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COMPREHENSIVE REVIEW

Application of the Transtheoretical Model to substance abuse: historical development and future directions

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Abstract

As a growing literature has documented applications of the Transtheoretical Model (TTM) to substance abuse, the utility or futility of such an application has been debated widely. The purpose of this paper is to critically examine the TTM, and its conceptual and empirical applications to the field of substance abuse. This review focuses not only on the stage of change dimension of the TTM, but also the processes, decisional balance, and self-efficacy dimensions, which have received less attention in earlier reviews. Particular emphasis is placed on the measurement and conceptualization of the stage of change construct. Unanswered questions and directions for future research are identified. It is concluded that, to effectively determine the TTM's applicability to substance abuse, all dimensions must be more fully developed, validated and evaluated across a range of substance abuse problems. Further, prospective studies are needed to determine the predictive utility of the TTM, and evaluation of TTM-matched interventions will help to address the model's specificity. [Migneault JP, Adams TB, Read JP. Application of the Transtheoretical Model to substance abuse: historical development and future directions. Drug Alcohol Rev 2005;24:437 – 448]

Key words: alcohol, decisional balance, processes of change, self-efficacy, stages of change, substance abuse, transtheoretical model.

Introduction: overview of the Transtheoretical Model

The Transtheoretical Model (TTM) began in the 1970s as an effort to provide a coherent theoretical organization to delineate a predictable and overarching behavior change process [1]. Since its conception, this model has been applied to a wide array of health behaviors [2 – 5] and has been one of the dominant models of health behavior change in the field over the last 20 years.

A growing literature has documented applications of this model to substance abuse, and the utility [6,7] or futility [8 – 11] of such an application has been debated widely. Evaluation of the TTM's applicability to substance use behaviors has been especially challenging because the literature has not clearly distinguished the theoretical model itself from measurement approaches designed to capture it.

This paper offers a critical examination of the Transtheoretical Model, and its conceptual and empirical applications to the field of substance abuse. This review builds on earlier work [9,11] by discussing not only the stage of change dimension of the TTM, but also the processes, decisional balance, and self-efficacy dimensions, which received less attention in earlier reviews. Additionally, although reviews of the psychometric properties of measures of TTM constructs in substance abuse populations have been published [12], there has been little discussion of how measurement issues affect conceptualization of TTM constructs and their applicability to substance use behaviors. Accordingly, this paper focuses on such issues, particularly with respect to the Stage of Change dimension. Because applications of

the TTM to smoking behavior have received extensive attention elsewhere [13–17], the TTM-smoking literature is discussed only as a reference point for discussions of other substances. This paper is part of a TTM review series organized parsimoniously into seven general topic areas (see Spencer *et al.* [16]). Thus, even though multiple substance abuse behaviors are discussed herein, the overriding theme—application of TTM to substance use behaviors—remains constant.

Dimensions of the Transtheoretical Model

The Transtheoretical Model represents an effort to describe multiple facets of the change process, and consists of four distinct dimensions. The stage dimension (i.e. stage of change) is central, and other dimensions of the model are organized around it. The other three dimensions of the TTM, processes of change, decisional balance, and self-efficacy (or temptations), are conceptually relevant to the description of substance abuse behavior. Each of these dimensions is described briefly below.

Stage of change. The stage of change construct provides for a temporal dimension of the process of behavioral change. Although the number of stages changed in the first years of model development, Prochaska and colleagues have been using five stages for nearly two decades: precontemplation (not considering change in the foreseeable future, usually defined as next 6 months), contemplation (considering change in the foreseeable future, but not immediately, usually defined as between 1 and 6 months), preparation, planning on change in the immediate future (usually defined as in the next month), action (made meaningful change in the recent past—6 months) and maintenance (maintained change for a period of time—6 or more months). Progression through these stages is viewed as cyclical rather than linear [18].

Processes of change. In contrast to the stages of change, which are thought to describe a relatively discrete progression [19], the processes of change represent the more qualitative aspect of change, and consist of a set of activities in which individuals engage during behavioral change [9]. Although others have been investigated, a core set of 10 processes has been well-validated [18]. These are categorized as either experiential or behavioral in nature. Experiential processes include consciousness raising, dramatic relief, environmental re-evaluation, social liberation and self re-evaluation. Behavioral processes include stimulus control, counter-conditioning, helping relationships, reinforcement management and self-liberation.

Decisional balance. Decisional balance, also called pros and cons, was developed from work on decision making by Janis & Mann [20]. This dimension addresses the relative importance placed by an individual on the advantages and disadvantages of behavior change. According to the TTM, behavior change occurs when the benefits (pros) of such a change come to be viewed as more important than the costs (cons) of change. Thus, the shift in pros and cons is thought to be emblematic of a progression toward behavior change [2,9,21].

Self-efficacy. The model's self-efficacy dimension was adopted from the work of Bandura [22,23] and integrated into the TTM model. Based on Bandura's seminal work, the TTM presumes that as self-efficacy for behavior change increases, the likelihood of successful implementation of new behavior will improve [24]. Initial model-based research developed both a self-efficacy variable (confidence) and a variable that measured the temptation to engage in unhealthy behavior (temptations) [25]. It was found that these variables had fairly high negative correlations with one another, and that the wording of the temptation items was easier to understand for behavior change that involved cessation of unhealthy behavior such as smoking or alcohol consumption. Thus, in the substance abuse literature, only the temptation scales are generally developed. As with the other TTM dimensional constructs, self-efficacy is believed to be related to stage of readiness to change; those with greater self-efficacy for change will be in more advanced stages of change.

