impact on the effectiveness of attributional retraining to improve students' academic performances, a test of the interaction between causal search and attributional retraining was performed on students' introductory psychology grades using a three-step multiple regression. In the first step, the variables age, gender, and English as a first language were included to account for any differences in academic achievement that may have resulted from these demographic factors. Following Perry et al. (2001) and Ruthig et al. (2004), students' self-reported final high school percentage was also included in order to rule out ability differences when estimating the effects of the individual differences on academic achievement in university. All of these variables were centered prior to being entered into the analysis to yield more straightforward and meaningful interpretations of the first-order regression coefficient (Cohen et al., 2003).

In the second step attributional retraining (0 = no-AR, 1 = AR) was included to test for a significant main effect of AR independent of the other factors. Also in the second step the centered causal search scale was included. In the third step, the AR by causal search multiplicative interaction term was entered, which was created using

centered AR and causal search variables to adjust for multicollinearity (Cohen et al., 2003). AR was predicted to affect student's academic achievement in two ways: 1) an AR main effect, where students who received AR would have significantly higher final grades than those who did not receive AR, and 2) a two-way interaction between AR and causal search, where students high in causal search who received AR will experience the most improvement from the treatment, compared to those low in causal search who received AR.

Correlations. As a preliminary analysis, causal search was correlated with students' introductory psychology grades. Students who engaged in higher levels of causal search tended to receive lower grades ($r = -.48$, $p < .01$, two tailed), which was expected as students high in causal search tend to experience more negative events (i.e., poorer test scores).

Main analyses. Prior to conducting the multiple regression analyses students were filtered according to their age and number of years in university. This was done in order to find the sub-sample of students most likely to be affected by the attributional retraining treatment. First year students were selected as students in their second year and beyond may have already realized the lessons taught in AR through experiences with past courses. Also, only students 17 to 20 years of age were selected because older students may have also learned the lessons taught in AR through life experiences outside university. After filtering, the sample consisted of 201 students.

In the *first step* of the multiple regression, age and high school grade significantly predicted students' introductory psychology performances (see Table 7). Students who

Table 7

Regression Coefficients and R^2s for Regressions on Introductory Psychology Performance

	Step 1			Step 2			Step 3		
Variable	*B*	*SE B*	β	*B*	*SE B*	β	*B*	*SE B*	β
Age	4.33	1.99	.14*	3.78	1.84	.12*	4.28	1.86	.14*
Gender	-1.25	1.72	-.05	-.33	1.59	-.01	-.09	1.59	-.003
English	3.06	2.32	.08	4.48	2.15	.12*	4.17	2.15	.12
High school grades	3.59	.48	.47***	3.00	.45	.40***	3.01	.45	.40***
AR	-	-	-	.14	1.46	.01	.20	1.45	.01
Causal search	-	-	-	-.64	.11	-.36***	-.65	.11	-.36***
AR X causal search	-	-	-	-	-	-	.36	.21	.10*
Adjusted R^2			.24			.35			.36

* $p < .10$ ** $p < .05$, *** $p < .01$

Note. $\Delta R^2 = .120$ from step 1 to step 2 is significant at $p < .001$, and $\Delta R^2 = .089$ from step 2 to step 3 is significant at $p < .10$.

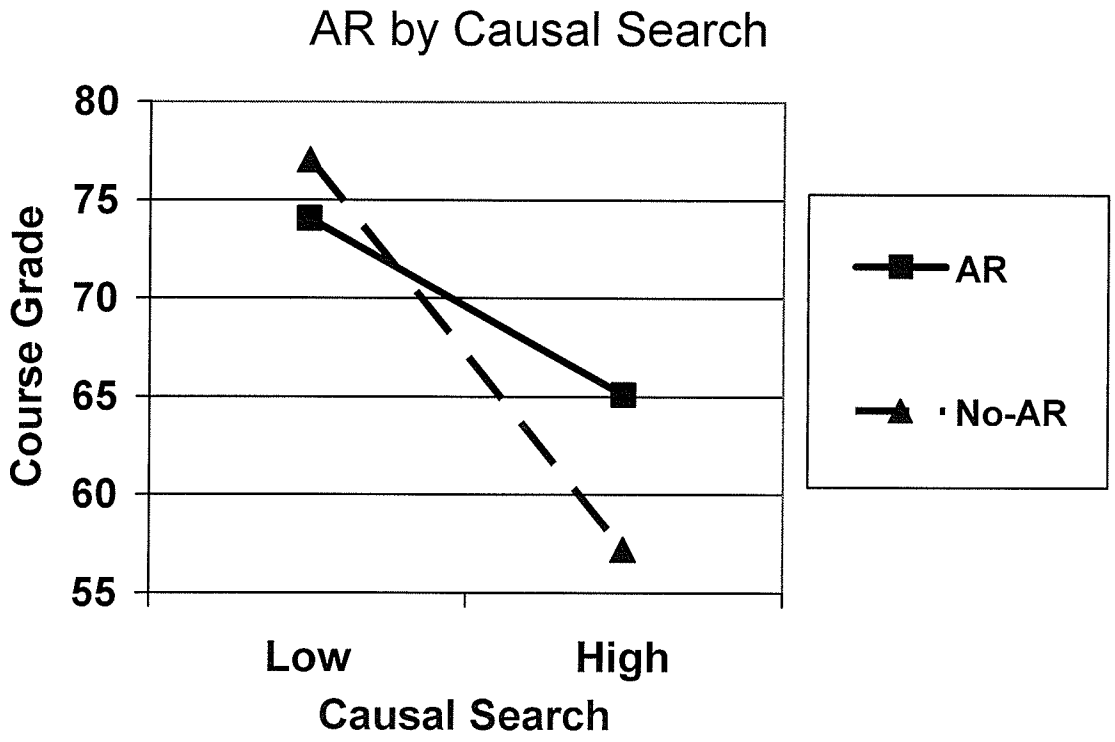
received higher high school grades tended to perform better in introductory psychology ($\beta = .47$) and older students tended to perform better than younger students ($\beta = .14$).

