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REASONS FOR NOT DRINKING AMONG VETERANS
SEEKING TREATMENT FOR ALCOHOL DEPENDENCE
IN A PARTIAL DAY HOSPITAL

by

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ABSTRACT OF THE DISSERTATION

Reasons for Not Drinking Among Veterans Seeking Treatment for
Alcohol Dependence in a Partial Day Hospital

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Prior research on motivation to quit drinking or to enter treatment for alcohol problems has shown that people may report reasons that are internally driven, externally driven, or some combination of the two types. In addition, the decision to quit drinking or enter treatment often follows cognitive and affective decision-making processes in which the pros and cons of continued drinking versus change are weighed. Cognitive theory and research suggest that accessibility of information depends at least in part on how recently or frequently the information was accessed, and that people process self-relevant information more deeply than non-self-relevant information. On the basis of this prior research, we hypothesized that people who reported high levels of internal motivation to quit drinking or to enter treatment would score higher on a measure of accessibility of information (the Decisional Balance Fluency Test or DBFT) and on a measure of depth of processing (the Memory for Alcohol Consequences Task or MACT) than those who reported lower levels of internal motivation. Forty-five alcohol dependent male veterans completed the DBFT, the MACT, and several self-report questionnaires, including the Alcohol Use Disorders Identification Test (AUDIT), the Reasons for Quitting Questionnaire (RQQ), the Treatment Motivation Questionnaire (TMQ), and the Alcohol and Drug Consequences Questionnaire

(ADCQ). DBFT and MACT scores were regressed on self-reported internal and external motivation on the RQQ and the TMQ. Results indicated that internal motivation scores on the RQQ predicted MACT scores but not DBFT scores, and that the TMQ did not predict DBFT or MACT scores. A secondary hypothesis examined the relationship between motivation to quit drinking and motivation to enter treatment; findings indicated that these types of motivation were not highly correlated and are not appropriate proxies for one another. Finally, post hoc tests were performed to assess the psychometrics of two fairly new measures used in the study. The psychometric properties of the DBFT were problematic in this study; however, the psychometric properties of the MACT were reasonably good. Further research is recommended to develop greater understanding of the relationships among the constructs and theory explored in this study.

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Introduction

People with alcohol problems attempt to change their drinking behavior for many reasons; they enter treatment for alcohol problems for similar, although not necessarily identical, reasons. The reasons why people reduce drinking or enter treatment for drinking problems have been assessed by examining the prevalence and effects of internal and external reasons, voluntary and coerced treatment, and approach and avoidance goals. In addition, researchers have sought to describe the role of cognitive appraisal of reasons to change or not to change in motivating change or treatment entry, the effects of readiness to change, and individual and environmental factors. The emerging picture of why people stop or reduce drinking with or without assistance is complex and does not lend itself easily to clear explanation. Moreover, understanding of why people change is hampered by methodological challenges. In particular, most studies have relied exclusively on self-report, and many have use retrospective approaches, both of which may impact the accuracy of the information obtained.

The current study was proposed as a means of exploring motivation to stop drinking and enter treatment among a population of alcohol dependent individuals early in treatment at a Veterans Administration partial day hospital. As discussed below, a theoretical model was proposed and tested, based on the self-determination theory first proposed by Deci and Ryan (1980; 1985). Alcohol-related cognitions, including reasons for desiring change, reasons for entering treatment, and perceived costs and benefits of change, were measured using self-report instruments. In addition, two implicit or indirect measures were used to explore cognitive processes hypothesized be related to these self-reported alcohol-related cognitions. Implicit measures included measures of accessibility of reasons to change and of depth of processing of reasons to change. The aim of the research was to develop greater

understanding of explicit and implicit cognitive processes underlying change in persons with alcohol use disorders. As discussed below, research has shown that implicit measures of cognitive processes related to alcohol use examine constructs that are related to, yet distinct from, the constructs measured by self-report measures of explicit cognitions related to alcohol use (e.g., De Houwer, 2006; Goldman, Reich, & Darkes, 2006). Moreover, studies on implicit alcohol-related cognitive processes suggest that such processes predict alcohol consumption in a variety of populations (see discussion below). Therefore, in this study, we explored the relationship between explicit, self-report measures of motivation to change or seek treatment, and implicit measures of accessibility and depth of processing of information relating to such motivation.

Issues in the Definition and Measurement of Motivation

Historically, the research and treatment communities have tended to view motivation as a stable client attribute, which was used to explain treatment outcome (Miller, 1985). That is, those who did poorly were viewed as lacking adequate motivation. This lack of motivation was seen as either a character problem or a deficit beyond the individual's control; in either case, if a client was seen as lacking motivation, the prevailing view was that the therapist could not expect to change this and therefore, treatment would be a useless endeavor (Miller, 1985). However, empirical research has not supported this view (Miller, 1985). In fact, although client motivation does strongly predict whether or not substance-related behavior will change (Miller, 1999), it appears that *therapist* beliefs about a client's motivation may affect outcome more strongly than the client's *own* view (Leake & King, 1977). Moreover, the research literature suggests that therapists may have substantial ability to increase client motivation through the use of appropriate therapeutic techniques (Miller, 1999; Pfeiffer, Feuerlein, & Brenk-Schulte, 1991).

The measurement of motivation can present difficulties because motivation is essentially a dynamic process that is affected by both internal events (e.g., cognitions, emotions) and external events (e.g., interpersonal interactions, life events) (Miller, 1985; Yahne & Miller, 1999). Thus, observation of motivation from an external perspective is difficult; evidence of motivation often is gleaned from a person's behavior (Miller, 1985; Yahne & Miller, 1999). For example, if a person attends AA frequently, the perception is that she or he must be strongly motivated to do so. This conflating of motivation and behavior is problematic, however, as people may experience and report themselves as motivated to behave in ways that are nevertheless quite different from what they actually do (DiClemente, Schlundt, & Gemmell, 2004; Yahne & Miller, 1999).

Motivation fluctuates over time (DiClemente et al., 2004; Miller, 1985); priorities change with variation in internal and external conditions (Yahne & Miller, 1999). Thus, measurement of motivation at any particular time may result in the failure to identify or consider important information about why people behave consistently or inconsistently with their reported motivation at some other time. This measurement problem is potentially important, because successful long-term behavior change typically requires ongoing commitment to making and maintaining such change. Commitment to change may be repeatedly challenged and motivation levels may drop as high risk situations are encountered, especially early in the process of behavior change (Amodeo & Kurtz, 1990). The dynamic nature of motivation also highlights the limitations of research conducted using retrospective designs, which appears to have been the most common approach.

Another issue is that motivation to enter treatment and motivation to change behavior need not be identical; in many cases, a person may recognize a problem and feel motivated to change drinking behavior for substantial periods of time before entering

treatment (Hingson, Mangione, Meyers, & Scotch, 1982). Many problem drinkers report that they not only have been motivated to change their drinking behavior for some time, but have made one or more unsuccessful attempts to quit or reduce their drinking on their own or with help (Hingson et al., 1982; Kaskutas, Weisner, & Caetano, 1997; Weisner, 1990). Moreover, while the recognition of a problem may be based primarily on the sheer amount of alcohol consumed and may be a reason for attempting to change behavior on one's own, it is usually not, by itself, sufficient to motivate help-seeking (Hingson et al., 1982).

The lack of success in self-change strategies for those who later attempt to resolve alcohol problems by entering treatment may reflect underlying differences in problem severity between populations of people who do and do not enter treatment for these alcohol problems (Cunningham, 1999; DiClemente et al., 2004). Thus, some research suggests that those who resolve drinking problems gradually, due to developmental changes – i.e., those who “mature out” of drinking problems – may have had less severe problems with drinking at the outset (Cunningham, Blomqvist, Koski-Jannes, & Cordingley, 2005b). One study found that those who met criteria for a lifetime diagnosis of alcohol dependence were more likely to report they decided to change their drinking habits because of the consequences of their drinking, whereas those who did not meet criteria for a lifetime diagnosis of alcohol dependence were more likely to report “drifting out” of their alcohol problems over time because of changes in circumstance such as finishing schooling or having children (Cunningham et al., 2005b). There was, however, no difference based on lifetime dependence in the number who reported that they had decided to change their drinking patterns based on what the authors called “reflective maturation,” defined as “conscious apprehension of possible consequences” (Cunningham et al., 2005b, p. 81). Examples of reflective maturation reasons included the desire for good health and wanting a better future.

Motivation to Quit or Reduce Drinking

Perceived Severity of the Problem

Regardless of whether heavy drinkers attempt to change their drinking behavior with treatment or without, they cite many of the same reasons for making such a change (Cunningham, Sobell, Sobell, & Kapur, 1995). The reasons reported often are categorized in a variety of ways: consequences or anticipated consequences (positive or negative) of continued heavy drinking or abstinence; and internal or external influences, especially those that affect the way that the positives and negatives of drinking are appraised cognitively. External influences also may be differentiated by the level of coercion or pressure applied. However, most of the research on internal versus external sources of motivation has been conducted in the context of motivation to enter treatment rather than motivation to change drinking behavior. In this section, because the focus is on motivation to change behavior, not motivation to enter treatment (which will be addressed in the next section), consideration of internality and externality of motivation sources is deferred.

In general, the perceived severity of the problem motivates the individual to change or consider changing his or her drinking patterns (Finney & Moos, 1995; Ryan, Plant, & O'Malley, 1995). The perceived severity appears to be affected by an individual's appraisal of anticipated or actual negative consequences of continued drinking, as well as anticipated positive and negative consequences of changing (Finney & Moos, 1995). Thus, regardless of what objective situation precipitated the desire to change, a subjective appraisal of it has usually led to a perception that the severity of the problem warranted behavior change (Ludwig, 1985).

This appraisal of the pros and cons of continued drinking versus changing was further supported in a study of 248 visitors at a science center. Participants were asked

about methods they had used to resolve problem drinking. About three quarters of the 64 who reported having successfully resolved problem drinking did so without treatment (Cunningham et al., 1995). About 42 percent reported being abstinent, while the remaining 58 percent reported continued non-problematic drinking. All of the non-abstinent resolutions occurred without treatment. Regardless of treatment history, the most frequently endorsed reasons for changing drinking habits were having weighed the pros and cons, and having made a major lifestyle change. This study finding supports the importance of a cognitive appraisal process for many problem drinkers who decide to quit, as well as further supporting the idea (discussed below) of a broad change in worldview; however, it may reflect current reasons for maintaining change that have been attributed retrospectively to the initiation of the change, rather than true reasons for having initiated the change. Other reasons that were endorsed at similar rates by both treated and untreated participants included having seen someone drunk or high, having experienced a traumatic event, having experienced health problems, and having had a religious experience. Thus, while the cognitive appraisal process appears to be an important factor in the change process for heavy drinkers, other factors may be important as well, regardless of whether the problem resolution occurred with or without treatment. As discussed below, these factors may include anticipated or actual negative and positive consequences of drinking or of changing drinking behavior.

Negative Consequences of Drinking (Avoidance Goals)

Among both treated and non-treated samples of resolved problem drinkers, a number of patterns emerge from the reasons given for desiring or deciding to reduce or quit drinking. In particular, the research on motivation to quit or reduce drinking is relatively consistent in finding that people generally report that they are initially motivated by the

desire to avoid, minimize, or terminate negative consequences of drinking (e.g., Amodeo & Kurtz, 1990; Hingson et al., 1982; Kaskutas et al., 1997; Ludwig, 1985). These consequences could include dependence symptoms, legal problems, health problems, relationship problems, and financial or employment problems (Krampen, 1989; Steinberg, Epstein, McCrady, & Hirsch, 1997).

Two recent prospective studies have examined the question of why heavy drinkers may consider making changes in their drinking patterns (Cunningham, Blomqvist, Koski-Jannes, & Cordingley, 2005a; Cunningham, Wild, Koski-Jannes, Cordingley, & Toneatto, 2002). In the first study, drinkers who were thinking about quitting or reducing their alcohol consumption were recruited via newspaper advertisements (Cunningham et al., 2002). At baseline, reasons for considering change were assessed using both an open-ended question and a modified version of the Alcohol and Drug Consequence Questionnaire (ADCQ, Cunningham, Sobell, Gavin, Sobell, & Breslin, 1997) that was designed to allow specific consideration of the costs and benefits of change (Cunningham et al., 2002). Severity of alcohol problems and quantity and frequency of alcohol consumption were measured using the Alcohol Use Disorders Identification Test (AUDIT, Bohn, Babor, & Kranzler, 1995; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), and life events experienced in the past year were assessed using the Life Events Questionnaire (LEQ, Tucker, Vuchinich, & Gladsjo, 1994; Vuchinich, Tucker, & Harlee, 1986). Two months later, a second set of questionnaires was mailed to participants. The questionnaires included a Timeline Followback Calendar (Sobell & Sobell, 1996) for recording information about daily drinking over the previous 60 days, as well as open-ended questions asking whether any serious attempt had been made to cut down or quit drinking since baseline and asking about drinking experiences and life events during this time frame (Cunningham et al., 2002). The

most commonly reported reasons for considering change at baseline were related to health concerns, financial concerns, and relationship concerns (Cunningham et al., 2002). Whether these concerns were based on history of problems in these areas, potential future problems, or both, was unclear. In several regression analyses, only the baseline measure of anticipated costs of changing behavior significantly predicted quantity of drinking at the follow-up, although negative life events approached significance ($p < .08$). The authors suggested that the absence of a significant effect may reflect imperfections in the measurement of negative life events rather than a true lack of relationship, as their measures did not permit weighting of events. Moreover, the authors did not address the question of whether the negative events reported on the LEQ were attributed by participants to their drinking. In addition, the authors pointed out that relative improvement in life experiences after quitting drinking may be the key to maintaining change rather than the absolute number of positive or negative events experienced. Thus, the results of this study left open the possibility that negative consequences specifically related to drinking may be involved in the decision to change drinking behavior.

In a second prospective study of heavy drinkers, conducted via random telephone survey, those who were considering change were compared with those who were not (Cunningham et al., 2005a). Despite similarity on a number of demographic characteristics, those who were considering change reported both more alcohol consumed per drinking day and more severe consequences of alcohol use (Cunningham et al., 2005a). As in the previous study, the most commonly cited reasons for considering change were health and financial concerns; again, no consideration was given to the question of entering treatment versus self-resolution.

In a study of 29 alcoholics who had resolved their drinking problems without treatment, Ludwig (1985) conducted semi-structured interviews to determine what cognitive processes were associated with the decision to change. He found that most of the reasons cited for changing behavior related primarily to the participant's state of mind and perceptions about the situation rather than to any particular life events or objective circumstances. Nevertheless, many of the reasons involved were current or threatened negative consequences, which reportedly had led participants to re-evaluate their drinking and its effects on their lives.

"Hitting Bottom"

The focus on escaping negative consequences is likely where the popular concept of "hitting bottom" originated. "Hitting bottom" is a term that has been used frequently both in the literature and in twelve step programs such as AA for several decades. An early definition of the term in the literature was "that a crisis had developed in the life of the individual and that he felt he could not continue on the path he had been pursuing" (Tiebout, 1961, p. 55). The term also may refer to Jellinek's work on the phases of addiction, known as the "Jellinek curve," which, when represented graphically shows a U-shaped curve in which the bottom of the curve represents the time just prior to the initiation of change when the individual is drinking "obsessively" in "vicious cycles" (see Jellinek, 1946, 1991). Although "hitting bottom" may involve experiencing major problems, such as legal, health, or relationship problems, researchers have found that it is essentially a subjective experience (e.g., Krampen, 1989; Ludwig, 1985). Some people require only the threat of loss in one or more important life domains, while others may recognize the severity of the problem only following actual loss in several domains (Krampen, 1989; Ludwig, 1985). Interestingly, while anecdotally it was believed that people who hit "low bottoms" –

that is, who actually experienced losses in important domains – were likely to be more committed to abstinence, research uniformly has dispelled this notion, finding that the prognosis is generally much better for problem drinkers who perceive that they still have something to lose (Krampen, 1989).