Applying the Transtheoretical Model to substance abuse

A growing literature has examined various applications of the Transtheoretical Model to substance use behavior including alcoholism, binge drinking and a few illicit drugs. On the whole, this research has focused largely on the stage of change dimension of the TTM, while the other three dimensions and their applicability to substance abuse have been addressed to a lesser extent. None the less, this paper provides a comprehensive discussion of all TTM dimensions to the extent that they have been applied to substance abuse.

Stage of change

The majority of the research on the TTM and substance abuse has been descriptive in nature, centering on the classification of individuals according to their stage of change. This research has sought to examine the extent to which the TTM stage paradigm offers an apt description of individuals with substance use problems, and their readiness to change their substance use behavior. Currently, the literature reflects three distinct approaches to assign individuals to a stage of change. We will refer to these as the algorithmic, scale and cluster methods. The three staging methods suggest fairly different

conceptual views of the stages of change; however, the implications of using these different approaches are rarely discussed in the TTM-substance use literature. The algorithmic method uses a short set of branched items that classify respondents clearly into one of the stages of change. For example, heavy drinkers might be asked if they are planning to reduce their drinking to below a criterion level within the next 6 months, and if they answer yes, whether they plan on doing so in the next 30 days. Based on their responses they would be assigned to precontemplation, contemplation or preparation stages. Individuals who are no longer drinking above the criterion level would be asked if they have been doing so for more or less than 6 months to distinguish action from maintenance.

In other areas of research, such as smoking, the algorithmic staging method has been the predominant approach, however, a small number of studies have used this method to evaluate stage of change in substance abuse samples. Most notably, Belding and colleagues [26] used a simple algorithm for 'illicit' drug use which provided a stage distribution that was consistent with the nature of the sample. Migneault et al. [27] used an algorithm to stage classify high school students for immoderate drinking. Both studies provided some cross-sectional validity evidence for these stages, and suggest that the algorithmic approach may be used successfully to classify individuals in terms of their readiness to change substance use behaviors.

The second and third staging methods both use results from multi-factor instruments measuring stage-related attitudes. The scale method categorizes subjects into a stage of change using decision rules applied to the scale scores. For example, individuals may be classified

based on their highest scale score. The cluster method applies cluster analysis techniques to the TTM scale scores. This method leads to multiple clusters, some of which are clearly interpretable within the stage paradigm, while others are not. The scale and cluster methods both rely on self-report instruments to collect information regarding an individual's perception of his or her readiness to change. However, these methods are classification procedures and are not instrument-specific, hence the three self-report instruments reviewed below have been used in both scale and cluster-based examinations of Stage of Change and substance abuse. These are the University of Rhode Island Change Assessment scale, the Readiness to Change questionnaire, and the Stages of Change Readiness and Treatment Eagerness scales. These instruments, staging methods used, and applications to specific populations are detailed in Table 1.

University of Rhode Island Change Assessment scale (URICA)

This scale was originally applied to problems leading individuals to psychotherapy [28]. This 32-item self-report measure assesses attitudes toward behavior change and its items are asked in reference to 'your problem' which is identified before the instrument is taken. Principal component analyses confirmed four distinct subscales of the URICA that correspond to the attitudes assumed to be dominant in the precontemplation, contemplation, action, and maintenance stages of change [28,29].

Support for the validity of using the URICA scales to classify individuals into stages of change for substance abuse was originally provided by DiClemente &

Table 1. *Stages of change construct: measurement approaches, staging methods, and population applications*

Reference	Sample size	Measure	Method	Population/substance
Belding *et al.* [26]	276	–	Algorithm	Methadone maintenance
Budd & Rollnick [40]	274	RCQ	Scale	Male heavy drinkers
Carney & Kivlahan [31]	486	URICA	Cluster	Alcohol and other drug users
DiClemente & Hughes [30]	224	URICA	Cluster	Problem drinkers
El-Bassel *et al.* [32]	257	URICA	Cluster	Female drug users
Heather *et al.* [42]	174	RCQ	Scale	Male heavy drinkers
Hile & Adkins [41]	7097	RCQ	Scale	Individuals seeking treatment for substance abuse
Isenhart [46]	165	SOCRATES	Cluster	Male substance-abusing veterans
Kavanaugh *et al.* [44]	121	RCQ	Scale	Problem drinkers
Migneault *et al.* [27]	853	–	Algorithm	Adolescents
Migneault *et al.* [34]	629	URICA-A	Cluster	Heavy-drinking undergraduates
McMahon & Jones [43]	86	RCQ	Scale	Alcohol-dependent
Miller & Tonigan [45]	1672	SOCRATES	Scale	Problem drinkers
Rollnick *et al.* [39]	141	RCQ	Scale	Heavy drinkers
Vik *et al.* [48]	278	SOCRATES	Scale	Heavy-drinking undergraduates
Willoughby & Edens [33]	141	URICA	Cluster	Alcohol-dependent

URICA = University of Rhode Island Change Assessment Scale, SOCRATES = Stages of Change Readiness and Treatment Eagerness scale, RCQ = Readiness to Change questionnaire.