In the *second step*, causal search and AR were included in the regression. Both high school grades and age still significantly predicted introductory psychology performance ($\beta = .40$ and $\beta = .12$, respectively). English as a first language now also significantly predicted performance ($\beta = .12$) as students who did not speak English as a first language received higher grades than students who did speak English as a first language. Surprisingly, AR did not significantly affect students' performances. As hypothesized causal search significantly predicted introductory psychology performance negatively ($\beta = -.36$, $p < .001$), as those students high in causal search tended to receive lower grades.

In the third and *final step*, the AR by causal search interaction was included in the regression. The interaction was found to be significant at the $p < .10$ alpha level ($\beta = .10$, $p = .089$), suggesting only a moderate effect; however, one worthy of further examination. The simple slopes of the interaction were plotted (see Figure 7) using the unstandardized minimum and maximum values of the centered causal search variable (-9.43, 21.57) and the two values of the AR variable (0, 1). The line representing the no-AR group had a significant slope ($t(190) = -6.08$, $p < .001$), suggesting that students in this group who were engaged in a high level of causal search received significantly lower grades than those low in causal search. Alternatively, the line representing the AR group did not have a significant simple slope ($t(190) = -1.26$, $p = .21$), suggesting students engaged in a high level of causal search who received AR received grades almost as high as those students low in causal search who received AR. Overall, the interaction

Figure 7

Causal Search by Attributional Retraining Interaction on Course Grades



suggested AR helped students engaged in a high level of causal search to receive higher course grades.

Supplementary analyses. To test a possible explanation for the effects of attributional retraining on students engaged in high causal search, students' attributions to effort and strategy following AR were examined. At the outset of the analyses, separate groups representing low and high causal search were created using a median split on the causal search variable: Low causal search ($M = 10.92$, $SD = 3.49$, range = 6-16) and high causal search ($M = 22.24$, $SD = 4.34$, range = 17-37). A median split procedure (the same used by Perry et al., 2001) was warranted based on the main analyses that found students engaged in high versus low levels of causal search reacted differently to AR, suggesting further differences between the groups may exist. Using the newly created variable, a causal search (low/high) by attributional retraining (AR/no-AR) 2 x 2 analysis of covariance was conducted to test the impact of causal search and AR on students' attributions to effort and strategy. The attributions were measured approximately 4 months after students had received the treatment. To parallel the main analyses, age, gender, and English as a first language were included as covariates, and the sample of first year students aged 17-20 were used as these students were believed to be the most susceptible to AR.

For effort attributions, a significant AR main effect was found, $M_{AR} = 5.26$, $M_{noAR} = 4.61$, $F(1,200) = 8.83$, $p < .01$ (see Table 8), which indicated students who received AR were making significantly more attributions to effort than students who did not receive AR. For strategy attributions, a moderately significant AR by causal search interaction was found, $F(1,200) = 2.81$, $p < .10$ (see Figure 8). Follow-up t-tests indicated