In the previously-described study of alcoholics who reported that they had successfully resolved alcohol problems without treatment, Ludwig (1985) found that the majority reported that hitting bottom had been a major reason for their initiation of behavior change. Among those who described this experience, the objective events varied widely, but the subjective appraisal of the situation was remarkably similar, involving personal humiliation, shame, despair, and/or a sense of loss.

Positive Consequences (Approach Goals)

In the context of deciding to change problematic drinking behavior, far greater emphasis has been placed on avoiding or terminating negative consequences of drinking than on obtaining anticipated positive outcomes of stopping or reducing drinking. Thus, most researchers who have identified concerns about health, relationships or finances as reasons for change have described participants who endorse or report these concerns in the context of concern about losing what they have or fixing what is already broken, rather than in the context of adding new and better dimensions to their lives (e.g., Kaskutas et al., 1997; Krampen, 1989). Nevertheless, a few studies have explored the issue of whether positive life goals or positive experiences may motivate change. Ludwig's (1985) interview study elicited some responses indicating that a few participants initiated change due to spiritual experiences or because of wanting to change their lifestyle for the better. However, in the latter cases, close reading reveals that even when the participants explicitly denied having "hit bottom," it appears that unpleasant events associated with drinking (e.g., witnessing a

bar fight resulting in severe injury to another person) may have precipitated the change.

Cunningham et al. (2005b), in a study of “maturing out” of drinking problems, reported that some participants reported reasons such as wanting a better life or good health as reasons why they reduced their drinking.

Differences between Treatment and No-Treatment Samples in Reported Motivation to Change Drinking Behavior

In the science center study described previously (Cunningham et al., 1995), despite the lack of significant differences between treated and untreated individuals with regard to many of the reasons cited for changing behavior, two differences in motivation did emerge: first, those who entered treatment were more likely to report that they had “hit rock bottom;” and second, those who entered treatment more frequently reported that they had received a warning from a spouse or other important person in their lives. However, neither of these motives was entirely absent from reasons given by the participants who changed without treatment (Cunningham et al., 1995), and at least one other study found that “hitting bottom” was an important motivating factor for more than half of the self-changed participants (Ludwig, 1985). Moreover, spousal or other social pressure has been cited in a number of studies as a reason for initiating change regardless of whether the study sample involves treatment samples (e.g., Hingson et al., 1982; Weisner, 1990). For some of the other reasons given by participants, the lack of significant differences between treated and non-treated groups may have been due to a lack of statistical power rather than a true lack of differences in the populations (Cunningham et al., 1995).

Motivation to Initiate Treatment

As noted previously, motivation to change and motivation to enter treatment are not necessarily identical (Cunningham et al., 2005a, 2005b; DiClemente et al., 2004; Hingson et

al., 1982). The literature on motivation to enter treatment is relatively more extensive than that on motivation to change; in some cases, the former is treated as a proxy for the latter (Miller, 1985; Yahne & Miller, 1999). This use of one type of motivation as a proxy for the other is understandable because to a large extent, the two types of motivation overlap (DiClemente et al., 2004). Nevertheless, the research on entering treatment is reviewed separately here to keep distinct what is understood about motivation to change from what is known about motivation to enter treatment.

Negative and Positive Consequences (Avoidance and Approach Goals)

A number of studies have found that, as with motivation to change behavior, avoidance or termination of the negative consequences of drinking are commonly cited reasons for entering treatment for drinking problems (e.g., Finney & Moos, 1995; Hingson et al., 1982; Krampen, 1989). This factor seems to be consistent over time, as a cross-sectional study published in 1989 largely replicated a prior study that had been published in 1958; in both cases, participants identified or endorsed a number of negative consequences of drinking they wished to avoid as reasons for seeking treatment (Krampen, 1989). These reasons included threatened or actual health problems, relationship problems, and financial or job problems (Krampen, 1989).

The motive of escaping negative consequences consistently emerges despite a variety of ways in which the construct has been operationalized. For example, in one study, the number of negative consequences of drinking that were reported by those who entered treatment was higher than the number reported by those who did not; help-seekers tended to explicitly identify negative consequences of drinking in response to open-ended questions about why they entered treatment (Hingson et al., 1982). In another study, endorsement of

3 or more lifetime alcohol-related problems strongly predicted help-seeking, although endorsement of alcohol dependence symptoms did not (Kaskutas et al., 1997).

Some researchers have found that the perception of problem severity mediated the self-reported effects of negative consequences of drinking on motivation to seek help (Finney & Moos, 1995). Alternatively, perceived problem severity may have simply factored into the subjective appraisal that the drinking was out of control (Hingson et al., 1982). Thus, just as the decision about what events warranted the decision to attempt behavior change was essentially subjective (Cunningham et al., 1995; Ludwig, 1985), so was the evaluation of what events warranted the decision to enter treatment (Amodeo & Kurtz, 1990). Moreover, this subjective evaluation sometimes could have resulted in deciding that one had hit bottom, which in turn could serve as motivation to enter treatment (Amodeo & Kurtz, 1990).

The decision to enter treatment also may be affected by beliefs about the costs and benefits associated with doing so (Cunningham et al., 2002). These beliefs may be affected in turn by perceived support from family, friends, or employers (Finney & Moos, 1995; Hingson et al., 1982), or by factors relating to perceptions of the therapist's motivation (Wild, Cunningham, & Hobdon, 1998). Moreover, having greater access to resources and having had treatment in the past have been found to significantly predict treatment entry, which may indicate that these factors reduce anticipated downsides to treatment, increase anticipated benefits, or both (Finney & Moos, 1995).

As with motivation to change behavior, there appears to be less focus on positive consequences of entering treatment than on negative consequences. This discrepancy may be because even where researchers have used open-ended questions in their methodology,

few study participants have identified such goals as reasons for initiating treatment (e.g., Amodeo & Kurtz, 1990).

Internal and External Sources of Motivation to Enter Treatment as Predictors of Treatment Outcome

Studies suggest that at some point, whether before entering treatment or after, people must develop internal sources of motivation in order to maintain abstinence for the long term (Amodeo & Kurtz, 1990; Amodeo, Kurtz, & Cutter, 1992; Downey, Rosengren, & Donovan, 2001; Ryan et al., 1995). It is less clear, however, that internal motivation *at the time of treatment entry* is important in predicting treatment outcome (Amodeo & Kurtz, 1990; Miller & Flaherty, 2000). Nevertheless, researchers often categorize reasons for entering treatment as originating from either internal or external sources (e.g., Downey et al., 2001; Miller & Flaherty, 2000; Ryan et al., 1995).

One problem with consideration of internal sources of motivation is that research demonstrates a lack of consistency in how internal sources of motivation are distinguished from external sources of motivation. For example, some studies consider internal sources of motivation to be primarily those in which the person has formed a personal belief that she or he has a problem and needs help, whereas external sources are primarily those in which she or he feels coerced in some way (e.g., Steinberg et al., 1997). Other studies take the approach that internal sources of motivation (sometimes called an “internal locus of causality”) are those in which the individual feels that she or he is the initiator and sustainer of his or her own actions, whereas external sources of motivation (“external locus of causality”) are those in which she or he feels that others have initiated, pressured or coerced his or her actions (Ryan et al., 1995). The differences in these two definitions, though seemingly slight, may result in classification of specific reasons as intrinsic in one study but extrinsic in another.

Furthermore, the distinction between extrinsic and intrinsic motivation is probably more accurately described as comprising a continuum rather than two independent categories (Ryan et al., 1995). Given the lack of uniformity in defining internal and external sources of motivation, the tendency to treat them as dichotomous rather than continuous may account for some discrepancies among the findings of various studies that examine intrinsic versus extrinsic motivation in an effort to determine whether particular types of motivation are associated with better treatment outcomes (see below). Thus, although family concerns could be viewed as an external source of motivation, it may be that the pressure is more due to internal feelings of guilt associated with sensing family disappointment rather than explicit pressure from family members (Ryan et al., 1995), which would better be understood as an internally motivated reason to enter treatment.

External sources of motivation frequently are involved in the motivation to enter treatment; it is not uncommon, following negative events associated with drinking, for family, friends, or community sources (e.g., the legal system, health or social service professionals) to suggest treatment (Hingson et al., 1982; Weisner, 1990). Many of those who do enter treatment cite these influences as important factors in their decision to do so (Hingson et al., 1982; Weisner, 1990). Some researchers nevertheless have suggested that external sources of motivation are less likely to produce lasting change than internal ones (Downey et al., 2001). Thus, one study of employed alcoholics found that those who initiated treatment due to employer coercion did not do as well as those who entered treatment voluntarily (Smart, 1974). However, another study suggested that, as long as internal sources of motivation are also present, additional external sources increase the likelihood of completing treatment and maintaining change (Ryan et al., 1995). A third study

argued that internal sources of motivation need not be present at the outset, as coerced treatment has been demonstrated to be effective (Miller & Flaherty, 2000).

Moreover, there is a sense in which all motivation, even that which originates with explicit coercion from another party, may be viewed as internal (Miller & Flaherty, 2000). In particular, despite whatever external pressure is brought to bear, a person always has the option not to bow to that pressure if she or he is willing to accept the consequences of that decision. For example, rather than entering treatment following a threat of divorce from a spouse, the choice to end the relationship – or allow the spouse to do so – is available; similarly, rather than report for legally mandated treatment, one could simply accept the alternative – perhaps a permanent loss of driver's license or a jail term (Miller & Flaherty, 2000). While these possibilities may not appear to present much of a choice, the understanding of external motivation must always be viewed from the perspective that one can never really be forced to do what one is truly unwilling to do (Miller & Flaherty, 2000).

Bearing in mind the recognition that all motivation is, to one degree or another, internal, it is nevertheless clear that the degree to which external factors are involved in the decision-making process may affect the likelihood of completing treatment as well as the likelihood of maintaining any behavior change post-treatment. Thus, those who report high levels of internal motivation appear to be more likely to complete treatment than those who report low levels of internal motivation (Downey et al., 2001; Ryan et al., 1995); however, the addition of an external mandate may increase the likelihood of treatment completion even in those with high internal motivation (see, e.g., Miller & Flaherty, 2000; Ryan et al., 1995). More particularly, the relative weights assigned to internal and external sources of motivation in the decision to enter treatment appear to be of critical importance (Ryan et al., 1995), but the research is contradictory about what relationship predicts the best outcome. Thus, one

study found that a measure of extrinsic motivation was inversely related to successful post-treatment abstinence, while a measure of intrinsic motivation was directly related to successful post-treatment abstinence; the difference between these two measures also was related to outcome (Downey et al., 2001). Conversely, another study found that so long as internal motivation was high, high external motivation was associated with better outcomes than low external motivation (Ryan et al., 1995). The reasons for these apparently disparate results are unclear, but may relate to differences in the way that the two types of motivation were categorized. The latter result is, however, supported by research that indicates that coercive treatment may be at least as likely to be effective as voluntary treatment (see Miller & Flaherty, 2000). However, unlike Downey et al. (2001) and Ryan et al.'s (1995) research, which involved external motivation as a continuous variable and was not limited to coercive pressure, Miller and Flaherty's (2000) research involved varying levels and types of coercion specifically.

The research on internal and external motivation to enter treatment for alcohol problems is limited by some important methodological issues. In particular, relatively few studies have addressed the question of whether motivation was primarily internal, primarily external, or some combination, and some of the studies available have been based on relatively small numbers of participants (see, e.g., Ryan et al., 1995). A related issue is that frequently, the representativeness of the sample involved is questionable, due to high dropout and/or refusal rates. For example, in one study, only 46 percent of those who met basic eligibility criteria provided baseline data; most of the remainder either refused to participate, failed to schedule the baseline appointment, or scheduled the appointment but failed to attend (Downey et al., 2001). The extent to which participants and non-participants were similar or dissimilar was not clear (Downey et al., 2001).

Self-Determination Theory

Self-determination theory (Deci & Ryan, 1980, 1985, 1987, 2000; Ryan & Deci, 1999, 2002) attempts to explain the ways in which external and internal reasons for initiating treatment or change may impact eventual outcome. According to self-determination theory, when an individual attempts a behavior change, the ultimate success or failure of that attempt depends, at least in part, on the extent to which the individual believes that he or she autonomously decided to attempt the change – i.e., that the change was self-determined (Deci & Ryan, 1985). A person experiences him or herself as having autonomy if she or he feels that the cause of or motivation for the change was primarily internally-driven (Deci & Ryan, 1985). In these circumstances, the individual integrates the new behavior into his or her identity, making the change more likely to last (Deci & Ryan, 1985). Moreover, to the extent that the individual feels coerced into a new behavior, she or he is unlikely to integrate the new behavior into his or her identity; rather, she or he will maintain the old behavior as the one that is viewed as truly part of him or herself, meaning that the old behavior will be resumed relatively quickly (Deci & Ryan, 1985).

In self-determination theory, intrinsic or internally-driven motivations are seen as related to autonomy, but the constructs are nevertheless distinct (see, e.g., Deci & Ryan, 1985). Deci and Ryan argue that intrinsic motivation refers to the degree to which one's reasons for engaging in a particular behavior emanate from within – that is, from reasons that have to do with personal desire to do so or with the rewards inherent in the activity itself, rather than with some external pressure or anticipated external reward or punishment. Autonomy, by contrast, subsumes within it the concept of a perception of choice, and therefore, whether activity is intrinsically or extrinsically motivated, it may nevertheless be considered autonomous if the individual believes he or she is choosing to engage in it. Thus,

the relationship between autonomy and intrinsic and extrinsic motivation is a complex one, in which higher levels of intrinsic motivation and lower levels of extrinsic motivation are likely to be associated with higher perceived autonomy, but individual differences may moderate the degrees of these relationships (see Deci & Ryan, 1985). The relationships between perceived autonomy and intrinsic and extrinsic motivation are likely bi-directional, with the absolute and relative weightweights of intrinsic and extrinsic factors in the decision-making process impacting perceived autonomy, as well as the perception of autonomy influencing the degree to which an individual cognitively or emotionally assigns weight to intrinsic and extrinsic reasons for deciding one way or the other.

Self-determination theory has successfully predicted outcome in a variety of behavior change studies. For example, in a study of a very low calorie weight loss program, researchers examined the relationship between level of autonomy in motivation for weight loss and outcomes up to 23 months post-treatment in 128 participants. They found that a higher degree of autonomy predicted better attendance and greater loss of weight during the program as well as increased maintenance of weight loss at follow-up (Williams, Grow, Freedman, Ryan, & Deci, 1996). Similarly, in a study of 159 adults with Type II diabetes, researchers found that perceived clinician support for autonomy predicted level of autonomous motivation, which in turn predicted glycemic control, with higher levels of perceived autonomy related to better glycemic control (Williams, McGregor, Zeldman, Freedman, & Deci, 2004). A third study explored whether self-determination theory could explain variability in long-term medication adherence among 126 adult outpatients with a variety of diagnoses and prescriptions. Higher levels of perceived autonomy were related to better medication adherence based on both self-report and pill count (Williams, Rodin, Ryan, Grolnick, & Deci, 1998). Likewise, two studies of tobacco cessation examined the

relationship between perceived autonomy and treatment outcome (Williams et al., 2006; G. C. Williams et al., 2002). In the first, a group of physicians used autonomy-supportive interventions with half of their smoking patients who agreed to participate. Compared with a control group, patients who received the autonomy-supportive intervention were more likely to be tobacco free at assessment sessions up to 30 months after the intervention (Williams, Gagne, Ryan, & Deci, 2002). In the second study, a longitudinal randomized controlled trial, 1006 adult smokers were assigned to intensive treatment designed to support patient autonomy or to community care. In this group of relatively poorly educated, low SES smokers, structural equation modeling demonstrated that the intervention group perceived greater support for autonomy, which predicted higher levels of autonomous motivation and in turn greater likelihood of smoking cessation.