Hughes [30] in a sample of 224 individuals in treatment for alcoholism. Cluster analyses yielded five distinct clusters that were consistent with earlier validation of the stages of change [29], but do not clearly correspond to the five stages of change. They were described as 'precontemplation', 'uninvolved/discouraged', 'contemplation,' 'ambivalent' and 'participation'. DiClemente & Hughes interpret the uninvolved/discouraged group as being a group that feels unable to make a behavior change even if they wanted. They consider this group as a subtype of precontemplation, and the ambivalent group as being between precontemplation and contemplation. It was not surprising that a maintenance cluster was not found, given the sample characteristics. DiClemente & Hughes also provided support for external validation against the Alcohol Use Inventory (AUI).

Carney & Kivlahan [31] applied cluster analytical procedures using the URICA to study motivational subtypes among a sample of substance-abusing veterans (alcohol and other substances of abuse). Results of cluster analyses identified four distinct subgroups that were equivalent to four described previously by DiClemente & Hughes [30] (precontemplation, contemplation, ambivalent, participation). El-Bassel *et al.* [32] administered the URICA with 257 substance abusing female inmates to measure stage of change. Interestingly, factor analysis found the instrument was composed of five factors, and the additional one, which they labeled 'determination for action', seems to measure attitudes specific to preparation. Cluster analysis using these five scales found five groups with that are very similar the five clusters described by DiClemente & Hughes [30]. In contrast, in cluster analyses using the URICA, Willoughby & Edens [33] found two distinct stage of change groups (precontemplation, contemplation/action) in their sample of 141 individuals entering alcohol treatment. This smaller set of clusters could be the result of smaller sample size, an important factor in cluster analysis, or a more homogeneous population. All these studies presented cross-sectional validity evidence for the stage classification they used.

Finally, it is useful to note there have been a few variations of the URICA that have been specified for alcohol use. For example, Migneault and colleagues [34] revised the items to be specific for alcohol use in a college population. Despite their attempt to include items to measure the preparation stage, principle component analysis resulted in a 21-item instrument with only three scales (precontemplation, contemplation, and maintenance), which was called the URICA-A. Despite investigating a very different population and behavior (college binge drinking) Migneault *et al.* [34] performed cluster analysis using their URICA-A, and found cluster profiles similar to found by DiClemente & Hughes [20]. They eliminated minor clusters and combined related ones resulting in five subgroups representing the five primary stages of change. Carbonari & DiClemente [6] used a scale they also labeled the URICA-A, which was an alcohol-specific version of the URICA. Factor analysis with this measure supported a four-dimensional instrument, as with the original. In addition to using the URICA to stage individuals, as the previously mentioned studies have done, some research has investigated the scale scores of these instruments independent of categorical stages. Although this research might be outside the stage paradigm of the TTM, this research demonstrates an alternative, non-stage-based conception of readiness to change. For example, in Project MATCH, the largest clinical trial for alcoholism treatment to date, scale scores were used as a continuous measure of readiness to examine it's utility as a matching variable to 12-Step, cognitive behavioral or motivational enhancement treatments with samples of out-patient and aftercare clients [35,36]. It was hypothesized that individuals low in readiness to change would demonstrate better outcomes in the motivational enhancement condition (MET), as this type of intervention is client-focused and geared toward meeting the specific needs of the individual. Initial outcomes did not support this hypothesis. However, readiness was predictive of outcome in the out-patient sample but not the aftercare sample. Specifically, readiness to change as measured by summed scale scores on the URICA-A [6] was associated significantly with drinks per drinking day and with percentage of days abstinent. Still, this variable accounted for only 3% of the variance in percentage of days abstinent [37].

In a *post-hoc* analysis on the Project Match data [36], Carbonari & DiClemente [6] examined the predictive utility of the four URICA-A scale scores. Based on post-intervention drinking status, participants were classified as abstinent, moderate drinker, or heavy drinker. Significant differences were found across three of four of the URICA-A scales. However, for the maintenance scale, post treatment scores were actually lower for the abstinent than the heavy drinking group.

Finally, Abellanas & McLellan [38] utilized the URICA scale scores to examine problem substance use behaviors in a sample of opioid-dependent male veterans with concurrent tobacco and cocaine dependence. Although the URICA demonstrated strong internal consistency and stability over repeated measures, the authors found similar scale scores across all substance use behaviors, suggesting that these scores on the URICA did not distinguish well among different substances of abuse.

Readiness to Change questionnaire (RCQ)

The Readiness to Change questionnaire (RCQ) was developed and piloted by Rollnick *et al.* [39] in a

sample of 141 mostly male 'excessive drinkers' in medical settings. The stated intention was to develop a set of scales which would measure stage of change for alcohol use in a way that avoided 'the complexities of clusters of scale profiles' [39, p. 745]. The RCQ consists of three four-item scales labeled precontemplation, contemplation, and action. Although items measuring maintenance were included in the original item set, this factor was not found, presumably because there were no maintainers in the original heavy drinking sample. This is a serious flaw in this otherwise well-developed instrument. Without a well developed maintenance scale, the instrument cannot detect full success in resolving alcohol-related problems, and if the instrument is applied to populations containing significant numbers of maintainers, these subjects are likely to inject additional error into analyses, making staging success less likely. The authors presented two different variations of a staging method, both using the highest scale score as an indicator of stage of change but in one case using raw scores, and in the other using standardized scores. Additionally, they present evidence of validity for both classifications, but leave it to future research to determine which is the superior. However, these findings have been challenged by a reanalysis of the same data by Budd & Rollnick [40], who conclude that the instrument is better used as a unitary scale measuring readiness to change.