Table 8

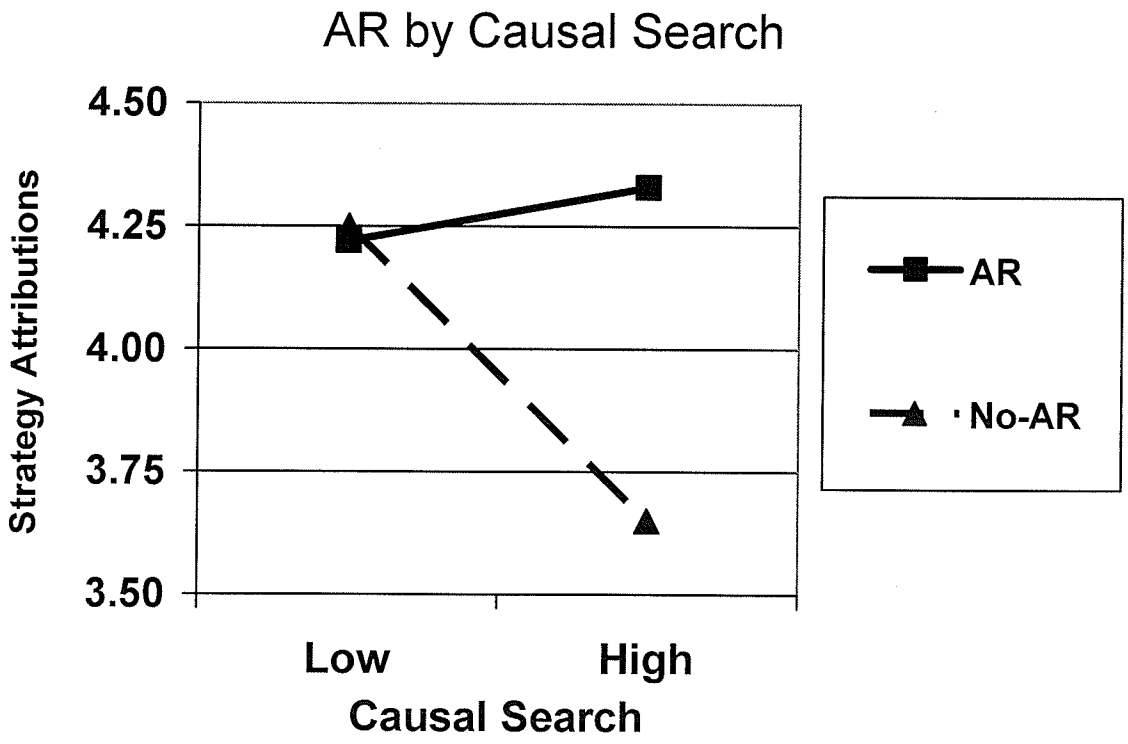
F-table for Effects of Causal Search and AR on Effort and Strategy Attributions

Measure	*MSE*	*MSW*	*F*	*Partial* η^2	*p*
			Effort attributions		
Age	486.90	1.93	.79	.004	.37
Gender	486.90	3.25	1.34	.007	.25
English	486.90	2.14	.88	.004	.35
Causal Search	486.90	5.37	2.21	.011	.14
AR	486.90	21.49	8.83	.042	.00
Causal Search X AR	486.90	2.73	1.12	.006	.29
			Strategy attributions		
Age	452.50	.00	.00	.000	.99
Gender	452.50	1.03	.46	.002	.50
English	452.50	6.83	3.02	.015	.08
Causal Search	452.50	2.87	1.27	.006	.26
AR	452.50	5.25	2.32	.011	.13
Causal Search X AR	452.50	6.36	2.81	.014	.09

Note: Numerator df = 1 and denominator df = 200 for all tests.

Figure 8

Causal Search by Attributional Retraining Interaction on Strategy Attributions



for the low causal search group there was little difference in the amount of strategy attributions between students who received AR compared to those who did not (M_{AR} = 4.22, M_{noAR} = 4.25, $t(111) = 0.11$, $p = .91$); however, for the high causal search group who received AR were found to be making significantly more strategy attributions than those who did not receive AR (M_{AR} = 4.33, M_{noAR} = 3.65, $t(92) = 2.15$, $p < .05$).

Discussion

The present study explored why bright, enthusiastic students may not attain their goal of being a successful undergraduate observed students as a result of unexpected, negative and/or important achievement events. The study had two primary objectives: to determine which precursors, or combination of precursors, to causal search will lead to the greatest amount of causal search, and to determine if the amount of causal search students are engaged in during attributional retraining (AR) affects their reaction to the treatment as shown by their grades. With these objectives in mind, two primary research questions were put forward. The first question was concerned with which of Weiner's (1985, 1995) precursors to causal search (negative, unexpected, and/or important events) elicit the greatest amount of causal search. This question was addressed in two ways. First, a hypothetical scenario based on previous research (Wong & Weiner, 1981) tested what achievement event characteristics students would *report* generate the most causal search. The results showed students believed each of the event characteristics outlined in Weiner's (1985) attribution theory are strong precursors to causal search, with unexpected events being the strongest single precursor, and unexpected/negative events the strongest combination of precursors.

The question of which precursors elicit the most casual search was also addressed using an actual achievement, namely students' first introductory psychology test. When the precursors were analyzed individually, results indicated negative events elicited the most causal search, followed by unexpected events, and event importance did not significantly affect causal search. When the precursors were examined in combination several interesting effects were found. An unexpectedness by valence interaction revealed students engaged in the same amount of causal search for unexpected events regardless of the event's valence; however, students engaged in more causal search about expected/negative events than expected/positive ones. A surprising valence by importance interaction was also found; specifically, students engaged in the most causal search for negative events regardless of their importance, and students engaged in more causal search for positive/unimportant events than positive/important ones. Finally, a significant three-way interaction revealed for important events, students engage in more causal search for unexpected than expected events, and more causal search for negative than positive events. However, for less important events, students engage in similar amounts of causal search for negative events regardless of their level of expectedness, but engage in more causal search for unexpected/positive than expected/positive events.