In addition, one study has used self-determination theory successfully to predict treatment completion in a residential treatment facility for persons with alcohol use disorders (Ryan et al., 1995). Based on self-determination theory, the Treatment Motivation Questionnaire was developed to examine the relationship between internally and externally driven motivation and treatment completion (Ryan et al., 1995). Results supported self-determination theory by finding that among 98 treatment-seeking alcoholics, higher levels of internalized motivation predicted better attendance records, higher clinician ratings of treatment involvement, and greater treatment retention rates eight weeks post-assessment. Those with high levels of both internal and external motivation fared best on these measures, while those with low internal motivation fared worst regardless of external motivation level (Ryan et al., 1995).

Thus, self-determination theory suggests that relative and absolute levels of internal and external motivation are likely to impact the process of deciding to change drinking

behavior. It seems, however, that other kinds of alcohol-related cognitions also may play an important role in the decision-making process.

Alcohol-Related Expectancies

Self-Reported or Explicit Expectancies

Alcohol-related expectancies can be defined as beliefs about what consequences will flow from the use of alcohol (see Leigh & Stacy, 1993). Such expectancies may relate to short or long-term consequences, and they may be positive or negative (Jones & McMahon, 1994). As discussed below, a number of researchers have found that alcohol-related expectancies predict both alcohol consumption and alcohol treatment outcomes.

Positive expectancies have been found to predict a large percentage of the variance in alcohol consumption (e.g., Finn, Bobova, Wehner, Fargo, & Rickert, 2005; Jones, Corbin, & Fromme, 2001; Leigh & Stacy, 2004; Meier, Slutske, Arndt, & Cadoret, 2007). For example, in a classic study, current expectancies predicted between 30 and 45 percent of the variance in adolescent alcohol consumption (Christiansen, Smith, Roehling, & Goldman, 1989). In this study, the researchers sought to test longitudinally the predictive validity of outcome expectancies as measured by the Alcohol Expectancy Questionnaire – Adolescent Form in an initial sample of 871 seventh and eighth grade students. Among the 637 adolescents who completed the study tasks at two data collection times that were one year apart, expectancies at time 1 predicted approximately 25 percent of the variance in alcohol consumption at time 2 (Christiansen et al., 1989).

Positive expectancies related to alcohol use also have been found to distinguish between a clinical sample of inpatients in an alcohol treatment program and a control sample of medical patients (Zarantonello, 1986). Using the Alcohol Expectancy Questionnaire (AEQ; Brown, Goldman, Inn, & Anderson, 1980), the researchers found that the thirty male

participants who were being treated for an alcohol use disorder differed significantly from their non-alcohol dependent counterparts in their alcohol-related expectancies. In particular, the alcoholics had significantly higher positive expectancies associated with alcohol use on four of the six subscales (Global Positive Changes, Sexual and Physical Pleasure, Social Assertion, and Tension Reduction).

Expectancies also discriminate between heavy and light drinkers, according to a more recent study (Lee, Oei, & Greeley, 1999). Using discriminant analysis, the researchers studied 174 participants who reported drinking at least once per week. They divided the sample into high risk (heavy) and low risk (light) drinkers using Australian National Health and Medical Research Council guidelines. Using the Drinking Expectancy Questionnaire (Lee, Oei, Greeley, & Baglioni, 2003; Young & Knight, 1989; Young & Oei, 1996), they found that five out of six subscales correlated significantly with consumption (with correlation strengths ranging from approximately .2-.5), and that expectancies relating to loss of control strongly discriminated between the two groups of drinkers. Together, alcohol expectancies and self-efficacy correctly classified 83.9 percent of drinkers.

Recently, researchers have explored whether the relationship between expectancies and alcohol use is similar across different age groups (Leigh & Stacy, 2004). In a nationally representative household sample of U.S. residents aged 12 and older, 2875 respondents completed self-administered questionnaires about positive and negative effects of alcohol and drinking habits. Using factor analysis and structural modeling, the researchers found that in all age and gender groups, positive expectancies were positively related to alcohol use and negative expectancies were positively related to abstention from all alcohol use. However, the predictive value of positive expectancy was stronger among those younger

than 35 years, whereas negative expectancy was a better predictor for those older than 35 years (Leigh & Stacy, 2004).

Although much of the work on the relationship between expectancy and drinking is correlational, one research group has completed a series of studies that supports a relationship in which expectancies play a causal role in drinking among college students (Darkes & Goldman, 1993, 1998; Darkes, Greenbaum, & Goldman, 2004). In an early study, Darkes and Goldman (1993) used an expectancy challenge paradigm in which participants drank either placebo or alcohol, then participated in a group activity. Finally, the participants were asked to identify who had consumed alcohol and who had not based on behavior. Participants were not particularly accurate in discriminating the alcohol-drinkers from the placebo-drinkers; in fact, they performed no better than chance in determining whether or not they themselves had consumed alcohol. Thus, the expectancy challenge portion of the experiment involved this demonstration that study participants were not necessarily able to determine alcohol consumption accurately by observing behavior, along with follow-up discussion about popular beliefs or expectancies about the effects of alcohol that may not be accurate. In order to test the hypothesized causal relationship between expectancy and drinking in this study, drinking levels were measured both before and after the challenge itself, and were compared to drinking levels in an assessment-only group and in a more traditional treatment group that received information about the societal, familial, personal, and physical consequences of alcohol in a didactic presentation format. In this study, and in a later study that followed participants for several weeks following the experimental intervention (including the week of spring break), consumption of alcohol was reduced in the challenge group but not in the other two groups (Darkes & Goldman, 1993, 1998). Moreover, in a more recent study, using sophisticated statistical modeling techniques,

researchers found that the well-established positive relationship between sensation-seeking and drinking and the negative relationship between religiosity and drinking both were mediated significantly and at least partially by expectancies (Darkes et al., 2004).

Although most expectancy research has focused on the content of expectancies using self-report measures, researchers have pointed out that such research may fail to measure important facets of expectancies (e.g., Del Boca, Darkes, Goldman, & Smith, 2002; Palfai & Wood, 2001; Stacy, 1997). One such aspect of expectancy is the distinction between strength and content of particular expectancies. For example, it is possible that both alcoholic and non-alcoholic individuals may hold similar beliefs about some of the effects of alcohol; they may nevertheless differ on how strongly they hold such beliefs or how much relative weight these beliefs are accorded in the decision-making process of whether to drink or not in a particular situation (cf. Palfai & Wood, 2001). Nevertheless, it is possible that such distinctions may be inherently difficult or even impossible for individuals to make for purposes of self-report (Del Boca et al., 2002).

Moreover, as has been noted, “we may study expectancies by using language-based measures, but we should never mistake our measures with the processes they measure, nor such operations for the full range of expectancy processes. . . [E]xpectancies are not necessarily the same as verbally expressed beliefs or attitudes and certainly are not entirely conscious (operating within awareness)” (Del Boca et al., 2002, p. 927). The next section will examine research regarding the role of implicit cognition, including expectancy, in alcohol use, abuse, and dependence.

Implicit Cognitions

Psychologists have long recognized that self-report and introspection cannot capture the entirety of all psychological phenomena of interest (see Nosek, Greenwald, & Banaji,

2007). Moreover, reasons may exist for preferring other methods even for phenomena that can be measured using these methods, because self-report is susceptible to intentional or unintentional distortion (De Houwer, Crombez, Koster, & De Beul, 2004; Nisbett & Wilson, 1977; Stacy, 1997; Wiers & Stacy, 2006). Perhaps due to this recognition, researchers have devised a variety of methods to investigate cognition using indirect methodologies. Such methods may be designed to tap into cognitive processes of which the individual is unaware, to disguise in some way the true object of measurement in order to prevent dissembling, or to use measurement techniques that are impervious to conscious attempts to manipulate responses. Any or all of these approaches may be especially useful in research on addictions, both because of lack of conscious recognition of relevant cognitions, and because of social constraints that may discourage disclosure of particular cognitions or behaviors.

Because of the recognition that expectancies and other cognitions are only partially susceptible to understanding through self-report, researchers have begun to explore alcohol expectancies using indirect or implicit measures. Such measures have included attempts to understand such implicit processes as memory accessibility (e.g., Kahler, 2001; Palfai & Wood, 2001), depth of processing (e.g., Kahler, 2001), automaticity and attentional bias (e.g., Johnsen, Laberg, Cox, Vaksdal, & et al., 1994; Stetter, Ackermann, Bizer, Straube, & et al., 1995), priming (e.g., Carter, McNair, Corbin, & Black, 1998; Weingardt, Stacy, & Leigh, 1996), cue exposure (e.g., Sayette, Monti, Rohsenow, Gulliver, & et al., 1994), and implicit associations or attitudes (e.g., De Houwer et al., 2004; Palfai & Ostafin, 2003). Methods have included applications of the Stroop paradigm, various memory tasks, and computer-based reaction time measures including the Implicit Association Test (Greenwald, McGhee,

& Schwartz, 1998), the Extrinsic Affective Simon Task (De Houwer, 2003; De Houwer et al., 2004), and the Go-NoGo Association Task (Nosek & Banaji, 2001).

Although implicit measures may be useful additions to the more explicit measures that have been used in research, they are not without problems. In particular, by virtue of the fact that implicit measures do not directly measure the constructs they are attempting to understand, questions may arise about how the results are to be interpreted (De Houwer, 2006). That is, if a measure is not measuring what it appears to measure on its face, how does one decide what it actually is measuring? To answer this question, researchers must articulate adequate theoretical and empirical reasons for the interpretations they propose, especially in cases where other plausible explanations may explain the data obtained equally as well. De Houwer (2006) has proposed that researchers must examine not only the reliability and validity of the measure, but also whatever functional properties are relevant. For example, if the measure is designed to measure a construct of which the participant is unaware, the participant's awareness of that construct, or of the true purpose of the measure, should be examined. If, instead, the measure is designed not to measure a construct of which the participant is unaware, but rather to use a method that gives participants little control over the outcome despite knowing the purpose, whether this intention has in fact been manifest must be tested empirically (De Houwer, 2006). Unfortunately, much of the research using implicit measures in cognitive, social, and clinical psychology to date has failed to empirically study whether the measure has the functional properties it is theorized to have (De Houwer, 2006). However, there are exceptions, some of which will be described below.

Implicit Alcohol-Related Expectancies. A number of implicit measures have been used in an attempt to tap into cognitions about alcohol that may be outside the individual's (1)

awareness or (2) conscious control. Some researchers have called such cognitions “implicit expectancies” (Goldman et al., 2006); like expectancies that are measured through self-report, they may reflect beliefs or evaluations about the consequences of using alcohol (see Goldman et al., 2006). However, the term “expectancy” as used here encompasses more than the outcome expectancies described above. In the sense used here, the implicit nature of the expectancies involved means that they include information processing, conditioning and learning, and motivational and affective components that may not be encompassed in the expectancy literature described to this point (see Goldman et al., 2006).

Nevertheless, implicit expectancies are related to the explicit expectancies described above. For example, multidimensional scaling methods have been used to map the expectancy associational space related to alcohol in an attempt to map the memory network associated with alcohol (Dunn & Goldman, 1998; Rather & Goldman, 1994; Rather, Goldman, Roehrich, & Brannick, 1992). Moreover, like explicitly measured expectancies, implicitly measured expectancies also predict alcohol consumption. Research on implicit expectancies has progressed using a variety of indirect measurement techniques, some of which are described here.

Studies Involving Priming Paradigms. Two types of priming tasks have been used in addictions research. The first type, semantic priming, generally involves the presentation of a prime word followed by a target word to which a response is to be generated – usually a pronunciation task or a lexical decision task. The prime either is or is not related to the target word; the difference in response time between these two types of targets is measured to determine the priming effect, which is theorized to provide information about memory networks. The second type of priming task, affective priming, involves the presentation of a priming stimulus that is consistent or inconsistent with the evaluative dimension of the

target that follows. Response time to categorize the target as “good” or “bad” is usually the measure of interest.

Research into alcohol-related issues using priming paradigms has proceeded in several ways. In one type of experiment, word primes are presented to participants. In one such study, researchers presented participants with either alcohol-related or neutral primes (Hill & Paynter, 1992). They used a lexical decision task, and found that among alcohol dependent participants, alcohol-related words semantically primed alcohol target words, but among non-dependent heavy drinkers and among light drinkers, this effect did not occur.

In another word-priming study, researchers presented participants with negative or positive mood phrases, or with primes that were unrelated to alcohol. The dependent measure was response time to read the alcohol target aloud. Researchers found that the negative mood primes, but not the positive ones, activated the alcohol concepts (Zack, Poulos, Fragopoulos, & MacLeod, 2003).

Researchers have explored the effects of alcohol-related primes on alcohol consumption. In particular, Roehrich and Goldman (1995) presented participants with alcohol-related or neutral primes of one of two types (video or semantic) and subsequently measured consumption of a non-alcoholic beer (participants were led to believe the beer was regular beer). They found that either type of alcohol-related prime increased women’s consumption of the beer as compared with those who had been presented with the neutral primes.

Accessibility of Information. The recency and frequency of use of information that is stored in memory may affect the relative speed and ease with which such information can be accessed on demand (cf. Palfai & Wood, 2001). This concept is known as accessibility of information or memory accessibility, and it appears to influence responses to alcohol-related

stimuli in a variety of domains, including cognition, affect, and behavior (Palfai & Wood, 2001).

Researchers have theorized that accessibility of alcohol-related expectancies may mediate the relationship between expectancy and drinking behavior (e.g., Palfai & Wood, 2001; Stacy, 1997). Such theories are based on information-processing research in cognitive science; according to this view, alcohol-related information, including cues, expectancies, and drinking behavior, is represented in memory as interconnected nodes (Palfai & Wood, 2001). One research group used a multidimensional scaling method to map networks of alcohol expectancies in heavy and light drinkers of various ages; they found in a series of studies that heavier drinkers could be differentiated from lighter drinkers based on how tightly expectancies in the model were linked, particularly in the arousal dimension (Dunn & Goldman, 1998; Goldman & Darkes, 2004; Rather & Goldman, 1994; Rather et al., 1992). Tighter linkage between expectancies and drinking should theoretically mean that the expectancies are more readily accessible for the heavier drinkers, which was consistent with the findings of these studies.

A few studies have examined the relationship between accessibility of alcohol-related information and self-report of alcohol-related cognitions and/or alcohol-related behaviors. For example, Stacy (1997) explored the predictive power of memory activation and expectancies on alcohol and marijuana use among college students. In this study, drawing on the view that people differ in the strength of associations between expectancies and behaviors, Stacy used a word association task, a phrase association task, and an object association task to explore the extent to which alcohol-related or marijuana-related words or activities were associated with ambiguous stimuli. The responses were coded for alcohol and marijuana response frequency, and through structural equation modeling the author tested

several models for each of the drugs (alcohol and marijuana). The best fit model for prospectively predicting alcohol use included previous alcohol use, memory activation, self-reported expectancies, and sensation seeking.

Another study examined whether accessibility of information may affect the behavioral consequences of expectancies. Thus, Palfai and Wood (2001) examined the relationship between memory accessibility and both expectancies and drinking behavior among college students who drank. To test accessibility of expectancies, they presented participants with a list of 21 phrases, 10 of which described positive outcomes of alcohol use, and the remainder of which described filler outcomes. The participants were asked to write down, for each phrase, the first two behaviors they thought of with regard to these outcomes for themselves. These responses were coded for alcohol response frequency; the results showed that accessibility predicted measures of frequency of alcohol use, heavy drinking, and alcohol-related problems, even when the predictive value of a self-report measure of alcohol expectancy was controlled statistically.

In a study exploring motivation to change drinking behavior among heavy drinkers, Kahler (2001) had participants complete the Decisional Balance Fluency Test (DBFT), a task in which they were asked to generate, in separate timed periods, reasons why they would or would not want to change their drinking patterns. The results indicated that accessibility of a composite measure of both types of reasons was significantly and positively related to how often participants reported having thought about reducing drinking. In fact, when time spent thinking about reasons to change drinking was statistically controlled, relationships between the composite measure and both stage of change and expectancies were not significant.