Hile & Adkins [41] created a parallel instrument called the Readiness to Change – Drug (RTC-D) for other drugs, and administer this along with the original RCQ, which they called the Readiness to Change – Alcohol (RTC-A). They classified subjects using the simple scale method used by Heather, Rollnick & Bell [42], and examined associations between stage of readiness to change for both behaviors and psychiatric symptoms, and addiction severity in a large sample ($n = 7097$) of individuals seeking treatment for substance abuse. Results revealed significant differences on all variables across the stages of change both for alcohol and for drug abuse, such that individuals in the contemplation stage reported highest levels of psychological distress and addiction severity, followed by those in the action stage. The authors thought these findings were consistent with the heightened awareness and conflict that contemplators would naturally experience.

In one of the few prospective studies of TTM stage constructs applied to substance abuse, Heather *et al.* [42] used the RCQ to predict drinking outcomes over a 6-month period in a sample of excessive drinkers following their discharge from in-patient treatment. The authors found that individuals in the action stage at baseline reported greater reductions in alcohol consumption than those in the precontemplation or contemplation conditions. This pattern was present at both 8-week and 6-month follow-up time-points. McMahon & Jones

[43] also examined the stages of change, as measured by the RCQ, to predict relapse among individuals with alcohol dependence. The authors assigned stage by using the highest RCQ scale scores, which they refer as the 'quick' method, as well as two stage assignment classifications based on which scales scores are above or below the mean for the sample, which they refer to 'refined' and 'refined-A' method. Stage of change, as measured by the 'refined-A' method, predicted length of time to relapse, with those in lower stages of readiness showing shorter time to alcohol use, whereas the other two methods did not. In further analyses they showed that stage of change predicted abstinence independent of negative alcohol expectancies.

Another prospective study by Kavanagh and colleagues [44] sought to predict treatment retention and alcohol intake among self-identified alcohol abusers over a period of 12 months using the stages of change. In this study, the RCQ was used to assess current stage of change. Measurement and distribution issues made interpretation of findings challenging. Evidence suggested that at 6 months, the RCQ did not adequately measure maintenance and probably misclassified some individuals in the precontemplation stage. This was supported by a negative correlation between precontemplation stage and alcohol consumption. These results are not surprising as the RCQ was originally developed on a population that had no maintainers. Paradoxically, although they are at opposite ends of the stage progression, precontemplators and maintainers can show similar item response patterns. For example both might endorse the item: 'I don't have a problem with drinking'. The authors of this study concluded that the RCQ might offer utility in the prediction of alcohol consumption outcomes, but that revision was needed in order to increase specificity in classification into stages.

Stages of Change Readiness and Treatment Eagerness scale (SOCRATES)

The Stages of Change Readiness and Treatment Eagerness scale was developed by Miller & Tonigan [45] over multiple studies. Originally a 40-item measure, a briefer form (19 items) was derived and is recommended by the authors. The SOCRATES was developed specifically to examine stage of readiness to change substance use behaviors. Initial factor analytical results yielded three distinct factors (taking steps, recognition, and ambivalence), which did not map neatly onto the stages of change proposed by Prochaska & DiClemente [19]. A validation study by Isenhart [46] on a sample of 165 male in-patient veterans found a similar factor structure for the SOCRATES. Although they did not actually use the SOCRATES to stage individuals, Carey and colleagues [47] did present further reliability and validity evidence for the scales on

a sample of dually diagnosed out-patients. This measure also demonstrated both convergent (with other theoretically relevant variables) and discriminant (from demographic variables) validity in this sample. All the above research has shown that the Ambivalence scale has low, and at times marginal, internal reliability.

In the study reviewed above, Isenhart [46] also performed a cluster analysis on the scale scores and found three clusters labeled uninvolved, ambivalent and active, which resemble three of the five clusters originally found by DiClemente & Hughes [30]. Group comparisons on validating variables such as the AUI scales showed a mix of significant and insignificant results, which might have been explained partially by the small size of the ambivalent group ($n = 17$).

Vik, Culbertson & Sellers [48] used the SOCRATES to explore motivation to reduce alcohol use in a sample ($n = 278$) of college students who had had at least one heavy drinking episode in the last 3 months. They first modified the SOCRATES based on confirmatory factor analysis, reducing it from 19 to 16 items. They used a simple scale method staging rule that staged 100% of the sample into precontemplation, contemplation or action. The authors did report differences in alcohol consumption and alcohol-related problems across groups of individuals categorized by each of these stages of change. However, students fell overwhelmingly into the precontemplation category, thus suggesting that the TTM may not be effective in distinguishing subsets of heavy drinking college students.

Summary. Valid measurement approaches for stage of change are a critical first step in the application of the TTM to a new behavior, as this is the construct around which the other dimensions are organized. Inconsistency in the conception and assessment of stages of change has hampered this effort (see also Sutton [11] and Bandura [49]) and clarification is an essential next step.

Results of studies examining the stage of change dimension of the TTM for substance abuse have been mixed. The literature is marked by multiple staging approaches, multiple stage of change instruments and thus, perhaps not surprisingly, disparate findings. At least two published studies [26,27] have used the algorithmic approach to identify successfully five distinct stages of change in substance use samples. However, this approach, standard in the smoking literature, has seldom been employed in substance abuse samples, and more research is needed to establish its utility in substance abuse populations. Cluster and scale methods for identifying stage of change in this population have been used far more widely. However, these approaches have yielded inconsistent findings regarding the structure of the stage of change dimension, whether it describes accurately distinct change stages in this population, and its concurrent and predictive relationship to substance use behaviors. The variability in conceptualization and measurement approach for the stages of change along with the large variability in sample characteristics and the nature of the examined behaviors renders the applicability of the TTM stage of change construct difficult to determine.