The second main research question examined how causal search in first year college students impacts the efficacy of attributional retraining (AR) in terms of academic performance. A first-order causal search effect found students engaged in high levels of causal search received lower grades, suggesting causal search is a strong indicator of these students being at-risk of academic failure. Surprisingly, attributional retraining was not found to have a significant impact on students' course grades. However, AR was

found to have a significant interaction with causal search. The interaction revealed students high in causal search who received AR had higher grades than students high in causal search who did not receive AR. This finding suggests that AR helps at-risk students receive higher course grades! The result also support previous research that found students who are failure pre-occupied (Perry et al., 2001) and are more actively engaged (Hall et al., 2004) receive more benefit from engaging in controllable attributions. The following sections discuss how these findings relate to the previous research on causal search and attributional retraining.

The Precursors to Causal Search

Beliefs versus reality. A comparison of the two methodologies used to study the precursors to causal search, the Determinants of Causal Search exercise and students actual experiences in their introductory psychology course, showed many similar findings and several important differences. Taken together the results revealed that students' *beliefs* about when they engage in causal search are not always consistent with when they *actually* engage in causal search. There are several explanations as to why students' causal search beliefs and behaviors may differ.

One equivalent result was that both the scenario and real-life methods showed individual precursors, as opposed to combinations of precursors, to be the strongest predictors of causal search; however, the two methods found *different* precursors to be the best predictors of causal search. For the scenario method, event unexpectedness was the best predictor, followed by importance, and valence was the weakest. For the real-life method, event valence was the best predictor followed by unexpectedness. Event importance did not significantly predict causal search using the real-life method. This

comparison shows students believed event valence would have the smallest impact on causal search, but in reality it had the largest. This effect may have occurred because students believe it is more socially desirable to think about their academic outcomes regardless of whether or not they were positive or negative. To only think about negative events may imply the positive events were taken for granted, suggesting perhaps overconfidence on the part of the student. An alternate explanation for this effect is that students may have underestimated the powerful emotional impact caused by negative test scores. With the majority of the sample being first-year students who most likely had not yet completed their first university test, they may not have expected the traumatic emotional reaction that follows a failure in university (e.g., guilt, shame, self-doubt).

There was also an important difference involving the first-order effect of importance on causal search. For instance, there was a significant first-order effect of event importance in the scenario method, but no effect in the real-life method. This difference is understandable, as it may seem logical to think more about important events. However, if there is no surprising issue that needs to be understood and/or no negative result motivating students to prevent events from occurring in the future, in actuality there really is not much reason to think about the event, as such the real-life result is sensible.

Another analogous result was that both methodologies found a strong unexpectedness by valence two-way interaction; however, the patterns of the interactions were different across the methodologies. For the scenario method, students believed expected positive and negative events would result in similar amounts of causal search, and that unexpected/negative events would produce more causal search than

unexpected/positive events. Alternatively, for the real-life method, students experienced similar amounts of causal search for unexpected positive and negative events, and expected/negative events produced more causal search than expected/positive events. An explanation for the difference on expected events again highlights social desirability; students reported they would engage in causal search for expected/positive events, perhaps to avoid appearing overconfident, when in reality they actually did think less about expected/positive test scores than about expected/negative scores. The difference on unexpected events was more surprising, as it was hypothesized experiencing an unexpected/negative event would double the amount of causal search, which was also predicted by the students. One explanation for the similar amount of causal search on unexpected positive and negative events may be the novelty of the event. Again, for many students this test was probably their first ever in university, and as such, *any degree of unexpectedness* may have elicited more causal search, even if the test score was positive.

An effect unique to the real-life method was a significant valence by importance interaction. The interaction found students engaged in similar causal search for positive and negative low-importance events; however the amount of causal search decreased for positive events as they became more important. One explanation may be if the event is very important students will spend more time thinking about it before it occurs, and if they succeed they know why and need no attribution. On the contrary, if students fail, causal search is required to understand why. An alternate explanation may be that students experiencing a positive event may intentionally avoid causal search for fear that the effect will become less positive. In other words, they may ask "why tamper with a

good thing?" For example, if a student receives an unexpectedly high grade on a test he or she may attribute it to a grading error; as such the student will avoid talking to their professor about the mark out of fear that the professor will correct the mistake and reduce the mark.

Finally, the real-life method found a significant three-way interaction, but the scenario method did not. This interaction is supported by all of the above effects for the actual classroom method of measuring the precursors to causal search. Furthermore, this effect may be due to the general discrepancy between how students *think* event unexpectedness, valence, and importance affects causal search and how it *actually* does.

This comparison of scenarios and real-life methodology leads to the question: Which methodology should be used for the final decision of which precursor, or combination of precursors, has the greatest impact on causal search? The research question of this study is best served by using the results from the real-life methodology, because these findings can more legitimately be applied to the behaviors of students in actual classrooms. However, choosing this method does not in any way diminish the validity or importance of using scenarios in research, as was demonstrated in this study by the two methods finding several equivalent results and the important insights into students' beliefs about causal search that were discovered when the scenarios and real-life results were compared.