Depth of Processing. The role of depth of processing in memory initially was explored by Craik and Tulving (1975). In this seminal study, the researchers developed an incidental recall task in which the participants were shown a list of words and asked to think either about something related to the meaning of each word (e.g., whether a word was a member of a particular category), or about a structural feature of each word (e.g., whether it rhymed with another word). In later recall and recognition tasks, they remembered more words if they had been asked to do the former task than the latter.

Based on the work of Craik and Tulving (1975), as well as on research on memory bias in depression, Kahler (1999; 2001) studied whether heavy drinkers would, on an incidental recall task, remember more information that was viewed as personally relevant than information that was not. He developed the Memory for Alcohol Consequences Task (MACT), a memory task in which the drinker initially was asked to sort two decks of index cards. Each card contained a statement of a single positive or negative consequence of drinking. The sorting criterion was based on whether each card was currently relevant to the individual. Following a distracter task, the individual was asked to write down from memory as many of the reasons as possible in any order, and without regard for exact wording or whether they had been sorted as relevant or not. The results showed that participants remembered more reasons that were considered relevant to themselves than those that were not considered relevant to themselves.

Limitations in the Literature to Date

As discussed previously, the research to date on motivation in alcohol treatment has relied primarily on self-report measures. This heavy reliance on self-report is true both for the specific reasons for entering treatment, and for other cognitions relating to alcohol, such as expectancies. To the extent that expectancies have been studied using implicit measures,

the relationship between implicit expectancies and reasons for entering treatment has not yet been explored. Moreover, with the exception of Kahler's (1999; 2001) development and use of the DBFT and the MACT, no studies were found in which more than one type of implicit measure was employed. Thus, little to no information is available concerning whether or how the different implicit measures may be related to each other in the same individuals.

In addition, certain methodological limitations are ubiquitous in the implicit cognition literature more generally. For example, much of the research has been conducted using college students as participants (e.g., Goldman & Darkes, 2004; Reich, Noll, & Goldman, 2005; Stacy, 1997; Weingardt et al., 1996), although there are exceptions (e.g., Kahler, 1999; Sayette et al., 1994; Stetter et al., 1995; Zack et al., 2003). Limitations of the Stacy (1997) study exemplify the types of limitations seen in much of the research using implicit measures. For example, while the measures of drug use generally assess use over the previous month, implicit measures of memory activation or cognitions reflect only immediately accessible memory associations (Stacy, 1997). Moreover, although the word association measure was designed to tap into implicit processes, the experimenters did not attempt to experimentally control for the possibility of participants' use of nonautomatic processes in completing the task (Stacy, 1997). Kahler (1999; 2001) also notes certain important limitations in his study of accessibility and depth of processing. In particular, the sample size was relatively small (47 participants) and relatively young (mean age = 28.9 years). It also was limited to people who were in the early stages of considering (or who were not considering) changes to their drinking. Finally, like most research in implicit cognition relating to alcohol, the study was cross-sectional, and therefore did not permit testing of the possible predictive power these variables may provide for other outcomes of potential interest, particularly change in drinking behavior. (Kahler, 1999, 2001).

Hypotheses

Based upon the work of Kahler (1999; 2001), it appears that drinkers who are seriously considering taking action to change their drinking show both greater access to, and greater depth of processing of reasons to change or not change their drinking patterns. Moreover, greater accessibility to reasons to change or not to change is associated with greater time spent thinking about such reasons. People who have entered treatment for addictions theoretically are attempting such changes, and therefore would be expected to have ready access and to have deeply processed reasons for having done so; however, self-determination theory would suggest that the consideration and decision-making process may have been minimal among those who report primarily external forces (and a relative absence of internal motivation) having driven their decision to enter treatment. In effect, the lack of internal motivation may indicate that the individual does not feel the decision to stop drinking is her or his own, and therefore has not yet internally adopted as her or his own the reasons for doing so. To the contrary, it is possible that in some cases, perceived external pressure may actually undermine or suppress internal motivation (see Ryan & Deci, 2000). On the other hand, those who report high internal motivation to change may have begun, through repeated accessing and consideration of reasons to change their drinking behavior, to internalize negative associations with alcohol in a way that externally-driven individuals have not. Although it is expected that all of those who have entered treatment for alcohol dependence will report having experienced substantial negative consequences of alcohol use, these self-reports may be more congruent with an implicit measure of negative expectancies if the individual is internally motivated for treatment entry. With this expectation in mind, two primary hypotheses were tested in this study.

The constructs investigated in the present study were: (1a) internal motivation to enter treatment; (1b) internal motivation to quit drinking; (2a) external motivation to enter treatment; (2b) external motivation to quit drinking; (3) time spent thinking about reasons to change or not to change drinking behavior; (4) accessibility of reasons to change or not change drinking behavior; (5) perceived self-relevance of reasons to change or not to change; and (6) depth-of-processing of reasons to change or not change drinking behavior. The following relationships among these constructs were hypothesized:

(1) Internal and external motivation, as measured by the RQQ and/or the TMQ, will be associated with accessibility of reasons to change or not to change in the following ways: (a) when internal motivation is high (regardless of external motivation), time spent thinking about reasons to change or not to change will be high, and therefore accessibility (DBFT) scores will also be high; (b) when external motivation is high and internal motivation is low, time spent thinking about reasons to change or not to change will be low, and therefore accessibility (DBFT) scores will be relatively low.¹ Figure 1 shows the hypothesized relationships among perceived autonomy (which was not tested in this study), internal and external motivation, time spent thinking about the decision to change, and the accessibility of information measures.

(2) Internal and external motivation as measured by the RQQ and/or the TMQ will be associated with depth-of-processing in the following ways: (a) when internal motivation is high (regardless of external motivation), number of reasons to change or not to change that

¹ We did not anticipate having participants in this sample who reported both low internal and low external motivation, as we would not expect such individuals to be seeking treatment. In fact, only two individuals scored fewer than half of the possible points on both RQQ-int and RQQ-ext; and only one participant scored fewer than half of the available points on both TMQ-int and TMQ-ext. In each of these three cases, the individual scored more than half of the available points on at least one of the two subscales on the other scale. Thus, as anticipated, the participants generally scored relatively highly on one or more of the subscales of the RQQ or the TMQ.

are viewed as relevant will be high, and therefore depth of processing (MACT) scores also will be high; (b) when external motivation is high and internal motivation is low, number of reasons to change or not to change that are viewed as relevant will be low, and therefore depth of processing (MACT) scores will be relatively low. Figure 2 shows the hypothesized relationships among perceived autonomy (which was not tested in this study), internal and external motivation, perceived self-relevance of positive and negative outcomes of change, and the depth of processing measures.

(3) Exploratory analyses examined whether self-report measures of motivation to enter treatment and motivation to change behavior are correlated sufficiently highly to make them acceptable proxies for one another.

(4) Psychometric properties of the main study measures were examined.

Method

Participants

Participants were individuals seeking treatment for alcohol dependence at a U.S. Veterans Administration Hospital in Newington, CT. They were required to meet criteria for a current diagnosis of alcohol dependence according to the DSM-IV (American Psychiatric Association, 2000) and to speak and read English at the sixth grade level or higher. Patients who were either intoxicated or in need of medically supervised detoxification were excluded until after they were sober and had completed any needed detoxification treatment. In addition, potential participants were excluded if they showed evidence of significant cognitive impairment (see below) or if they had a mental or physical condition that contraindicated participation. This latter criterion was determined based on observation by the experimenter or self-report by the potential participant of some impediment to participation (such as injury or physical impairment that precluded

completion of study tasks); to the extent possible, accommodation was made to allow participation.

Sixty-seven patients who reported alcohol-related problems during a routine intake interview for the Substance Abuse Treatment Program at the Veterans Administration Hospital were asked if they would be willing to meet with a researcher about the possibility of participating in a study about motivation to stop drinking. Sixty-four patients agreed to meet with the researcher, of whom 50 consented to participate. Of these fifty, four were determined to be ineligible based on exclusion criteria (one showed significant evidence of cognitive impairment, the other 3 had been voluntarily abstinent for longer than a month, thus placing their alcohol dependence in the early full remission course specifier category rather than the current dependence specifier). Data from an additional subject were excluded because it became clear in reviewing his responses on the DBFT that, although he met diagnostic criteria for alcohol dependence based on the screening interview, he did not consider alcohol a problem and was primarily responding to study tasks with regard to his cocaine use. Most of the 14 people (13 men, 1 woman) who declined to participate indicated that they wanted to focus on the required activities of the treatment program rather than become involved in research activities.

Patients at the hospital are adults who have served in the military. The final sample was all male. Racial and ethnic backgrounds were primarily white/non-Hispanic (32 participants; 71.1 percent); minorities represented were black or African American/non-Hispanic (11 participants; 24.4 percent) and white/Hispanic/Latino (2 participants; 4.4 percent). The mean age was 54.4 years ($SD=8.6$ years). On average, the veterans reported 13.06 years of education ($SD=1.90$; $Mdn=12.75$; $range=9-18.4$); eighteen veterans also reported having attended trade or technical school for up to 60 months ($M=15.65$;

$SD=15.31$; $Mdn=12$; $range=1-60$). The median monthly income reported was \$803.50 ($mode=0$; $range=0-12,047$). Of those who reported income in the past month, the most commonly reported primary and secondary sources were disability or pension (59%); employment or self-employment (34%); and unemployment compensation or family support (9% each).

Median number of days since last consumption of alcohol was 8 ($M= 9.75$; $SD=9.8$; $range: 2$ to 30). Participants generally had long histories of problems with alcohol, reporting an average age of onset of alcohol-related problems of 26.2 years ($SD=10.1$; $Mdn=24.5$; $range:12-55$). All participants reported 5 ($n=1$; 2.2%), 6 ($n=12$; 26.7%), or 7 ($n=32$; 71.1%) lifetime dependence symptoms. They typically had experienced dependence symptoms for several decades ($M=28.4$ years; $SD=11.5$; $Mdn=30.2$; $range: 2.7-56.8$). Moreover, they typically endorsed frequent heavy drinking, severe dependence, and significant negative consequences of drinking; eighty percent of the sample scored between 20 and 40 on the AUDIT, indicating high problem severity (Donovan, Kivlahan, Doyle, Longabaugh, & Greenfield, 2006).

Forty percent of the sample reported illicit drug use within the past month, with the most frequently reported drugs used being cocaine (20 percent), marijuana (11 percent), and heroin (9 percent). Thirty-one percent reported no history of illicit drug use at all, while the remainder reported history of illicit drug use ranging from 1 month to 40 years prior to the interview. With permission of study participants, their electronic medical records also were reviewed to determine what other substance use or mental disorder diagnoses they had. In particular, the participants' diagnostic profiles in routine psychiatric evaluations completed prior to treatment entry were reviewed. These psychiatric evaluations are routinely conducted via interview by a licensed psychologist or psychiatrist, or by an advanced trainee

(psychology intern or postdoctoral resident or psychiatric resident) under supervision of an appropriate licensed professional. Other than alcohol dependence, most participants had no other substance use disorder diagnoses (n=23; 51.1 percent). The remainder had one (n=11; 24.4%), two (n=8; 17.8%), or three (n=3; 6.7%) additional substance use disorder diagnoses.

Specific diagnoses according to the psychiatric evaluations were as follows: current cocaine abuse or dependence (n=12; 26.7%); cocaine dependence in early or sustained full remission (n=5; 11.1%); current cannabis dependence (n=7; 15.6 percent); cannabis dependence in early or sustained full remission (n=3; 6.7%); current opioid abuse or dependence (n=4; 8.9 percent); opioid dependence in early or sustained full remission (n=5; 11.1%); and current benzodiazepine dependence (n=1).

Excluding substance use disorders and rule-out diagnoses, thirty-two of the participants (71.1 percent) had at least one comorbid DSM-IV Axis 1 diagnosis. Of these participants, 20 had one such diagnosis, 11 had two, and one had 3. Mood disorders were the most prevalent (n=20; 44.4% of the full sample), followed by PTSD (n=10; 22.2%), and other anxiety disorders (n=4; 8.9%). The remaining diagnoses included psychotic spectrum disorders, adjustment disorders, and ADD (n=5; 11.1%). Only one participant's medical record indicated a full Axis 2 diagnosis (borderline personality disorder). Four others were described as exhibiting various axis 2 features, including borderline, schizotypal, paranoid, or schizoid.

Seven participants reported that they had been explicitly required to seek treatment and anticipated a specific negative consequence if they did not attend (2 by a court, 2 by the Rocky Hills Veterans Home,² and 3 by an employer). Six additional participants reported

²The Rocky Hill Veterans Home is a state-funded housing facility for homeless veterans. It has 483 beds available and provides a wide variety of services to residents, including

having received pressure to attend treatment by family, by a landlord or the Veterans Home, or by a probation officer, although they did not believe this pressure rose to the level of a mandate to attend treatment.

Participants were not compensated for participating in the study; however, they were given a \$5 gift card to their choice of a local retail store or fast food restaurant to thank them for their participation.

Measures

Diagnostic Measures

Alcohol Dependence. The diagnosis of alcohol dependence was confirmed using the Structured Clinical Interview for DSM-IV (research version) (SCID; First, Spitzer, Gibbon, & Williams, 2002). The SCID is designed to allow the researcher to diagnose any or all of the disorders included in the Diagnostic and Statistical Manual of Mental Disorders (4th edition) (DSM-IV-TR) (American Psychiatric Association, 2000). Diagnoses may be made for current or lifetime disorders. In this study, only the alcohol dependence portion was used. The SCID has demonstrated good reliability and validity in addictions treatment populations (Kranzler, Kadden, Babor, & Tennen, 1996).

Cognitive Impairment. In participants who showed evidence of cognitive impairment (e.g., if they appeared to be having issues with memory, attention, or orientation during the interview), the Folstein Mini Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) was administered. The MMSE is a 17 item interview designed to allow rapid assessment of cognitive functioning in a variety of domains, such as short-term memory, orientation to time and place, and visuospatial skills. If a participant scored below 25, he was excluded from participation on the basis of cognitive impairment.

extended substance abuse treatment, vocational rehabilitation, and therapeutic recreation services.

Demographic and Recent Substance Use Information

Participants were asked as part of the consent process to permit investigators to review their electronic medical record for information about demographics and other psychiatric or substance abuse problems or histories. Diagnostic information was obtained from recent diagnostic psychiatric evaluations, which are conducted routinely by licensed psychiatrists or psychologists, or by advanced psychiatric residents or psychology interns with review and clarification by appropriate licensed supervisors. Demographic information generally was obtained from the Addiction Severity Index (McLellan, Luborsky, Woody, & O'Brien, 1980), which is administered routinely to patients in the treatment program. Occasionally, the ASI was not completed because the patient left the program before the ASI had been completed by the case manager. In these cases, information was obtained from other portions of the electronic medical record to the extent it was available and could be considered reliable.

In addition, as part of the research interview, participants were asked the type, amount, and frequency of typical and most recent alcohol consumption, and when they last had an alcoholic beverage. Participants were also asked when they last used illicit drugs or abused medications, and what and how much they had used at that time.