As noted previously, another source of confusion in the measurement of stage of change seems to be the conceptual relationship of the scale scores to the stages of change. Although not often clearly delineated in the extant literature, there are essentially two views regarding how individual stage of change scales are (or should be) related to stage of change constructs. One view, represented by Carbonari & DiClemente [6], suggests that the individual scales measure attitudes related to stage, not stages themselves. In this case a one-to-one correspondence between scales and stages is not necessary. Instead, stage membership is evidenced by a 'profile' of motivational or readiness related attitudes. In this case, cluster analytical techniques are most appropriate for finding distinct groups using continuous variables. An example of the profile analytical approach comes from work of McMahon & Jones [43], who showed that a modified 'scale' method, which was in essence a profile analysis, produced the best results among three staging methods. Their work also demonstrated an empirical approach to resolving staging method controversies, namely using different staging strategies in the same study and comparing them directly to determine which is superior. This approach should be more applied systematically with other staging methods and more general populations.

The alternative view suggests that a one-to-one correspondence should be found such that a unitary stage specific 'attitude' should be measurable [39]. According to this view, failure to produce such a correspondence calls into question the validity of the stage model. In developing the SOCRATES, Miller & Tonigan [45] sought such a one-to-one correspondence, but ultimately settled for a 'continuously distributed motivational processes that may underlie stages of change' (p. 84). Unfortunately, they did not explore this idea further with profile or cluster analysis. The lack of agreement regarding how to view associations between scale scores and the stage of change construct adds further complexity in evaluating the application of this construct to the problem of substance abuse.

Processes of change

Although the processes of change dimension was the first conceptualized and measured dimension of the TTM, it is less well known than the stages of change dimension. A process of change measure was first developed for smoking cessation using a 40-item self-report measure [15]. Respondents are asked to rate

the frequency to which they use various change strategies on a scale from 1 (never) to 5 (repeatedly).

Our review of the literature identified five studies that applied the processes of change to addictive behaviors; four of these were for alcohol use and one for heroin. In a sample of 84 treated out-patients, Hodgins and colleagues [50] investigated post-relapse cessation of drinking by analyzing interview transcripts, categorizing strategies used to stop drinking according to the TTM processes of change. The authors concluded that their data provided support for Prochaska & DiClemente's conceptualization of change processes, as those who were in action used action-related processes more commonly than processes associated with earlier stages. These strategies included stimulus control, self-liberation, counter-conditioning and use of helping relationships.

Snow and colleagues [51] investigated the relationship of TTM processes of change use to involvement in Alcoholics Anonymous. Principal component analyses validated the basic factor structure of the change processes, which included both behavioral and experiential processes, and found support for associations between process use and recovery behaviors [i.e. Alcoholics Anonymous (AA involvement)]. The authors reported that those with greater involvement in AA also evidenced greater use of TTM processes, such as using helping relationships, stimulus control, behavior management and consciousness raising than did individuals with lower levels of AA involvement.

Carbonari & DiClemente [6] used profile analysis to determine whether abstinent, moderate and heavier drinkers in the Project MATCH study differed at follow-up in the processes of change in which they engaged. The authors grouped processes as experiential or behavioral and found significant differences among the groups on behavioral processes for both out-patient and aftercare arms of their sample, and differences in experiential processes in the out-patient sample. The pattern of these effects showed those in the abstinent and moderate drinking groups demonstrating more engagement in change processes.

Isenhart & Van Krevelen [52] tested the extent to which processes of change map onto the stages of change (contemplation, determination, action) and found mixed support. Of five change processes (self-liberation, stimulus control, counter-conditioning, self-re-evaluation and reinforcement management) only one, self-re-evaluation, was shown to be significantly associated with stage of change constructs. These data may suggest that engaging in particular change processes may not be as reflective of movement through stages of change as they are purported to be, but this study measured only five, largely late-stage processes.

Tejero and colleagues [53] used the 40-item Processes of Change Inventory for Opiate Addicts (PCI-OA) self-report instrument to examine the processes of change in a sample of individuals addicted to heroin. Results offered mixed support for the 10 TTM processes in this sample. Two of the 10 processes yielded an internal consistency coefficient lower than 0.60 (social liberation and self-re-evaluation), and only two of the 10 (counter-conditioning, self-liberation) demonstrated alpha coefficients higher than 0.70. Although confirmatory factor analysis supported the hypothesized 10-process model, exploratory factor analyses supported a three-component solution. Despite this factor complexity, abstinent and non-abstinent heroin-addicted individuals could be discriminated based on one of these components consisting of stimulus control and counter-conditioning items.

Summary. There have been far fewer applications of the TTM's processes of change construct to substance use behaviors than applications of the stages of change. However, the literature on these processes is generally more consistent. This literature has validated the existence of two distinct types of change processes (behavioral and experiential), and suggests that these processes are linked to abstinence and recovery behaviors. However, the extent to which these processes are reflective of movement through different stages of behavioral change has not been adequately determined.