Implications for previous research. The findings of this study have substantial implications for previous research on what precursors result in causal search. Perhaps the most critical finding is the finding that event importance is a precursor to causal search. The results suggest importance should not be regarded as a predictor to causal search on

its own as unexpectedness and valence can be. Certainly, importance is a mediator of event valence and unexpectedness when predicting causal search. This conclusion provides support to Weiner's (1985) theory, as well as the study by Gendolla and Koller (2001), who suggest that event importance elicits causal search in combination with negative and surprising events.

Results from this study also supports the position that unexpected events elicit more causal search than expected events (Bettman & Weitz, 1983; Lau & Russell, 1980), and that negative events elicit more causal search than positive events (Lau, 1984; Gilovic, 1983; Holtzworth-Munro & Jacobson, 1985; Holtzworth-Munro & Jacobson, 1988). However, this study does not support the proposition that unexpectedness is the most critical precursor to causal search (Kanazawa, 1992), or that event valence does not have an effect causal search as other researchers have suggested (Clary & Tesser, 1983; Hastie, 1984; Pyszczynski & Greenberg, 1983). Instead, the results suggest that event valence was the most important single precursor to causal search, with event unexpectedness being the second most important predictor. An interesting additional finding was that not only did negative events result in causal search, but positive events in particular unexpected/positive events elicited causal search as well, a finding that supports research by Moeller and Koeller (1999).

The debate over one factor versus several factors in combination being the strongest predictor of causal search was also addressed with this study. Finding significant two-way interactions, specifically unexpectedness by valence, and valence by importance, and a significant three-way interaction specifically provides strong support for previous research that examines precursors to casual search in combinations (e.g.,

Gendolla & Koller, 2001; Wong & Weiner, 1981), keeping in mind that for all the studies the strongest effects are commonly found with independent predictors.

Causal Search and Attributional Retraining

A key finding of this study was the AR by causal search interaction wherein students high in causal search were found to receive higher grades than students low in causal search following AR. This effect is believed to have occurred due to students engaged in a high degree of causal search being more receptive to the suggested attributions presented to them during AR; as such, they were more likely to use the attributions on subsequent tests, and consequently their academic performances improved throughout the year. Alternatively, students engaged in low levels of causal search, may have been less receptive and less likely to use the suggestions made through AR, and consequently, the effects of AR were minimal. This effect was qualified by the finding that negative events elicited the greatest amount of causal search in students. Although students high in causal search were found to be at greater risk of academic failure, fortunately they were also found to be in a good position to improve because they were more actively seeking explanations for their failure. Overall, students high in causal search are receiving worse grades but are in a good position to benefit from cognitive interventions, such as attributional retraining.

Follow-up analyses on the AR by causal search interaction showed students who received AR were making more attributions to effort than no-AR students, and students high in causal search who received AR were making more attributions to strategy than students high in causal search who did not receive AR. These supplementary analyses confirmed the predicted effect of AR which was to bolster adaptive attributions to effort

and strategy, and according to Weiner's (1985) theory, should result in more positive emotions, increased motivation, and ultimately better grades.

Implications for AR research. These findings contribute to previous AR research in several important ways. First, the findings provide support for several previous studies that have examined controllable attributions and causal search related constructs. Specifically, in Perry et al. (2001) students high in failure preoccupation and perceived academic control were believed to be making more controllable attributions which resulted in higher grades than low failure preoccupation and/or low perceived academic control students. Similarly, in Hall et al. (2004) students high in elaborative learning who received AR received high grades than students high in elaborative learning who did not receive AR. The results of this study supports these previous studies, as students high in causal search who received AR performed better academically than students low in causal search who received AR.

Another implication is that a new group of students who benefit from AR have been identified, those engaged in a high level of causal search. This follows the recent trend of identifying distinct groups of students who are most likely to benefit from AR (Perry et al., 2005). Discovering causal search as a mediator of the effectiveness of AR is an extremely valuable finding because it is highly dissimilar to previously discovered mediators of causal search (e.g., elaborative learning, Hall et al., 2004; optimism, Ruthig et al., 2004; locus of causality, Perry & Penner, 1990; perceived success, Perry & Struthers, 1994), yet it is still strongly grounded in a prominent theory (Weiner, 1985).

Another way these findings impact AR research is by demonstrating, once again, AR shows the greatest improvements for students who are at-risk of poor academic

performance. This study identified causal search as a risk factor for students, as those high in causal search tended to receive lower grades. Students high in causal search should now also be considered along with students low in perceived control (Perry et al., 2005) and overly high in optimism (Ruthig et al., 2004) as at-risk and in a position to benefit from AR.

As causal search is a component of Weiner's (1985) attribution theory there may be implications for the administration of the intervention. For example, the causal search activation component of AR, at which time students are asked to reflect on their performance on a test which is intended to have them think about their academic performances. This has now been justified as a very important stage in the process and suggests that AR techniques that do not use this aspect of AR may be less effective. Furthermore, there may be implications that lead to improvements in AR techniques such as finding new ways to increase the amount of causal search students engage in when they receive AR.