Implicit Measures

Decisional Balance Fluency Test (DBFT)/Verbal Fluency Task: The DBFT was developed as a way to study the accessibility of reasons to change or not change heavy drinking (Kahler, 1999). Participants initially are asked to verbally generate a list of reasons why they would want to continue drinking in their current pattern. They are given 2 minutes and told to generate as many reasons as they can before the researcher tells them to stop. Then, the participant is asked to rate the overall strength of the reasons for not wanting to quit

drinking on an 11 point Likert scale. The participant is next asked to rate how often in the past month they have thought about why they would not want to quit drinking (“not at all”, “a little bit”, “a fair amount”, “quite a bit”, or “very much”). The participant is then asked to repeat the entire procedure, generating a list of reasons why they would want to stop drinking. Both of these tasks are recorded on audiotape for later coding by the investigator. Because this order is believed to mirror the real-world process that people go through as they are considering whether or not to drink, the order of administration of the two tasks is kept constant (Kahler, 1999, 2001). The transcripts are coded by counting the number of non-synonymous reasons to change or not to change given by the participant in the timed period. In the current study, it was expected that those participants who scored higher on self-report measures of internal motivation would generate more of both types of reasons than those who scored lower on these measures. The DBFT has demonstrated good reliability and validity in prior research (Kahler, 1999, 2001). In particular, interrater reliability as measured by Pearson’s r was good for both reasons to change ($r(47)=.89$; $p<.0001$) and reasons not to change ($r(47)=.73$; $p<.0001$) (Kahler, 2001). Test-retest reliability was adequate for number of reasons to change ($r(15)=.65$; $p<.01$) and number of reasons to change ($r(15)=.68$; $p<.01$) (Kahler, 2001). Number of reasons to change was positively correlated with frequency of thinking about reasons to change in the past month ($r(47)=.46$; $p<.01$), but number of reasons not to change was not significantly correlated with frequency of thinking about reasons not to change ($r(47)=.24$; $p=.10$) (Kahler, 2001).

The Verbal Fluency Task is designed to allow researchers to control for differences in verbal fluency among participants (Kahler, 1999). In this task, participants are asked to name as many words as possible that begin with the letters F, A, and S, excluding repetitions (or variations of the same word), proper names, and numbers. For each letter, the

participants are given one minute. The task is scored by summing the number of words generated in the allotted time that meet the above criteria.

Memory for Alcohol Consequences Task (MACT): The MACT was developed as a method for studying depth of processing of reasons to change or not to change drinking behavior (Kahler, 1999, 2001). In the MACT, participants are shown index cards, each of which contains a sentence describing a positive or negative consequence of drinking or of reducing drinking. The sentences describe 6 positive and 6 negative consequences of continued drinking and 6 positive and 6 negative consequences of reducing drinking, for a total of 24 sentences. Table 1 shows a list of the sentences. Each statement contains one word that is in capital letters; the capitalized word is intended to be the most salient aspect of the sentence to aid recall. Initially, the participant is presented with the cards in one of two random orders, and is asked to sort the cards according to whether they generally do or do not apply to the participant and his drinking. Following a distracter task, in which the participant is asked to list as many words as possible that begin with the letter M for 30 seconds, the participant is asked to recall as many of the reasons as he can, regardless of whether the reasons generally apply to the participant or not. The participants are instructed that order and exact wording are not important, but that they should try to give the meaning of the statement as much as possible. As initially conceived, the MACT recall task was a written task; however, because many of the participants in this study were considered likely to have poor writing skills, the recall task in this study was conducted orally and tape recorded for later coding by researchers. Coders determined whether each statement given during the recall period contained one of the emphasized words or was otherwise synonymous with one of the sentences, and if so, identified which target sentence the statement recalled. The number of statements identified as recalled for each of the 4 groups

of sentences was recorded, and the number of recalled pros of drinking and cons of quitting were summed to determine the total number of negative outcomes of change recalled; similarly, the number of recalled pros of quitting and cons of drinking were summed to determine the total number of positive outcomes of change recalled.

The MACT is used to assess depth of processing of reasons to stop or continue drinking. It has demonstrated good reliability and validity in prior research (Kahler, 1999). Interrater reliability was quite high, with the raters agreeing on the coding of 1099 out of 1128 MACT statements (97.4%) (Kahler, 2001). In addition, the participants recalled more self-applicable statements ($M=48.4\%$; $SD=17.7\%$) than non-applicable statements ($M=37.4\%$; $SD=18.7\%$), a difference that was significant ($t(46)=3.19, p<.01$). In concurrent validity analyses, Kahler (1999; 2001) tested the four sets of sentences to see if they were associated with self-report measures that would be expected to measure similar constructs. The following significant positive relationships were reported: number of MACT self-relevant pros of changing with Benefits on the ADCQ ($r(47)=.69; p<.0001$); the number of MACT self-relevant cons of changing with Costs from the ADCQ ($r(47)=.60; p<.0001$); the number of self-relevant MACT pros of drinking with Positive Expectancies from the AEQ ($r(47)=.77; p<.0001$); and the number of self-relevant cons of drinking with Negative Expectancies on the Primary Appraisal Measure ($r(47)=.64; p<.0001$) (Kahler, 1999).

Self-Report Measures

Alcohol Use Disorders Identification Test (AUDIT). The AUDIT (Saunders et al., 1993) is a 10 item screening questionnaire designed to identify individuals whose drinking patterns are hazardous or harmful. Its items assess quantity and frequency of drinking as well as negative consequences of alcohol use. Developed by the World Health Organization, it has

been used extensively in research and clinical settings, and has demonstrated good reliability and validity (Allen, Litten, Fertig, & Babor, 1997).

Treatment Motivation Questionnaire (TMQ). The TMQ (Ryan et al., 1995) is a 26 item scale that measures reasons for entering treatment for alcoholism using a 7 point Likert scale. The items are designed to explore the extent to which the decision to enter treatment was driven by internal or external factors. The TMQ has demonstrated adequate psychometrics and good construct validity (Ryan et al., 1995). In prior research, a factor analysis supported the validity of mapping specific items onto internal (TMQ-int) and external (TMQ-ext) subscales (Ryan et al., 1995). Sample items include “I came for treatment at the clinic because I really want to make some changes in my life” (internal subscale); “I chose this treatment because I think it is an opportunity for change” (internal); “I came to treatment now because I was under pressure to come” (external); and “I came for treatment at the clinic because I was referred by the legal system” (external).

Reasons for Quitting Questionnaire (RQQ). The RQQ (Curry, Wagner, & Grothaus, 1990; Curry, Grothaus, & McBride, 1997; Downey et al., 2001; McBride et al., 1994) is a 20 item self-report questionnaire that asks respondents to rate on a 5 point Likert scale to what extent particular reasons for quitting substance use are relevant for the respondent. It has demonstrated good reliability and validity in tobacco smokers (Curry et al., 1990; Curry et al., 1997; McBride et al., 1994) and, in a slightly modified version, among alcohol and drug users (Downey et al., 2001). In this study, because its items were specifically worded to be appropriate for analysis of reasons for quitting alcohol or drug use, as opposed to tobacco use, and because it has demonstrated good validity in use with alcohol and drug users, Downey et al.’s version was used. In previous research, Downey et al. (2001) used a principal components analysis to map the items onto extrinsic (RQQ-ext) and intrinsic

(RQQ-int) factors; these are the subscales used in this study. Sample items include “I want to quit at this time so that I can feel in control of my life” (intrinsic); “I want to quit at this time because using alcohol or drugs does not fit who I want to be” (intrinsic); “I want to quit at this time because people I am close to will be upset if I don’t quit” (extrinsic); and “I want to quit at this time because of legal problems related to my using alcohol or drugs” (extrinsic).

Alcohol and Drug Consequences Questionnaire (ADCQ). The ADCQ (Cunningham et al., 1997) is a 28 item questionnaire that measures the expected costs and benefits of quitting substance use. Respondents are asked how important, on a 6 point Likert scale, specific items would be if they cut down or quit substance use. The ADCQ has demonstrated good reliability and validity in research studies (e.g., Carey, Maisto, Carey, & Purnine, 2001). Items all begin with the phrase “If I stop or cut down...”; sample completion phrases include “I will feel better physically” (benefits); “I will have fewer problems with my family” (benefits); “I will feel frustrated and anxious” (costs); and “I will miss the feeling of being high” (costs).

Procedures

The study measures were completed by participants in a single session, which generally lasted approximately 75 minutes (including the informed consent and debriefing processes). The study sessions were conducted by the principal researcher or by a psychology predoctoral student from a local university who was trained by the principal researcher. Potential participants were asked by their intake clinician if they would be willing to speak with a researcher about participating in a research project. If they agreed, they met with a researcher within 3 business days after admission to the program. Following the informed consent process, those who agreed to participate were screened for eligibility using the alcohol dependence portion of the SCID. If eligible, they were then asked several

additional interview questions: first, whether they had been required to attend treatment, second, if not required to attend, whether anyone had pressured them to attend treatment, third, when they last consumed any alcohol, and how much they drank at that time, and fourth, when they last used any drug other than medication used appropriately, and what and how much they had used at that time. In each case, follow-up questions were asked as necessary to clarify the participant's response, for example, to ensure that quantity of alcohol consumed reflected standard drinks. Next, the implicit measures were administered, followed by the self-report measures. Finally, participants were debriefed and given their gift card to thank them for participating. To avoid potential priming effects on the implicit measures, the order of data collection measures was kept constant, in the following order: (1) DBFT; (2) MACT; (3) AUDIT; (4) ADCQ; (5) TMQ; (6) RQQ.

Analyses

With the exception of power analysis and effect sizes, as described below, all analyses were performed using SPSS Graduate Pack version 11.5.

Power analysis

Sample size was calculated using the GPOWER program to attain 80 percent power (Erdfelder, Faul, & Buchner, 1996; Faul & Erdfelder, 1992) for a medium effect size; experimental alpha was set to .05. This calculation yielded a sample size estimate of 44.

Data preparation

Data were examined for problems such as outliers, violations of assumptions underlying tests, and missing data. To minimize missing data, self-report measures were examined in the session and participants were asked to supply any missing values. As noted above, to the extent that missing ASI data were available elsewhere in the medical record, they were included (e.g., in many cases, previous ASIs could be used to supply demographic

information and, in conjunction with current intake and psychiatric evaluations, could also supply information regarding drug use and treatment history). Data that could not reliably be obtained elsewhere were dropped from analyses. Once missing data were dealt with, the assumptions of homoscedasticity, linearity, and normality were tested by examining residuals plots. In cases where the distributions were skewed, several different transformations (log, square root, power) were explored to see if they would normalize data, but they did not appear to do so, and in any event, there was no clear theoretical reason for believing these types of relationships existed among variables (Cohen, Cohen, West, & Aiken, 2003). Therefore, where suitable, the data were dichotomized and the binary variables were used in place of the raw data.

In addition, before conducting the main analyses, the following variables were assessed to determine whether they should be statistically controlled: quantity and frequency of drinking, consequences of drinking, perceived benefits and costs of change, and age (e.g., Jajodia & Earleywine, 2003). The determination of whether to control for specific variables was made by examining correlations between each potential confounding variable and each outcome measure. In addition, we tested for relationships between verbal fluency and the DBFT outcome measures (number of reasons to change, number of reasons not to change, total reasons given, and relative accessibility as defined below); similar to the findings of Kahler (1999; 2001), we found no relationship between verbal fluency and any of the DBFT outcomes.

Primary Analyses

In an effort to control Type I error, preliminary multiple regression analyses were conducted to test whether internal and external motivation, as well as the centered interaction of the two, significantly predicted scores on the DBFT and the MACT. The

significance of model coefficients was examined and follow-up univariate analyses were performed only where the initial multiple regression model was significant.

In addition, each of the proposed models included a mediator variable: time spent thinking about reasons to change or not to change was hypothesized to mediate the relationship between the two types of motivation to change and the accessibility of information related to change; and perceived self-relevance of information was hypothesized to mediate the relationship between the two types of motivation and depth of processing of information. The relationships between the proposed mediators and corresponding dependent variables were tested initially by calculating Pearson's r to see if the variables were associated with each other. If either of these relationships was significant, the proposed mediation relationship would be tested using hierarchical regression, with the dependent variables regressed on the motivation variables in the first step and on the motivation variables plus the proposed mediators in the second step. This procedure would test whether the relationships between the motivational variables and the dependent variables were due to the proposed mediators. As described below, however, the preliminary steps of the mediation analyses did not yield significant results, so these analyses were abandoned.

Independent samples t-tests also were performed to determine whether participants who reported (in response to interview questions) they were mandated to treatment differed from those who reported they were not mandated to treatment on the proposed dependent and mediator variables for both the accessibility of information and depth of processing models. These t-tests were then repeated with the groups defined as those who reported having been either pressured or mandated to attend treatment versus those who reported not having been pressured or mandated to attend treatment.

Secondary Analyses

In addition to the primary analyses relating to the study hypotheses, a number of secondary and exploratory analyses were conducted to improve understanding of the various measures used in this study and their psychometrics in the study population. The MACT and DBFT were examined, where possible, by replicating the work of Kahler (1999; 2001). Thus, correlations were calculated for the relationships between DBFT outcome scores and the variables relating to strength of reasons to change and not to change as well as time spent thinking about reasons to change and not to change.

Kahler (1999) tested the concurrent validity of the 4 groups of MACT statements (pros of drinking, cons of quitting, pros of quitting, and cons of drinking) by examining the levels of relationship with self-report measures that theoretically measure similar constructs (respectively, positive expectancies from the Alcohol Effects Questionnaire (Rohsenow, 1983); costs of change on the ADCQ; benefits of change on the ADCQ; and negative consequences of drinking from the Primary Appraisal Measure (PAM); he found significant correlations between scores on the relevant measures and the number of statements deemed self-relevant in theoretically associated MACT statement groups. In this study, we had no equivalent measure to the AEQ, so we did not test that set of statements. In lieu of the PAM, we tested the relationship between the cons of drinking and the consequences questions on the AUDIT, and replicated the analyses using the ADCQ and the statements relating to pros and cons of quitting.

In addition, several of the self-report measures (ADCQ, RQQ, and TMQ) were tested for internal consistency by calculating Cronbach's alpha. Moreover, the validity of the extrinsic subscale of the RQQ (RQQ-ext) and the external subscale of the TMQ (TMQ-ext) were examined by correlating each of these with participants' responses to two questions

that were asked routinely during the screening portion of the session: “Did anyone require you to attend treatment at this time?” and “Did anyone pressure you to attend treatment at this time?”.

Finally, the appropriateness of using self-reported motivation to quit drinking interchangeably with motivation to enter treatment interchangeably was explored by examining the relationships between the intrinsic and extrinsic subscales of the RQQ and their counterparts on the TMQ.

Results

Psychometric Properties of Measures

Self-Report Measures

Relationship between motivation to quit drinking and motivation to enter treatment. Pearson’s r was calculated to determine relationships between the internal and external subscales of the TMQ and the intrinsic and extrinsic subscales of the RQQ. The TMQ-int and the RQQ-int were moderately correlated ($r(45) = .305; p = .042$). When one influential outlier was removed from the analysis, the relationship appeared stronger ($r(44) = .441, p = .003$). The TMQ-ext and the RQQ-ext subscales were not significantly related to each other ($r(44) = .229, ns$). Table 2 shows the bivariate correlations between the continuous predictor variables and outcome variables.

Reliability and validity of the ADCQ, RQQ, and TMQ. To examine the internal consistency of the ADCQ, the TMQ, and the RQQ in this sample, Cronbach’s alphas were calculated. The results indicated that internal consistency for all scales was good, with alphas equal to .7935, .7116, and .7833, respectively. One participant’s data were excluded from all analyses involving the ADCQ because he scored every question as 0 (“not relevant”).

The TMQ-ext and the RQQ-ext also were tested to see if they predicted whether participants reported, in response to a yes/no question, having been required or pressured to attend treatment. This question was examined first by dichotomizing solely on the basis of reporting being required to attend (with a specific anticipated consequence for not doing so) ($n=7$) versus not being required to attend ($n=38$), and again by dichotomizing as required or pressured ($n=13$) versus neither required nor pressured ($n=32$). Results indicated that the TMQ-ext was positively correlated with reporting being required to attend treatment ($r(45)=.350; p=.018$), but the RQQ-ext was not ($r(45)=.098; ns$). Self-reported external pressure to attend treatment was not significantly related to either RQQ-ext ($r(45)=-.038, ns$) or TMQ-ext ($r(45)=-.145; ns$).