Decisional balance

A third dimension of the TTM is decisional balance (also known as pros and cons). Although commonly noted as an important aspect of the change process among those with substance use disorders [54–56], there have been relatively few empirical applications of this dimension to substance abuse. Migneault and colleagues [27] examined the factor structure of a decisional balance measure in high school students. Exploratory and confirmatory factor analyses confirmed the factor structure of the decisional balance inventory in this sample. A subsequent study by Migneault *et al.* [34] examined decisional balance of immoderate drinking in a sample of college students ($n = 629$). This research suggested that the data could be equally well accounted for with two- or three-factor solutions. The two-factor solution was consistent with their earlier findings, whereas the three-factor solution suggested that there might be two types of cons, those related to actual negative consequences of drinking (e.g. I do not like myself when I drink) and those related to potential negative consequences (e.g. I might get addicted). In both studies the pros and cons of alcohol use demonstrated the hypothesized relationship with stage of change, with cons of drinking increasing with stage progression as the pros declined, and their levels crossing over between contemplation and preparation. Findings also revealed that pros and cons

appeared to change over time, and that consumption variables demonstrated significant positive correlations with pros, and smaller but significant, negative correlation with cons. Carey *et al.* [47] examined the decisional balance dimension in a sample of individuals with substance use and co-morbid persistent mental illness. They reported that pros and cons were related to stages of change attitudes measured by the SOCRATES such that the pros of using were significantly and negatively associated with the taking steps subscale of the SOCRATES, while the cons of using had a significantly positive association with this subscale.

In a study comparing similar constructs across from different theories, Noar and colleagues [57] compared decisional balance to alcohol expectancies measures in a sample of college students and found that the shorter decisional balance scales outperformed alcohol expectancies measures. This study also presents a useful template for research to clarify the relationship of similar constructs that were developed within separate theories, an important task for the field.

Summary. Although decisional balance is commonly viewed as being an important clinical tool in working with addicted individuals, there has been relatively little empirical examination of this TTM dimension as it relates to substance use behaviors. However, research does suggest consistently that pros and cons are associated with the stages of change, and that these factors change over time, presumably as individuals makes progress in changing their substance use behaviors.

Self-efficacy and temptation

As with the other, lesser-known dimensions of the TTM, relatively few studies have examined the temptation construct specifically with respect to substance abuse. One such study was conducted by DiClemente & Hughes [30], who used the Alcohol Abstinence Self-Efficacy scale (AASE) to assess both temptation to drink alcohol and confidence to resist drinking across 49 drinking risk situations. Results revealed that participants differed in both temptation and confidence according to their stage of readiness to change, with those in latter stages reporting lower temptation and higher confidence. A later study by DiClemente and colleagues [58] used a briefer (20-item) version of the AASE, validating this measure in a sample of individuals seeking out-patient treatment for alcohol. The authors found significant associations between confidence and the action subscale, but not for confidence and contemplation or maintenance subscales. Carbonari & DiClemente [6] used data from Project MATCH to compare levels of temptation to drink alcohol and confidence to abstain among abstinent, moderate and heavy drinkers using the AASE.

Heavy drinkers reported higher levels of temptation and lower levels of confidence than abstainers or more moderate drinkers. In both out-patient and aftercare samples, those in the abstinent group demonstrated a different pattern, scoring higher in confidence and lower in temptation following treatment.

With a sample of regularly drinking college students, Migneault [59] developed a 21-item assessment measure designed to evaluate four types of situations in which an individual might be tempted to use alcohol. Maddock *et al.* [60] developed a shorter version of the Migneault measure in a sample of undergraduates and found that this briefer measure could reliably evaluate the extent to which young adult drinkers experience temptation to drink alcohol. These authors also found temptation scores to differ according to TTM stage of change; those in action and maintenance stages reported lower drinking temptation than those in earlier change stages.

Summary. Although only a few studies applying the temptation construct to substance use and abuse have been conducted, findings across these studies appear to be consistent with one another and with TTM theory. More alcohol involvement and earlier stages of change for drinking demonstrate higher levels of self-reported temptation to drink and lower levels of confidence to abstain. To our knowledge, the temptation construct has only been applied to the substances of alcohol and tobacco. Thus, the extent to which this TTM construct offers a useful way of conceptualizing use of other substances remains to be determined.

Unanswered questions and future directions

In many respects, the Transtheoretical Model appears to offer a promising approach to the problem of substance abuse. Interventions for substance abuse have moved away from confrontational approaches [61,62], and have focused instead on working within the parameters of an individual's own readiness to make a behavior change [56,63]. Stage-based approaches to substance abuse treatment may facilitate therapeutic alliance and increase likelihood of treatment progress. Indeed, the TTM offers an alternative way of conceptualizing the now well-worn notions of denial and resistance [7], is less pathologizing and provides a descriptive rather than evaluative way of understanding substance abuse. Further, as relapse is common among those with substance use disorders [64], addicted individuals may find themselves repeating similar patterns of substance abuse, treatment, recovery and lapse back to abuse; the cyclical stages of the TTM make it well-suited to describing the course of substance abuse.

However, despite its intuitive appeal, the TTM's applicability to substance abuse is far from definitively

established. As we have noted, applications of the Transtheoretical Model to substance abuse have focused largely on the stages of change dimension. More research is needed to address the full range of TTM constructs (i.e. processes, decisional balance, temptations) to provide an adequate test of this model's applicability to substance abuse. Further, with respect to methodological issues, applications of the TTM to substance abuse samples have yielded mixed results for the validity of TTM constructs. Wide variability in measurement of TTM constructs—particularly stage of change—is the source of substantial ambiguity regarding the value of applying this model to substance abuse, and make comparison across studies difficult.