Strengths and Limitations

The method of measuring causal search is a possible limitation of the current study. In the past, causal search has most often been measured by participants answering open-ended questions about hypothetical scenarios, researchers counting the number of attributional statements in their answers, and the more attributional statements found the higher the causal search score the students received. This unobtrusive method of measuring causal search was created to contend with the criticism that attributional measures are often reactive (i.e., the scale itself elicits attributions). This was a common criticism prior to Weiner's (1983) article that so clearly argued attributions happen

spontaneously. However, the open-ended method was not used in this study for two reasons. First, the subjective ratings by researchers as to whether or not an attributional thought occurred were eliminated to create a measure of causal search that were potentially be more valid. Also, there is no longer a need to demonstrate spontaneous attributional activity as numerous studies have already found attributions to occur spontaneously.

The causal search scale used in this study was created in response to the criticism that previous methods of measuring attributions have been reactive (i.e., the method of measuring causal search elicits causal search). This scale addressed those criticisms in two ways. First, the items were carefully worded in a way to get students to think about their past behaviours and thoughts, by giving them a list of actions other students have thought or done previously. The short and easy-to-read statements regarding *past* thoughts and behaviours students might have engaged in allowed the students to quickly respond to the items. Second, the scale contained a distracter item designed to divert students from the scale's purpose, that is, the item was a thought people don't often associate with someone searching for explanations for their test score ("I'll do better next time"). These two aspects of the causal search scale should have allowed students to complete the scale without generating any new causal search about their past test performance. Furthermore, by the students filling out the questionnaire on bubble sheets there is no need for subjective estimates of the number of 'attributional statements', which gives this scale an advantage over the open-ended methods.

The use of single item measures in the study was a limitation, as single item measures are believed to be less reliable. However, by correlating each variable with a

similar measure at a later time, suitable concurrent validity was demonstrated, as such we can be more confidence that the items were measuring what they were intended to measure.

A major strength of the current study was the use of an actual achievement outcome to measure the precursors to causal search and test the effectiveness of AR. Using a real-life situation makes the results of this study highly generalizable to actual classroom experiences. Furthermore, by collecting data on a scenario test of causal search allowed for the comparison of the two methodologies, which resulted in several interesting findings. One limitation of using real-life data is that several variables were found to have non-normal distributions, such as the importance measure having a negative skew and the unexpectedness item having a positive skew. Fortunately, the limitation of non-normality was dealt with by using exponential and square-root transformations of our variables in order to satisfy the assumptions of our statistical tests.

The over use of university students as subjects in research is a commonly cited limitation in research today, and one that will not be disputed here. However, for the current study university students were not used simply because they were a sample of convenience. Instead they were chosen for two reasons. First, this sample was seen as suitable for the research questions of this study primarily because university students regularly encounter success and failure experiences in their courses that, according to Weiner (1985), they will often seek to explain and understand. And second, there is a definite interest in understanding the processes of the many students who struggle in university, as from the outset of this study it was genuinely hoped by better understanding the processes of causal search and how it interacts with attributional

retraining, a more powerful method of improving the performance of students in university will be found.

Implications for Future Research

The results of this study support and extend Weiner's (1985) theory of achievement motivation and emotion by providing empirical support for the precursors of causal search outlined in the theory. If researchers, psychologists, and educators can better predict when attributions are going to be made, the better they can understand the attributional process and how our attributions can impact on students' emotions, cognitions, and behavior.

This study is unique in that it was the first to test the effect of causal search on a practical application of Weiner's attribution theory. An important implication of identifying a new factor for selecting students who would receive the most benefit from attributional retraining, is that the study would provide further support for the use of attributional retraining in the curriculum of every introductory university course. This study was also the first to use a scale to measure the amount of causal search students are engaging in.

Although several significant steps in understanding causal search may have been made with this study, there are still many unknowns about the process. In particular, there may be other precursors to causal search, perhaps other event characteristics and personality traits. The length and timing of causal search is another issue that has received little attention. Questions such as how long does causal search last? Does causal search continue until an attribution is decided upon? Does causal search continue after an attribution is decided upon, and if so why? With these questions in mind, causal search

research should continue to move forward by studying the precursors in real-world settings to better understand this critical process in attribution theory.

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Appendixes

A. Determinants of Causal Search Exercise

B. Phase 1, 2, and 4 questionnaire items

C. AR handout

D. AR writing exercise

E. Consent form and grade release form

APPENDIX A

Determinants of Causal Search Exercise

The following four statements ask you to imagine receiving a grade on a test worth 40% of your final course grade. After reading each statement, please rate how much time you would spend thinking about *why you got the mark you did* using the scale below.