Implicit Measures

DBFT. Responses on the DBFT were transcribed and the transcripts were coded by the author. In addition, 21 of the transcripts were re-coded by a second coder who was trained by the author. Agreement between the two coders was good for both number of reasons to change ($r(21)=.963, p<.001$) and number of reasons not to change ($r(21)=.912, p<.001$). Participants named an average of 8.69 reasons to change ($SD=3.315$; range = 2-16; $Mdn=8$) and 6.2 reasons not to change ($SD=2.625$, range = 2-14) during the two 2-minute time periods. This difference was significant ($t(44)=6.36; p<.001$). Eight of the participants were coded as having named one or more reasons in one time period that belonged in the other, but only 2 of these reasons were not repeated in the correct time period. Age, quantity and frequency of drinking, consequences of drinking, perceived benefits of change, and perceived costs of change were tested to see if they should be statistically controlled in the primary analyses. The perceived benefits of change variable was significantly related to DBFT number of reasons to quit ($r(44)=.349; p=.02$) and to DBFT total reasons given

($r(44)=.298$; $p=.05$); none of the other potentially confounding variables was related to any DBFT outcome measure. Verbal fluency was not significantly correlated with number of reasons to change ($r(45)=.104$, ns), number of reasons not to change ($r(45)=.260$; ns), or total number of reasons listed ($r(45)=.191$; ns), and was not included in the remaining analyses. Table 3 shows the correlations between the potentially confounding variables and the outcome measures. Number of reasons to change was positively correlated with number of reasons not to change ($r(45)=.631$; $p<.001$). To control for this relationship, a composite measure, Relative Accessibility, was calculated by subtracting reasons not to quit from reasons to quit and dividing this difference by total reasons given (see Kahler, 1999). In this sample, Relative Accessibility was significantly greater than zero ($M=.1662$; $SD=.187$; $t(44)=5.963$; $p<.001$), indicating that reasons to change were on average relatively more accessible to these participants than reasons not to change.

As discussed above, cognitive theory suggests that accessibility of reasons to change or not change drinking behavior should be related to frequency of thinking about these reasons. Most participants reported spending a lot of time thinking about reasons to quit drinking, with more than half selecting the maximum response (“very much”). In addition, the majority of participants reported that these reasons were very strong, with 60 percent selecting the strongest available rating. Because of an apparent ceiling effect in these measures, time spent thinking about reasons to change was dichotomized into “very much” ($n=24$) vs. all others ($n=21$), while strength of reasons to change was dichotomized into the maximum rating of 10 ($n=29$) vs. all others ($n=16$). There was more variability in the reported strength and time spent thinking about reasons not to quit drinking; these items were dichotomized into “none” or “a little bit” ($n=22$) vs. “a fair amount”, “quite a bit”, or “very much” ($n=23$) for the time variable and 0-7 ($n=22$) vs. 8-10 ($n=23$) for the strength

variable. However, neither time spent thinking about reasons to change or not to change, nor strength of reasons to change or not to change, correlated with DBFT outcome measure (r s between $-.210$ and $-.014$; all n s). See Table 4, which shows rank order correlations for truncated predictor variables and relevant outcome variables.

MACT. As with the DBFT, the responses to the MACT were transcribed and the transcripts were coded by the author. In addition, a second trained rater re-coded 21 of the transcripts to allow testing of interrater reliability. Statements were coded as either recalled, not recalled, intrusions, repetitions, or uncodeable. In one instance, despite both initial instructions and two attempts to correct the participant, the statements given in this portion of the task did not appear to be responsive to the instructions; therefore, this participant's responses were not coded and were excluded from all MACT analyses. Except for this participant, few statements were considered uncodeable; only three statements made by 2 participants could not be coded as either a recollection or an intrusion. Statements were coded as recalled if their meaning could be determined and they either included a target statement's emphasized word or were synonymous with the statement. Statements were coded as intrusions if (1) their meaning could be determined, (2) they did not contain the salient (emphasized) word, and (3) they were not synonymous with one of the target statements. Repeats of previously given intrusion statements were coded as repeats rather than intrusions. Agreement between the coders was good for statements recalled; out of 504 statements that could be coded as recalled or not recalled, the raters agreed on 492 (97.62%). Disagreements were reviewed and re-coded. Agreement also was high for coding of intrusions ($r(21)=.986$; $p<.001$) and repetitions ($r(21)=.904$; $p<.001$). Note that Pearson's correlations were calculated for the intrusions and repetitions rather than using percent agreements (as with the recalled versus not recalled designations) because the set of

responses that qualifies for designation as an intrusion or repetition was open-ended rather than finite (see Kahler, 2001). The mean number of intrusions was 3.27 ($SD=4.495$, range = 0-21; $Mdn=2$), and the mean number of repetitions was 1.43 ($SD=1.62$, range = 0-6; $Mdn=1$). In several cases, more than 50 percent of the statements given by the participant in the recall portion of the MACT were coded as either repetitions or intrusions ($M=.3026$; $SD=.1914$; $Mdn=.29$; range=.00-.75). The distributions of intrusions, repetitions, and the sum of these were examined both as raw data, and as a proportion of the total number of statements given in response to the recall instructions. Based on examination of these distributions, the primary analyses were run both with and without four outliers to determine whether their exclusion would substantively impact the results; the analyses excluding outliers are reported below where they materially affected the results.

In this sample, participants averaged selection of 11.27 positive outcomes of change as self-relevant ($SD=1.12$; $Mdn=12$; range=8-12), as compared with 6.56 negative outcomes of change ($SD= 2.8$; $Mdn=6$; range=1-12), a difference that was significant ($t(44)=10.822$; $p<.001$). As described above, depth-of-processing theory suggests that participants should recall more statements that they consider self-relevant than statements they do not consider self-relevant. Following Kahler (1999), this postulate was tested by calculating a difference score for each participant between the proportion of self-relevant reasons recalled and the proportion of non-self-relevant reasons recalled. Thus, a positive difference score indicates a higher proportion of self-relevant reasons recalled. As predicted by theory, the mean difference score for the sample was positive and significantly greater than zero ($M=.5548$; $SD=.3167$; $t(43)=11.62$; $p<.001$).

Following Kahler (1999), we also looked at the relative numbers of reasons to change versus reasons not to change recalled. This “Balance Recalled” was calculated by

subtracting reasons not to change from reasons to change and dividing the result by the total number of reasons recalled. The Mean Balance Recalled was not significantly different from zero ($M=-.0565$, $SD=.3084$, $t(43)=-1.214$, ns), indicating that participants recalled similar numbers of reasons to change and reasons not to change.

In our concurrent validity analysis, we found significant correlations in the expected direction between MACT relevant cons of quitting and ADCQ costs ($r(44)=.434$; $p=.003$), and between MACT relevant cons of drinking and AUDIT consequences ($r(44)=.433$; $p=.003$). The correlation between MACT relevant pros of quitting and ADCQ benefits was lower and did not reach significance ($r(44)=.235$; ns).

Primary Analyses

In an effort to control Type 1 error, preliminary multiple regression analyses were run for each dependent variable. In each case, diagnostic statistics (studentized deleted residuals, standardized dfBeta, standardized dfFit, and leverage) were examined in an attempt to identify influential outliers. Where potential outliers were identified, the analyses were re-run excluding the potential outlier or outliers. Except as noted otherwise below, these outliers were not found to materially affect the results and therefore the re-analyses are not reported. In addition, residuals plots and Q-Q plots were examined to assess normality and homoscedasticity. The plots indicated no gross violations of these assumptions.

Hypothesis 1: Internal and External Motivation will be Associated with Accessibility of Information

Preliminary multiple regression analyses were run to see if internal and external motivation, and the interaction between these variables, were associated with (1) DBFT reasons to change; (2) DBFT reasons not to change; and (3) the composite measure, Relative Accessibility, described above. As noted above, ADCQ benefits scores were associated with DBFT reasons to change, so the ADCQ benefits score was included in the preliminary

multiple regression analysis for this dependent variable. Because the RQQ and the TMQ were found to be poorly correlated (see above), the preliminary multiple regressions were done twice, once using each measure. None of these analyses were significant at an alpha level of .05, and therefore no follow-up univariate or mediation analyses were conducted for these tests. Effect sizes were calculated for the multiple regression analyses and are reported in Table 5.

As an alternative way to explore the relationships among the constructs, independent samples t-tests were performed to determine whether the participants who reported being mandated to attend treatment differed with respect to any of the dependent or mediator variables in the proposed model from those who reported they were not mandated to attend treatment. As Table 6 shows, the results of these tests showed no significant differences between the two groups on any of the relevant variables. A second set of t-tests was performed to test whether participants who reported having been mandated or pressured to attend treatment differed on the proposed dependent or mediator variables from those who reported not having been mandated or pressured to attend treatment. As Table 7 shows, the results of these tests also showed no significant differences between the groups on any of the tested variables.

Hypothesis 2: Internal and External Motivation will be Associated with Depth of Processing of Reasons to Change or Not to Change

Age, quantity and frequency of drinking, consequences of drinking, perceived benefits of change,, and perceived costs of change were tested to see if they should be statistically controlled in the primary analyses (see Table 3). Of these, perceived costs and age were significantly related to Balance Recalled and were included in subsequent analyses

for this measure; none of the other variables tested were related to any MACT outcome measure.

Preliminary multiple regression analyses were run to see if internal and external motivation, and the interaction between these variables, were associated with (1) recall of positive outcomes of change (the sum of recalled pros of quitting and cons of drinking); (2) recall of negative outcomes of change (the sum of recalled pros of drinking and cons of quitting); or (3) the composite measure, Balance Recalled. Again, because reasons for quitting and treatment motivation do not appear to be good substitutes for one another, each analysis was run twice, once using each measure. Three of these preliminary multiple regression analyses warranted further analysis. The regression of recalled positive outcomes of change on intrinsic and extrinsic reasons for quitting on the RQQ, and the interaction of these variables, was significant at the .05 level (but only if no adjustment was made for multiple tests; $R^2=.181$; $F(3, 40)=2.94$; $p=.045$). As Table 8 shows, only the model coefficient for intrinsic motivation significantly predicted MACT positive outcomes of change recalled ($R^2=.13$; $F(1,42)=6.279$; $p=.016$). For the mediation analysis, the number of self-relevant positive outcomes of change was not significantly related to positive outcomes recalled ($r(44)=.206$; $n.s$), so the remainder of the planned mediation analysis was not conducted. When the preliminary multiple regression was re-run excluding the four cases identified as having extreme numbers or proportions of intrusions and repetitions, the results were no longer significant at the .05 level ($R^2=.188$; $F(3.36)=2.778$; $p=.055$). See Tables 8 and 9, which show the model coefficients and the squared semi-partial correlations for these regressions.

Similarly, the regression of Balance Recalled onto age, perceived costs, RQQ intrinsic, extrinsic, and the intrinsic by extrinsic interaction of these variables also was

significant ($R^2=.40$; $F(5,37)=4.926$; $p=.001$). The model coefficients indicated that, of the motivation variables, only RQQ intrinsic motivation significantly predicted Balance Recalled ($R^2=.146$; $F(1,42)=7.163$; $p=.011$). In the mediation analysis, Balance Recalled was not significantly related to number of self-relevant positive ($r=.205$, *ns*) or negative ($r=-.288$, *ns*) outcomes of change, or to total number of self-relevant statements ($r=-.156$, *ns*) on the MACT. Therefore, no further mediation analyses were conducted. When the four intrusion and repetition outliers were removed and the analyses were re-run, the overall regression remained significant ($R^2=.43$; $F(5,33)=4.939$; $p=.002$), as did the regression of Balance Recalled on RQQ-int ($R^2=.124$; $F(1,38)=5.372$; $p=.026$). The relationships between Balance Recalled and the numbers of self-relevant statements of the above types all remained non-significant, so no further mediation analyses were conducted. In addition, the regression of Balance Recalled on RQQ-ext approached but did not reach significance ($R^2=.085$; $F(1,38)=3.536$; $p=.068$). See Tables 10 and 11.

The regression of Balance Recalled on age, perceived costs, internal and external treatment motivation, and the internal by external interaction also was significant ($R^2=.321$; $F(5, 37)=3.491$; $p=.011$). However, the model coefficients and follow-up univariate analyses indicated that only the control variables were associated significantly with Balance Recalled. With the four outliers removed, the same relationships were found, with the overall model significant ($R^2=.344$; $F(5, 33)=3.468$; $p=.013$), but the model coefficients and follow-up univariate analyses indicating that only the control variables were related significantly to Balance Recalled. See Tables 12 and 13.

Independent samples t-tests also were performed to determine whether the participants who reported being mandated to attend treatment differed with respect to any of the dependent or mediator variables in the proposed model from those who reported they

were not mandated to attend treatment. As Tables 14 and 15 show, the results of these tests showed no significant differences between the two groups on any of the relevant variables. A second set of t-tests was performed to test whether participants who reported having been mandated or pressured to attend treatment differed on the proposed dependent or mediator variables from those who reported not having been mandated or pressured to attend treatment. As Tables 16 and 17 show, the results of these tests also showed no significant differences between the groups on any of the tested variables.

Discussion

To date, most studies examining motivation to quit drinking or to enter treatment have relied solely on self-report measures. While these measures may provide useful information about the overt thought processes involved in the decision to change drinking behavior or enter treatment, they also have important limitations. In this study, two indirect measures were tested to see if they might provide additional understanding of the relationship between internal and external motivation to quit drinking or enter treatment and cognitive process involved in decision-making relating to quitting drinking and entering treatment. It was hypothesized, based on self-determination theory, that more internally-driven reasons for quitting drinking or entering treatment would be associated with greater depth of processing and ease of accessibility of information relating to the decision to change on the two indirect measures. In addition, it was expected that in the relative absence of internal motivation, high external motivation would be associated with lower scores on depth of processing and accessibility of information tasks. The results of the study partially support the proposed model, but also highlight the importance of caution in using measures validated on one population in a different population.

Motivation and accessibility of information

Contrary to our hypothesis, accessibility of reasons to change or not to change as measured by the DBFT was not related to levels of internal and external motivation to quit drinking or to enter treatment in this population of severely dependent male veterans. In addition, the proposed mediator, time spent thinking about the decision to change or not to change, was not related to accessibility of information as measured by the DBFT. It is possible that these results may reflect a true absence of the hypothesized relationships, and may undermine the theorized applicability of self-determination theory in the context of this study's population. If this is the case, then because none of the proposed relationships in the model were supported (see Figure 1), the model should be dropped. However, since perceived autonomy was not tested in this study, it could be that the hypothesized relationship between that construct and accessibility of information may be supported in future research.

Another possibility is suggested by the effect sizes that were found for the multiple regression equations. The regression of number of reasons not to change on motivation to enter treatment, in particular, had an effect size ($f^2=.1261$) that nearly reached the .15 level, which conventionally has denoted a medium sized effect. This suggests that the reason this relationship was not found may be due to insufficient power, and future research may be warranted. Similarly, both of the preliminary multiple regressions of number of reasons to change on perceived benefits and motivation yielded effect sizes that approached or surpassed the conventional medium effect size. Interpretation of these latter two effect sizes is complicated, however, by the inclusion of perceived benefits of change in the equation; further research may be warranted to tease out the relative effects of motivation and perceived benefits on this DBFT outcome measure.

It may be, however, that in this population, the DBFT is not a valid measure of accessibility. Cognitive theory and prior research have supported the notion that, at least with respect to certain types of information and in other populations, accessibility of information is related to the recency and frequency of previous accessing of that information (cf. Palfai & Wood, 2001; Stacy, 1997). In fact, this relationship was the theoretical underpinning of the DBFT, and it was at least partially supported in Kahler's prior work with it, in which relative accessibility was found to be correlated significantly with time spent thinking about reducing drinking (Kahler, 1999). However, in the present study, no significant relationship was found between participants' self-report of recent time spent thinking about reasons for quitting or not quitting drinking and accessibility according to the DBFT. Likewise, in Kahler's prior study, perceived strength of reasons to change drinking predicted DBFT number of reasons to change generated, and perceived strength of reasons not to change predicted DBFT number of reasons not to change generated, but in this study, neither of these relationships was found. Thus, it appears that the DBFT has distinctly different psychometric properties in the current study population as compared with the previous study population.