In their discussion of the TTM and substance abuse, Joseph *et al.* [9] propose that a theoretical model should be evaluated according to conceptual and methodological criteria. Conceptual criteria pertain to a model's underlying assumptions, whether these assumptions make sense and are useful in conceptualizing the behavioral phenomenon in question. Methodological criteria address critical issues such as whether theoretical constructs are adequately measured and validated. Based upon these criteria, we submit that the intuitive appeal of the TTM has probably contributed to the current state of the literature whereby there has been much attention focused on its the conceptual utility, and inadequate work conducted on the measurement of its core constructs and the empirical testing of basic model concepts. In addition to the issues that we have outlined thus far, still other gaps, inconsistencies and unanswered questions remain. We outline a few of these below.

Variation across substances

Adding to the complexity of measuring TTM constructs is the fact that substance abuse encompasses a range of problematic behaviors. As such, applications of the TTM to each different substance may carry different nuances. For instance, policy issues affecting readiness to change probably differ for illegal versus legal substances. The predictive validity of stage of change may not be comparable for a substance that is readily available as compared to one that is a controlled substance and, presumably, less accessible. Misuse of illegal drugs or socially undesirable substances may also present self-presentation issues that are relevant for reporting change readiness and accompanying processes. Even within the set of studies assessing the same substance the variations in behavior can be very large, e.g. binge drinking versus dependent alcohol use.

Varied patient populations

Applications of the TTM to substance abuse have varied considerably with respect to patient populations and have included single-sexed samples [32,65], incarcerated individuals [32], primary care patients [66], veterans [30,31], in-patients [6,42,46] and college students [27,48], to name a few. As yet, there is insufficient research to systematically understand how these groups differ or are the same on the dimensions of the TTM. Thus, when discrepant findings have emerged with respect to the application of the TTM to substance use behaviors, it is difficult to determine whether these differences reflect inconsistencies in the model itself, or simply expected variation across populations. More well-designed studies with heterogeneous samples will be a helpful addition to this literature.

Prediction versus description

Another unanswered question is the issue of the TTM as a descriptive compared to a predictive model. Much of the literature applying TTM to substance abuse has focused on its descriptive capabilities, consisting largely of studies that describe stage of readiness in various groups of substance abusers, and presenting cross-sectional associations with drinking and treatment seeking behaviors. It may be concluded from this literature that the TTM may be used to describe different typologies of substance use and treatment-seeking patterns [32,33,67] and to provide a rich clinical framework for describing substance abuse and its manifestations. However, the extent to which application of the TTM advances the field of substance abuse beyond the task of simple description is unclear. The literature has yet to demonstrate the TTM's ability to reliably chart the course of substance abuse recovery. Recently, Sutton [17] noted that prospective studies examining specific predictors of stage transitions would allow for enhanced understanding of baseline characteristics that differentiate those who make a change in their substance abuse behavior from those who do not. Such examination may be achieved only through the implementation of longitudinal studies. Although, arguably, these studies have been conducted for smoking, there have been remarkably few longitudinal applications of the model to substance abuse. Moreover, the prospective studies that have been conducted have commonly focused on how stage of readiness at a single time point (i.e. baseline assessment) predicts substance abuse outcome over time [42,44,46]. The use of a static stage of readiness to predict outcome is useful for identifying those at greatest risk for relapse. However, this application falls short of elucidating the dynamic processes of change, or the predictive meaning of movement from one stage to another.

In a related manner, a behavior change theory should allow for the development and empirical testing of

hypotheses about behavior and how it might be expected to change. The current TTM literature does not reflect this process for substance abuse. A priori hypotheses regarding predicted associations between TTM variables and substance use and recovery behaviors have frequently either not been specified or have cast a wide net, examining the gamut of TTM constructs and providing seemingly *post-hoc* descriptions of their associations with other variables. A major contribution to the TTM/substance abuse literature will be the studies that specify a priori, then test hypotheses guided by the TTM framework.

Efficacy of TTM-based tailored interventions

As a model of health behavior, the TTM potentially offers a mechanism to identify and describe processes that are purported to motivate, prepare and assist individuals in realizing behavior change. As such, the TTM could provide substance abuse intervention strategies tailored to specific individual differences in readiness to change behavior. Because the literature has not identified a single 'best practice' treatment for substance use disorders [68,69], identification of which clients may benefit from which type of treatment may maximize the efficacy of available treatments.

Many have touted the value of stage-matched interventions for substance abuse [7,70,71], yet empirical tests of such stage-matched interventions and how their outcomes compare to more generalized interventions have not, to our knowledge, been conducted. Although Project MATCH did not match substance abuse patients to specific treatments *per se*, matching effects between stage of change and treatment were examined. Tests of the study's primary hypotheses revealed no significant interaction for motivational enhancement therapy (MET) based on stage of change readiness. In fact, results indicated that participants low in baseline readiness who received MET—an intervention by nature geared toward an individual's stage of readiness to change—actually reported poorer drinking outcomes following treatment than those in twelve-step facilitation or cognitive behavioral therapy.

Summary and conclusions

'It is popular . . . for the utilization of popular concepts to run ahead of empirical support'. (Isenhart & Van Krevelen [52, p. 182])

The objectives of the TTM are ambitious; seeking an integrated, comprehensive and broadly applicable approach to conceptualizing substance use (and other health) behaviors. Undeniably, the transtheoretical model has had a significant impact on the way that substance use disorders are understood and treated.