No time Lots of time
1 2 3 4 5 6 7

1. You failed the exam, and it was unexpected because you always do well in that subject.

2. You failed the exam, and it was expected because you always do poorly in that subject.

3. You did very well on the exam, and it was unexpected because you usually do poorly in that subject.

4. You did very well on the exam, and it was expected because you always do well in that subject.

The next four statements ask you to imagine receiving a grade on a test worth only 5% of your final course grade. After reading each statement, please rate how much time you would spend thinking about *why you got the mark you did* using the scale below.

No time Lots of time
1 2 3 4 5 6 7

5. You failed the exam, and it was unexpected because you always do well in that subject.

6. You failed the exam, and it was expected because you always do poorly in that subject.

7. You did very well on the exam, and it was unexpected because you usually do poorly in that subject.

8. You did very well on the exam, and it was expected because you always do well in that subject.

APPENDIX B

Time 1 Questions

Demographics and Background

1. What is your gender?

(1)	female	(2)	male

2. What is your age in years?

(1)	17-18	(6)	27-30
(2)	19-20	(7)	31-35
(3)	21-22	(8)	36-40
(4)	23-24	(9)	41-45
(5)	25-26	(10)	older than 45

3. Do you consider English to be your first language?

(1)	yes	(2)	no

4. What was your average (%) in your last year of **high school**?

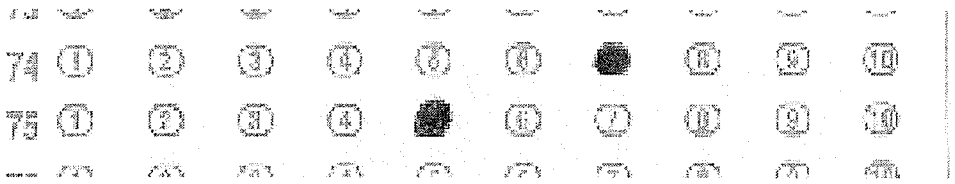
(1)	50% or less	(6)	71-75%
(2)	51-55%	(7)	76-80%
(3)	56-60%	(8)	81-85%
(4)	61-65%	(9)	86-90%
(5)	66-70%	(10)	91-100%

Precursors to causal search (pretest measures)

5. What exact percentage do you expect to get on your **first introductory psychology test**?

NOTE: to answer this question, you need to use 2 lines of the bubble sheet. An example is given below:

- If you expect a grade of 75% on your first test, you would bubble in the "7" on line 74 of the bubble sheet and bubble in the "5" on line 75, as in the diagram below.



6. With regards to your **first Introductory Psychology test**, for you **personally doing poorly** means a grade of _____ or less.

(1)	50%	(6)	75%
(2)	55%	(7)	80%
(3)	60%	(8)	85%
(4)	65%	(9)	90%
(5)	70%	(10)	95%

7. How important do you consider your first introductory psychology test grade?

Not at all important						Very important
1	2	3	4	5	6	7

8. How important do you consider your introductory psychology course?

Not at all important						Very important
1	2	3	4	5	6	7

9. Compared to your first test grade in other courses, how important do you consider your first Introductory Psychology test grade?

Much less important			Equally important			Much more important
1	2	3	4	5	6	7

10. Compared to other courses you are taking, how important do your Introductory Psychology test grade?

Much less important			Equally important			Much more important
1	2	3	4	5	6	7

Time 2 Questions

Precursors to causal search (post-test measures)

1. How unexpected was your grade on your first Introductory Psychology test?

Exactly what I expected						Very unexpected
1	2	3	4	5	6	7

2. How **successful** do you feel you are in your introductory psychology course this year?

Very unsuccessful									Very successful
1	2	3	4	5	6	7	8	9	10

3. How important do you consider your first introductory psychology test grade?

Not at all important						Very important
1	2	3	4	5	6	7

4. How important do you consider your introductory psychology course?

Not at all important						Very important
1	2	3	4	5	6	7

5. Compared to your first test grade in other courses, how important do you consider your first Introductory Psychology test grade?

Much less important			Equally important			Much more important
1	2	3	4	5	6	7

6. Compared to other courses you are taking, how important do your Introductory Psychology test grade?

Much less important			Equally important			Much more important
1	2	3	4	5	6	7

7. I have spent a great deal of time and effort searching for the reason(s) why I received the mark I did on my **first Introductory Psychology test**.

Not at all true of me			Moderately true of me			Very true of me
1	2	3	4	5	6	7

Causal Search scale

The following is a list of things people sometimes *think* after they get a test score back. When you learned your *first introductory psychology test score*, did you *think about* any of the following? If you did, for how long?

Not at all						For a long time
1	2	3	4	5	6	7

7. I don't have the right skills to make it through the course

8. Didn't studied hard enough

9. The test was too hard

10. I studied the wrong way

11. I was just unlucky on that test

12. The professor is making this course too hard

13. I'll do better next time

Time 3 Questions

1. What year of university are you in?

(1)	first	(4)	fourth
(2)	second	(5)	fifth or more
(3)	third		

When your performance on a test of assignment is POOR, OR LESS THAN YOU WERE EXPECTING, to what extent do each of the following explain your performance?