One difference between the two study populations is that in the previous study, participants were not yet acting on any decision they might have made to change their drinking habits, whereas in the current study, the sample was limited to people who were presently seeking treatment to help them stop drinking. It may be that once the decision is made and action taken to carry out that decision, there is a reduction in the salience of decisional balance considerations, which may in turn reduce the impact of time spent thinking about changing or the strength of reasons to change or not to change on accessibility. A second possibility is that the individual's mere presence in a treatment facility

may function as a cognitive prime for cognitions relating to the decision process regardless of how much consideration of such cognitions preceded the treatment or how strong such cognitions are perceived to be. A third possibility is that individuals with the high level of problem severity and dependence exhibited by these veterans may enter treatment without engaging in a full decision-making process beforehand.

A fourth possibility is that the individuals in this population are not accurate in assessing their own thought processes about their drinking, thus making measurement error unavoidable and interfering with accurate assessment of the relationships among the variables relating to cognitive processes. Prior research has clearly demonstrated that long-term heavy drinkers often show patterns of cognitive impairment that distinguish them from moderate drinkers and non-drinkers (e.g., Duka, Townshend, Collier, & Stephens, 2003; Pitel et al., 2007; Ratti, Bo, Giardini, & Soragna, 2002; Ratti et al., 1999); this cognitive impairment may influence insight into one's cognitive processes, performance on accessibility-related tasks like the DBFT, or both.

Thus, because of the apparent poor validity of the DBFT in this population, further research is needed to permit conclusions to be drawn about motivation, accessibility of information, and the applicability of self-determination theory.

Depth of processing and motivation

The hypothesis that internal and external motivation would be associated with depth of processing on the MACT was partially supported. In particular, intrinsic motivation to quit drinking was associated with higher depth-of-processing recall scores for positive outcomes of change, as well as for Balance Recalled, but not for negative outcomes of change. This result supports self-determination theory, in which it would be expected that stronger internal reasons for wanting to quit drinking would be internalized and integrated in

a way that would lead to deeper processing of reasons supportive of change than of reasons not supportive of change. The squared semi-partial correlations in the regressions for these models show that intrinsic motivation explains between seven and fifteen percent of the variance in the depth-of-processing outcome measures.

Neither extrinsic motivation nor an extrinsic*intrinsic interaction was related to depth of processing, and the proportion of the variance explained by these variables in the regression models was relatively small (generally below five percent). This may indicate that even if these relationships exist but were not detected due to insufficient power, they may not be clinically relevant.

Moreover, the mediational model was not supported, as neither the number of self-relevant positive outcomes of change nor the number of self-relevant negative outcomes of change was associated with the numbers of statements recalled. Thus, based on this study, the proposed model (Figure 2) could be modified to reflect the relationships found: intrinsic motivation to quit drinking is associated with certain measures of depth of processing, but this relationship does not appear to be mediated by the self-relevance of the information. Because the relationship between extrinsic motivation to quit drinking and depth of processing approached significance in one test of this relatively new measure, we recommend further testing before dropping it from the model completely (see Figure 3). Finally, perceived autonomy was not measured in this study, and awaits future research to test its hypothesized relationships with the other constructs in the model.

The MACT demonstrated reasonably good validity in this sample. First, depth-of-processing theory would lead one to expect that participants would recall relatively more self-relevant statements than non-self-relevant statements (Kahler, 1999, 2001). The results were consistent with this expectation. In addition, two of the four groups of statements

exhibited reasonable concurrent validity. Specifically, the costs of change as measured by the ADCQ were moderately and directly correlated with the number of self-relevant cons of quitting drinking on the MACT, and the negative consequences of drinking construct as measured by AUDIT questions 7 through 10 was moderately and directly correlated with number of self-relevant cons of continued drinking on the MACT. However, the number of self-relevant pros of quitting on the MACT was not significantly related to benefits of quitting as measured by the ADCQ; and the final set of MACT statements, the number of self-relevant pros of drinking could not be tested for concurrent validity due to lack of an appropriate comparison measure in this study.

Interestingly, the Mean Balance Recalled in this study was not significantly different from zero, meaning that people recalled the same number of reasons to change and not to change; this result is perhaps surprising in the context of a study in which participants have at least theoretically made the decision to quit drinking, and are seeking treatment. Based on prior decisional balance research, it would be expected that the decision to change would come only after having weighed the pros and cons of change and decided that the pros outweighed the cons. In turn, it would be expected that the positive outcomes of change would be more likely to be selected as self-relevant than the negative outcomes of change; this difference was supported by the current research, in which participants selected as self-relevant more positive outcomes of change than negative outcomes of change. However, this difference in numbers of relevant statements of the two types did not translate to a difference in recall, and therefore of depth of processing of the positive versus the negative outcomes of change. As noted above, it is possible that this population of severely dependent drinkers does not engage in a full decision-making process before entering treatment.

Issues in task administration and psychometrics

In the course of data collection, a number of issues were noted that may warrant further investigation in future studies. First, on the MACT, a number of the participants responded with apparent embarrassment or amusement to the statement “drinking makes me feel more sexy.” It also appeared that this statement may have been more likely to be recalled by participants than other statements, even if it was not selected as self-relevant. This suggests that different cognitive or emotional processes may be involved in the encoding and recall of this statement as compared with other statements on the MACT. Second, many of the participants, in recalling the statements on the MACT, changed particular statements that had not been selected as self-relevant to a version that would be true for the individual (e.g., “My friends would be upset if I cut down on my drinking” might become “my friends would NOT be upset if I quit drinking”). In most such cases, the similarity to one of the MACT target statements was such that it was apparent that the reason for making the statement at all was that the person had recalled the original statement and wanted to indicate its truth or untruth with respect to himself.

As noted above, in Kahler’s (1999; 2001) prior study, participants wrote down their responses to the MACT recall task rather than giving responses orally, so repetitions do not appear to have been a consideration in that study. Moreover, Kahler reported very few intrusions. In the current study, however, in which verbal recall was used, the vast majority of participants gave one or more statements that were coded as either intrusions or repetitions, with only 4 participants having given neither. The time period given for recall of statements on the MACT in this study was 4 minutes, one minute less than in the previous study due to the change from writing to speaking the recall portion of the task. Nevertheless, most participants did not speak for the full time, and in some cases, intrusions

and/or repetitions may have been produced in an effort to ease participants' discomfort by "filling" silence toward the end of the time period.

The high number of intrusions and repetitions given on the recall portion of the MACT in this study also could be a marker of cognitive impairment. In some cases, participants appeared to begin the recall task period by providing several target statements and few or no intrusions or repetitions, but as the period progressed, their responses included fewer target statements and more intrusions and repetitions. In a few instances, it appeared that participants may have forgotten the instructions and returned to generating their own reasons for wanting to change or not change their drinking behavior as they had been instructed to do on the DBFT.

The current research also adds to the literature about several of the self-report measures used in this study. First, it appears that motivation to enter treatment and motivation to quit drinking should not be considered adequate proxies for one another, at least based on the relatively small relationship between the two measures used in this study. Future research could examine whether the relationship between these two variables is stronger using other measures or in different populations.

Finally, this study provides additional support for the reliability of the ADCQ, the TMQ, and the RQQ by demonstrating good internal consistency for these scales in this sample.

Limitations and Future Directions

The present study has some important limitations. First, the study involved a substantial number of statistical tests, which inflated the risk of Type I error. However, this was appropriate because of the exploratory nature of many of the analyses and because of

the limited prior research using the two indirect measures involved in the primary analyses. Future research would benefit by refining hypotheses and limiting tests accordingly.

A second set of limitations relates to the sample, which was relatively small – just 45 participants – and although this was calculated to be adequate to detect medium-sized effects, it is possible that smaller effects were missed. This may have been an issue on the MACT, as some of the analyses were re-run with outliers on intrusion and repetition scores removed. The loss of these four participants, who theoretically may not have been similar enough to the rest of the sample to warrant their inclusion, resulted in a significant loss of power, such that a higher R^2 value than in the original test was not sufficiently strong to reach statistical significance. Moreover, one of the follow-up analyses presented a tantalizing hint that extrinsic motivation to quit drinking may be related to depth of processing after all, but power was not sufficient to fully explore this possibility.

The sample in this research also was recruited solely from a population of people seeking treatment for alcohol dependence in a single VA hospital, which may limit its generalizability to other treatment-seeking samples in other locations. Perhaps due to the relatively small number of women in the veteran population, no women participated in the study. In addition, only a relatively limited range of ethnic and racial backgrounds was represented, with only two Hispanic or Latino participants, no Asians or Pacific Islanders, and no Native American or Native Alaskan populations. Findings should therefore be generalized to these underrepresented groups with extreme caution, and future research would do well to involve a larger, more diverse sample. However, on the positive side, we had relatively few exclusion criteria – only those who evidenced severe cognitive impairment, or who were actively psychotic were excluded. The fact that comorbid mental health or

substance use diagnoses did not preclude participation likely improves generalizability to some degree.

Finally, the study was cross-sectional and correlational in its design. Therefore, no inferences can be made as to causality. Future longitudinal studies could clarify the nature of the relationships between the indirect measures and other measures of motivation to change drinking behavior or enter treatment. For example, perhaps as treatment progresses, some individuals find that their internally-driven reasons for wanting to quit drinking increase in strength or number; perhaps this change triggers increased evidence of deeper processing of information. Moreover, randomized controlled trials in which autonomy in the decision-making process is emphasized and supported would permit evaluation of possible causal relationships between autonomy and performance on indirect or implicit measures of depth of processing, accessibility, or implicit expectancies and attitudes.

To fully explore the relationship between autonomy and implicit cognitions, much could be learned by exploring the use of other implicit measures and their relationships with motivation to quit drinking or to enter treatment. For example, perhaps people who are highly internally motivated either to quit drinking or enter treatment may have developed and internalized stronger negative outcome expectancies for drinking than those who are not particularly internally motivated. This difference may be observable in another type of measure designed to assess relative or absolute strength of implicit associations between constructs. Possible measures that may be useful in this regard are the Implicit Association Test (Greenwald et al., 1998); one of its variants (e.g., Jajodia & Earleywine, 2003; Nosek et al., 2007); or an Extrinsic Affective Simon Task (De Houwer, 2003).

Conclusions

This study examined whether self-determination theory, and in particular, self-reported levels of intrinsic and extrinsic motivation, could explain variability in scores on measures of depth of processing and accessibility of information related to the decision to change drinking behavior. This research provided mixed support for this theory, with some results consistent with the theory, some less consistent, and some difficult to interpret because of concerns about the validity of one of the measures for use in this population.

The research adds to the current research literature on motivation to enter treatment for alcoholism. As described above, implicit measures of cognitive processes related to alcohol use appear to examine constructs that are related to, yet distinct from, self-report measures of explicit cognitions related to alcohol use (e.g., De Houwer, 2006; Goldman et al., 2006). Although implicit measures frequently correlate with explicit measures, such correlations are usually of moderate magnitude; the relationship between intrinsic motivation to quit drinking on the RQQ and depth of processing scores on the MACT is in line with this research. To the extent that the relationship between implicit and explicit measures is dependent on the nature of the motivation involved in the decision to enter treatment, implicit measures may provide a new way to think about motivational issues at the time of treatment entry, and thus may suggest ways that such issues can be addressed. Future research could examine whether implicit cognitions change over the course of treatment, and if so, whether such changes may predict treatment outcome. Thus, this study may be viewed as a first step in examining how implicit and explicit alcohol-related cognitions, and their relationship with each other, may relate to treatment motivation and treatment outcome.

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Tables

Table 1

Target sentences for the Memory for Alcohol Consequences Task

Reasons not to change: Pros of drinking:

I ENJOY myself more when I'm drinking.

I SOCIALIZE more easily when I'm drinking.

I feel more SEXY when I'm drinking.

Drinking makes me feel CONFIDENT.

Drinking helps me RELAX.

Drinking gives me a PLEASANT feeling.

Reasons not to change: cons of changing.

If I drank less, I would get DEPRESSED.

If I drank less, I would be BORED.

If I drank less, I would MISS the good times.

It would UPSET my friends if I cut down on my drinking.

I would WORRY a lot if I cut down on my drinking.

I would feel IRRITABLE if I cut down on my drinking.

Reasons to change: pros of changing

If I drank less, I could ACHIEVE more.

If I drank less, I would SAVE a lot of money.

If I drank less, I would feel more HEALTHY.

I would be more ENERGETIC if I cut down on my drinking.

I would feel PROUD of myself if I cut down on my drinking.

My relationships would IMPROVE if I cut down on my drinking.

Reasons to change: cons of drinking

My drinking could be HARMFUL to my liver.

My drinking could make me UNHAPPY.

My drinking could RUIN some of my relationships.

I could FAIL to meet my goals because of my drinking.

I might do something SHAMEFUL because of my drinking.

I might DISAPPOINT my family because of my drinking.

Table 2

Correlations among Continuous Variables Related to Motivation for Change

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Relative Accessibility	---											
2. Reasons to change	.37	---										
3. Reasons not to change	-.44	.63	---									
4. Balance Recalled	-.04	.09	.18	---								
5. Positive outcomes of change recalled	-.07	.28	.36	.72	---							
6. Negative outcomes of change recalled	.13	.28	.14	-.45	.18	---						
7. Self-relevant positive outcomes of change	-.04	.18	.11	.21	.21	-.01	---					
8. Self-relevant negative outcomes of change	-.12	.16	.19	-.29	-.27	.07	.09	---				
9. Total self-relevant outcomes of change	-.12	.07	.07	-.16	-.14	.02	.48	.81	---			
10. Intrinsic motivation to change	.17	.30	.10	.38	.36	-.10	.29	.05	.12	---		
11. Extrinsic motivation to change	.02	.13	.11	-.27	-.15	.08	.11	.01	.08	.15	---	
12. Internal motivation to enter treatment	.19	-.09	.32	.15	.01	-.21	.30	-.08	.16	.31	-.26	---
13. External motivation to enter treatment	-.08	-.13	-.06	.03	.04	-.11	.10	-.25	-.05	-.21	.20	.14

Note: Correlations in bold are significant at $p < .05$ (two-tailed)

Table 3

Correlations between Potentially Confounding Variables and Outcome Measures

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Reasons to quit	---												
2. Reasons not to quit	.63	---											
3. Total reasons	.93	.88	---										
4. Relative Accessibility	.37	.44	.01	---									
5. Positive outcomes of change recalled	.28	.36	.35	-.07	---								
6. Negative outcomes of change recalled	.28	.14	.24	.13	.18	---							
7. Balance Recalled	.09	.18	.15	-.04	.72	-.45	---						
8. Verbal fluency	.10	.26	.19	-.18	.11	.25	-.03	---					
9. Age	-.15	-.08	-.13	-.09	.18	-.28	.31	.10	---				
10. Perceived costs of change	-.19	-.07	-.15	-.10	-.18	.22	-.40	.21	.06	---			
11. Perceived benefits of change	.35	.15	.30	.13	.21	-.06	.18	.07	.04	-.23	---		
12. Quantity and frequency of drinking	.12	.17	.16	-.11	.09	-.14	.09	.00	.14	.13	-.04	---	
13. Dependence severity	-.01	.02	.00	-.05	-.03	-.20	.10	.06	-.05	.25	.00	.58	---
14. Consequences of drinking	.07	.05	.07	-.01	-.10	-.26	.03	.14	.00	.09	.31	.35	.59

Note: Correlations in bold are significant at $p < .05$ (two-tailed).

Table 4

Rank Order Correlations (Spearman's rho) among Truncated Variables and Accessibility of Information

Dependent Variables

Variable	1	2	3	4	5	6
1. Strength of reasons to change	---					
2. Time thinking about reasons to change	.21	---				
3. Strength of reasons not to change	-.11	.22	---			
4. Time thinking about reasons not to change	.00	.42	.51	---		
5. Relative Accessibility	-.09	-.07	.12	.13	---	
6. Reasons to change	-.14	.00	.04	.17	.35	---
7. Reasons not to change	.01	.06	-.06	.01	-.52	.57

Note: Correlations in bold are significant at $p < .05$ (two-tailed).

Table 5

Effect Sizes (Cohen's f^2) for Regressions of Accessibility of Information on Perceived Benefits of Change, Internal and External Motivation, and the Interaction of Internal and External Motivation

Regression of Y:	On X:	R^2	f^2
Number of reasons not to change	Intrinsic, extrinsic, and intrinsic*extrinsic motivation to enter treatment (TMQ)	.112	.1261
Number of reasons not to change	Intrinsic, extrinsic, and intrinsic*extrinsic motivation to quit drinking (RQQ)	.047	.0493
Number of reasons to change	Perceived benefits of change, intrinsic, extrinsic, and intrinsic*extrinsic motivation to enter treatment (TMQ)	.149	.1751
Number of reasons to change	Perceived benefits of change, intrinsic, extrinsic, and intrinsic*extrinsic motivation to quit drinking (RQQ)	.123	.1403
Relative Accessibility	Intrinsic, extrinsic, and intrinsic*extrinsic motivation to enter treatment (TMQ)	.043	.0449
Relative Accessibility	Intrinsic, extrinsic, and intrinsic*extrinsic motivation to quit drinking (RQQ)	.042	.0438

Table 6

Independent Samples t-tests of Differences between Participants Who Reported Having Been Mandated to Attend Treatment (N=7) versus those who Reported Not Having Been Mandated to Attend Treatment (N=38)

Variable	Mandated	Mean (SD)	df	<i>t</i>	<i>p</i>	<i>d</i>
DBFT time thinking about reasons not to quit	Yes	1.82 (1.37)	43	1.195	.239	.364
	No	1.14 (1.35)				
DBFT time thinking about reasons to quit	Yes	3.11 (1.25)	43	-.075	.941	.022
	No	3.14 (1.07)				
DBFT # of reasons not to quit	Yes	6.11 (2.69)	43	-.560	.579	.171
	No	6.71 (2.36)				
DBFT # of reasons to quit	Yes	8.68 (3.47)	43	-.022	.983	.007
	No	8.71 (2.50)				
DBFT total reasons given	Yes	14.79 (5.63)	43	-.286	.776	.087
	No	15.43 (3.95)				
DBFT relative accessibility	Yes	.172 (.188)	43	.473	.639	.144
	No	.135 (.195)				

Table 7

Independent Samples t-tests of Differences between Participants Who Reported Having Been Mandated or Pressured to Attend Treatment (N=13) versus those who Reported Not Having Been Mandated to Attend Treatment (N=32)

Variable	Mandated or Pressured	Mean (SD)	df	<i>t</i>	<i>p</i>	<i>d</i>
DBFT time thinking about reasons not to quit	Yes	1.91 (1.35)	43	1.515	.138	.462
	No	1.23 (1.36)				
DBFT time thinking about reasons to quit	Yes	3.09 (1.28)	43	-.149	.882	.045
	No	3.15 (1.07)				
DBFT # of reasons not to quit	Yes	6.03 (2.42)	43	-.672	.505	.205
	No	6.62 (3.15)				
DBFT # of reasons to quit	Yes	8.66 (3.40)	43	-.102	.919	.031
	No	8.77 (3.22)				
DBFT total reasons given	Yes	14.69 (5.21)	43	-.391	.698	.119
	No	15.38 (5.95)				
DBFT relative accessibility	Yes	.171 (.201)	43	.290	.773	.088
	No	.153 (.155)				

Table 8

Summary of Multiple Regression Analysis for Motivation to Change Variables Predicting MACT Total

Positive Outcomes of Change Recalled (N=44)

Variable	B	SE B	B	sr²
RQQ intrinsic	.192	.069	.406*	.158
RQQ extrinsic	-.049	.039	-.187	.033
Interaction	.007	.011	.099	.009

Note: $R^2=.18$; * $p<.05$

Table 9

Summary of Multiple Regression Analysis of Motivation to Change Variables Predicting MACT Total Positive Outcomes of Change Recalled, Excluding 4 Outliers

Variable	B	SE B	β	sr^2
RQQ intrinsic	.181	.072	.389*	.143
RQQ extrinsic	-.067	.040	-.265	.055
Interaction	.004	.011	.061	.003

Note: $R^2=.19$; * $p<.05$

Table 10

Summary of Multiple Regression of Motivation to Change Variables Predicting MACT Balance Recalled

Variable	B	SE B	β	sr²
Age	.010	.005	.257	.062
ADCQ costs	-.006	.003	-.298*	.073
RQQ intrinsic	.025	.012	.298*	.070
RQQ extrinsic	-.010	.006	.221	.043
Interaction	.002	.002	.165	.023

Note: $R^2=.40$; * $p<.05$

Table 11

Summary of Multiple Regression for Motivation to Change Variables Predicting MACT Balance Recalled

Excluding Four Outliers

Variable	B	SE B	β	sr²
Age	.011	.005	.298*	.082
ADCQ costs	-.006	.003	-.294*	.075
RQQ intrinsic	.024	.012	.292	.069
RQQ extrinsic	-.011	.006	-.234	.047
Interaction	.002	.002	.189	.032

Note: $R^2=.428$; * $p<.05$

Table 12

Summary of Multiple Regression of Motivation to Enter Treatment Variables Predicting MACT Balance

Recalled

Variable	B	SE B	β	sr²
Age	.014	.005	.353*	.122
ADCQ costs	-.008	.003	-.383*	.138
TMQ internal	.007	.006	.178	.030
TMQ external	-.002	.008	-.027	.001
Interaction	.001	.001	.077	.006

Note: $R^2=.321$; * $p<.05$

Table 13

Summary of Multiple Regression of Balance Recalled on Treatment Motivation Variables Excluding Four Outliers

Variable	B	SE B	β	sr²
Age	.015	.005	.403*	.159
ADCQ costs	-.008	.003	-.365*	.127
TMQ internal	.008	.006	.201	.038
TMQ external	-.002	.008	-.041	.002
Interaction	.001	.001	.091	.008

Note: R²=.344; *p<.05

Table 14

Independent Samples t-tests of Differences with Respect to Proposed Mediator Variables between Participants who Reported Having Been Mandated to Attend Treatment (N=7) versus those who Reported Not Having Been Mandated to Attend Treatment (N=38)

Variable	Mandated	Mean (SD)	df	<i>t</i>	<i>p</i>	<i>d</i>
MACT # of self-relevant statements	Yes	32.79 (6.85)	43	.396	.694	.121
	No	31.71 (4.82)				
MACT # of self-relevant positive outcomes of change	Yes	11.24 (1.17)	43	-.414	.681	.126
	No	11.43 (.787)				
MACT # of self-relevant negative outcomes of change	Yes	6.76 (2.87)	43	1.163	.251	.355
	No	5.43 (2.23)				

Table 15

Independent Samples t-tests of Differences with Respect to Proposed Dependent Variables between Participants who Reported Having Been Mandated to Attend Treatment (N=7) versus those who Reported Not Having Been Mandated to Attend Treatment (N=37)

Dependent Variable	Mandated	Mean (SD)	df	<i>t</i>	<i>p</i>	<i>d</i>
MACT total positive outcomes of change recalled	Yes	4.11 (1.79)	42	.348	.729	.107
	No	3.86 (1.46)				
MACT total negative outcomes of change recalled	Yes	4.46 (1.73)	42	.437	.665	.135
	No	4.14 (1.95)				
MACT Balance Recalled	Yes	-.064 (.302)	42	-.372	.712	.115
	No	-.016 (.364)				

Table 16

Independent Samples t-tests of Differences with Respect to Proposed Mediator Variables between Participants who Reported Having Been Mandated or Pressured to Attend Treatment (N=13) versus those who Reported Not Having Been Mandated to Attend Treatment (N=32)

Variable	Mandated or Pressured	Mean (SD)	df	<i>t</i>	<i>p</i>	<i>d</i>
MACT # of self-relevant statements	Yes	33.41 (7.10)	43	1.271	.211	.388
	No	30.69 (4.55)				
MACT # of self-relevant positive outcomes of change	Yes	11.31 (1.15)	43	.428	.671	.131
	No	11.15 (1.07)				
MACT # of self-relevant negative outcomes of change	Yes	6.75 (2.96)	43	.727	.471	.222
	No	6.08 (2.40)				

Table 17

Independent Samples t-tests of Differences with Respect to Proposed Dependent Variables between Participants who Reported Having Been Mandated or Pressured to Attend Treatment (N=13) versus those who Reported Not Having Been Mandated to Attend Treatment (N=32)

Variable	Mandated or Pressured	Mean (SD)	df	<i>t</i>	<i>p</i>	<i>d</i>
MACT total positive outcomes of change recalled	Yes	4.06 (1.72)	42	-.035	.972	.011
	No	4.08 (1.83)				
MACT total negative outcomes of change recalled	Yes	4.47 (1.70)	42	.367	.715	.113
	No	4.25 (1.91)				
MACT Balance Recalled	Yes	-.068 (.305)	42	-.389	.700	.120
	No	-.027 (.329)				

Figures

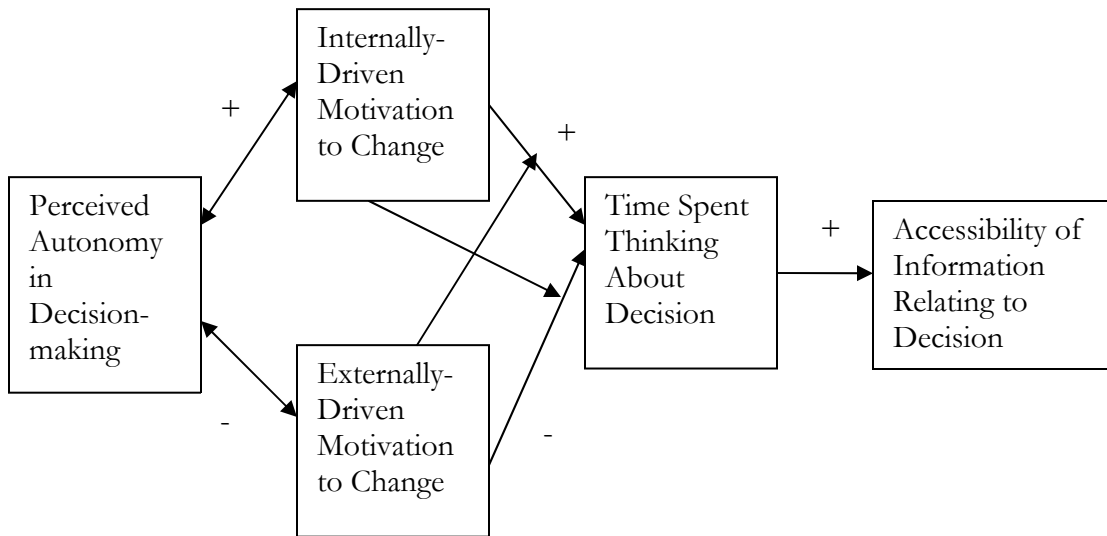


Figure 1. Theoretical Model. Autonomy in Decision-Making is Associated with Accessibility of Information

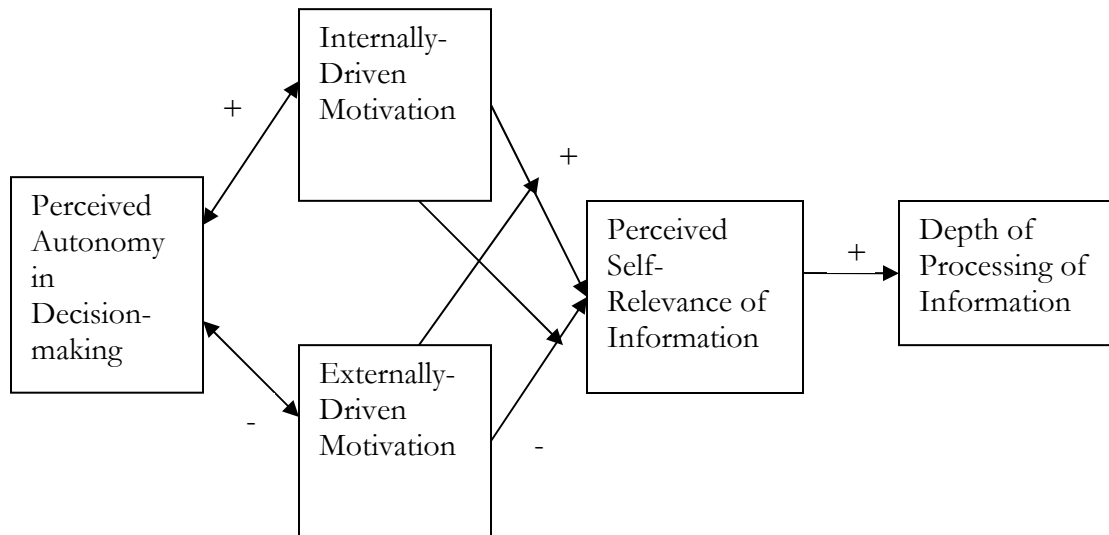


Figure 2. Theoretical Model. Autonomy in Decision-Making is Associated with Depth-of Processing of Information

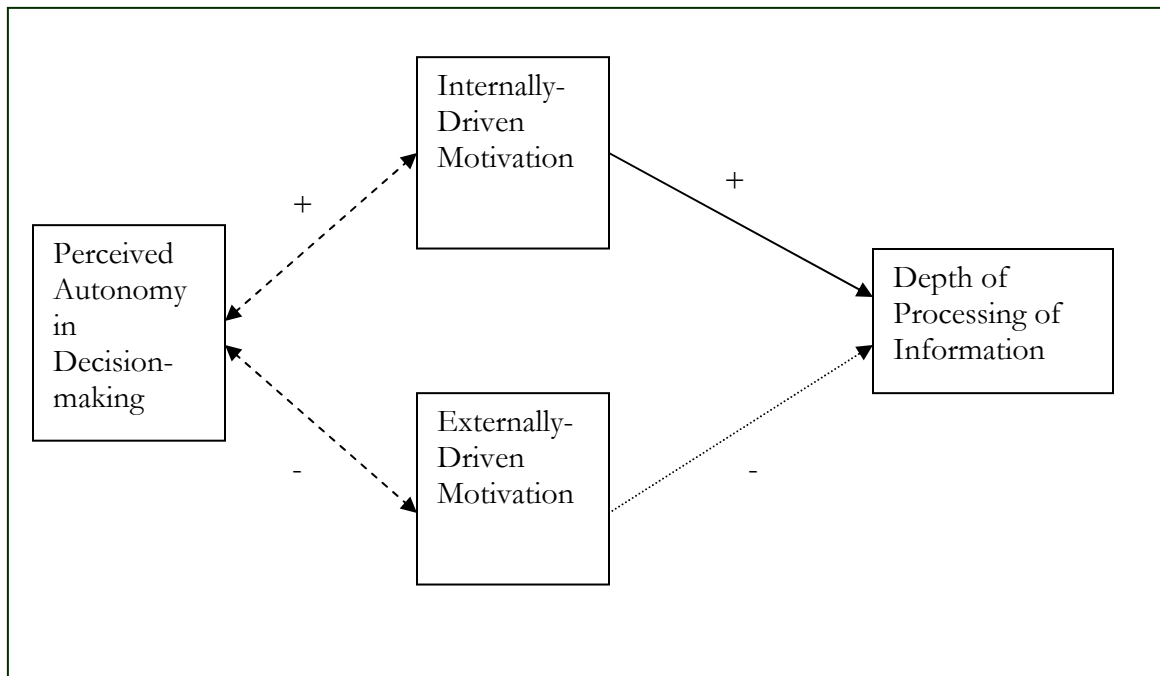


Figure 3. Revised Theoretical Model. Autonomy in Decision-Making is Associated with Depth-of Processing of Information: Relationships are represented as follows: (1) solid line: internally driven motivation to change was related to depth of processing in this study; (2) dotted line: relationship between externally driven motivation to change and depth of processing approached significance in this study; (3) dashed lines: relationships between perceived autonomy and motivation variables were not tested in this study.

Curriculum Vita

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Education:

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