Not at all						Very much so
1	2	3	4	5	6	7

2. lack of effort

3. lack of a strategy

APPENDIX C

Didn't do as well on a test as you wanted? Feeling frustrated, depressed, angry?

Here are some suggestions as to how you can change the way you *think* about negative experiences in your life:

Rather than thinking...	Instead...
• I'm stupid.	• Everybody can succeed - you just have to work at it. Here are some examples as to how you can study more effectively: – read chapters several times – review notes several times – use your study guide – study with someone *Note: Counseling Services offers various study skills courses*
• The test was too difficult.	• Tests can appear difficult when you're not well enough prepared. Study more for the next test.
• My professor is lousy.	• If you are having problems with a professor, talk to him or her about your difficulties. If that doesn't help, you may have to work extra hard to do well in the course.
• I had a bad day.	• We all have bad days once in a while, but make sure that you study enough for the next test to improve your grade.
• I panicked.	• If you have a problem with text anxiety, try to relax under stress (see your psychology text for relaxation methods or check the Counseling Services for courses on stress management).

The next time you don't do as well on a test or assignment as you wanted, remember that most reasons for doing poorly are under your control and can be changed.

AAHE, Jan/96 H.O.

APPENDIX D

Questions Concerning the Handout

Please answer the following questions on the blank paper provided.

1. Summarize the main points of the handout in your own words.

2. Discuss and describe several important and controllable reasons for why university students may not perform as well as they could in their courses, and provide an example of each.

3. Try to recall a recent instance where you performed poorly, or didn't perform as well as expected, on an important course exam or assignment. Discuss as openly and honestly as you can how the event made you feel. If possible, also explain how you were able to learn from this event, or how you were able to reinterpret the event in a positive way.

4. Describe and explain several ways you could apply the main points of the handout to the way you currently approach your university courses.

APPENDIX E

UNIVERSITY OF MANITOBA | Department of Psychology

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Fax (204) 474-7599

Informed Consent, Grade Release, & Study Withdrawal Forms for 17.120 Research Participation in "Calgary"

Dear Student,

This package contains 3 documents:

1. an "Informed Consent" form (this page)
2. a "Grade Release Consent" form (page 2)
3. a "Voluntary Withdrawal From Study" form (page 3)

Please read all three forms first, then complete, and ***turn in the first two forms.*** Detach the third form (last page) and keep it handy in the event that you wish to withdraw from the study at some point in the future but still get partial credit for your participation.

****

Informed Consent Form

Description of Study

This study concerns various aspects of university students' experiences, behaviours, opinions, and attitudes towards school and life-in-general, how they are related to each other, and if and how they may change throughout the school year. As such, your participation in this study requires that you attend three separate sessions throughout the school year. Two sessions take place in the first term. In each session you will be asked to complete a questionnaire - one shorter one today (about half an hour), and a second longer questionnaire (about 90 minutes) approximately one month from now. The third questionnaire (about 45 minutes) will be done in a third session in the second term after spring break (exact date to be announced in class during the second term). In exchange for your participation you will receive a total of 6 research credits towards your Introduction to Psychology (17.120) course grade (1 credit for the first session, 3 credits for the second session, and 2 credits for the third session = 6 credits total).

All of the information you provide will be kept completely confidential. Any reporting of the results of the research will only be in "aggregate form" (e.g., average ratings, general group trends, etc.), and handled in a way so as to protect the identity of individual participants. You may also refrain from answering any questions you prefer to omit without prejudice or consequence, and may withdraw from the study at any time, and receive partial credit by completing and returning the Voluntary Study Withdrawal Form.

Statement of Consent to Participate (please complete blank areas)

I, (please print name) _____, have read and understand the above description of the study, and with this understanding, agree to participate. I understand that:

- I will be required to attend three sessions during the academic year, as outlined above.
- Any and all data that I provide to the researchers will be kept confidential, that I may refrain from answering any questions I prefer to omit, and that any reports of the finished research will report only aggregate results.
- I may withdraw from the study at any time, and receive partial credit by completing and returning the Voluntary Study Withdrawal form.

Signature _____

Student Number _____ Date _____

UNIVERSITY OF MANITOBA | Department of Psychology

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Introductory Psychology Grade Release Form
for "Calgary" Study

One very important part of our research is to determine if and how the various dimensions and aspects of student experience may be related to students' grades.

Because of this, we need your *signed permission* to obtain your Introductory Psychology test results and course grade from your instructor at the end of the year.

As with the information you provide on the questionnaires, your test scores and final course grade will be kept completely confidential and used only by the researchers, and that the summarization, presentation, or reporting of the results will be handled so that the identity of all participants is protected (e.g., in aggregate form such as class averages).

Please indicate below as to whether you consent to our accessing your psychology test results and final grade in Introductory Psychology.

I, (please print name) _____ ,

(please check) [ ] grant
[ ] do not grant

Dr. Raymond Perry permission to obtain my introductory psychology (17.120) test results and final grade from my instructor.

Student Number: _____

Name of My Intro Psych Professor: _____

My Signature: _____

Today's Date: _____