Further, it is difficult to think of any comprehensive theoretical model of behavior change that has been empirically tested as extensively as the TTM.

Nevertheless, the studies that have examined the applicability of the TTM to substance use behaviors have yielded mixed results, and it appears that caution regarding the TTM and substance abuse is warranted. Because innovation always precedes evaluation, we are not inclined to discourage use of the model based on its insufficient development. Rather, because it addresses several deficiencies in accepted methods of counseling patients with substance abuse disorders, we encourage further development of the TTM and other models that may improve treatment outcomes. This will involve all TTM dimensions being more fully developed, validated and evaluated across a range of substance abuse problems and significant discrepancies in findings either understood or eliminated. Further, prospective studies will speak to the predictive utility of the TTM, and evaluation of TTM-matched interventions will help to address the specificity of the model.

Only when these questions are answered will it be possible to determine whether the difficulties that the model has presented in such applications may be overcome with greater methodological, conceptual and statistical clarity and more empirical effort, or whether these mixed findings represent a true mismatch between the model itself and the reality of substance abuse.

References

[1] Prochaska JO. Systems of psychotherapy: a transtheoretical analysis. Homewood, IL: Dorsey Press, 1979.

[2] Prochaska JO, Velicer WF, Rossi JS, *et al*. Stages of change and decisional balance for 12 problem behaviors. Health Psychol 1994;13:39–46.

[3] Rodgers WM, Courneya KS, Bayduza A. Examination of the transtheoretical model and exercise in 3 populations. Am J Health Behav 2001;25:33–41.

[4] Rakowski W, Dube C, Marcus B, Prochaska J, Velicer W, Abrams D. Assessing elements of women's decisions about mammography. Health Psychol 1992;11:111–8.

[5] Velicer WF, Prochaska JO, Fava JL, LaForge RG, Rossi JS. Interactive versus noninteractive interventions and dose–response relationships for stage-matched smoking cessation programs in a managed care setting. Health Psychol 1999; 18:21–8.

[6] Carbonari JP, DiClemente CC. Using the transtheoretical model profiles to differentiate levels of alcohol abstinence success. J Consult Clin Psychol 2000;68:810–7.

[7] Connors GJ, Donovan DM, DiClemente CC. Substance abuse treatment and the stages of change: selecting and planning interventions. New York: Guilford Press, 2001.

[8] Davidson R. Prochaska and DiClemente's model of change: a case study? Br J Addict 1992;87:821–2.

[9] Joseph J, Breslin C, Skinner H. Critical perspectives on the transtheoretical model and stages of change. In: Tucker JA, Donovan DM, Marlatt GA, eds. Changing addictive behavior. New York: Guilford Press, 1999:160–90.

[10] Sutton S. Can 'Stages of change' provide guidance in the treatment of addictions? A critical examination of Prochaska and DiClemente's model. In: Edwards G, Dare C, eds. Psychotherapy, psychological treatment, and the addictions. Cambridge, UK: Cambridge University Press, 1996: 189–205.

[11] Sutton S. Back to the drawing board? A review of applications of the transtheoretical model to substance use. Addiction 2001;96:175–86.

[12] Carey KB, Purdine DM, Maisto SA, Carey MP. Assessing readiness to change substance abuse: a critical review of instruments. Clin Psychol Sci Pract 1999;6:245–66.

[13] Abrams DB, Herzog TA, Emmons KM, Linnan L. Stages of change versus addition: a replication and extension. Nicotine Tobacco Res 2000;2:223–9.

[14] Fava JL, Velicer WF, Prochaska JO. Applying the transtheoretical model to a representative sample of smokers. Addict Behav 1995;20:189–203.

[15] Prochaska JO, Velicer WF, DiClemente CC, Fava J. Measuring processes of change: applications to the cessation of smoking. J Consult Clin Psychol 1988;56:520–8.

[16] Spencer L, Pagell F, Hallion ME, Adams TB. Applying the Transtheoretical Model to tobacco cessation and prevention: A review of the literature. Am J Health Prom 2002; 17:7–71.

[17] Sutton S. A critical review of the transtheoretical model applied to smoking cessation. In: Norman P, Abraham C, eds. Understanding and changing health behaviour: from health beliefs to self-regulation. Amsterdam, the Netherlands: Harwood Academic Publishers, 2000: 207–25.

[18] Prochaska JO, DiClemente CC, Norcross JC. In search of how people change: applications to addictive behaviors. Am Psychol 1992;47:1102–14.

[19] Prochaska JO, DiClemente CC. Stages and processes of self-change of smoking: toward and integrative model of change. J Consult Clin Psychol 1983;51:390–5.

[20] Janis IL, Mann L. Decision making: a psychological analysis of conflict, choice, and commitment. New York: Free Press, 1977.

[21] Velicer WF, DiClemente CC, Prochaska JO, Brandenburg N. Decisional balance measure for assessing and predicting smoking status. J Personal Soc Psychol 1985;48:1279–89.

[22] Bandura A. Social learning theory. Englewood Cliffs, NJ: Prentice-Hall, 1977.

[23] Bandura A. Social foundations of thought and action: a social cognitive theory. Upper Saddle River, NJ: Prentice Hall, 1986.

[24] Velicer WF, DiClemente CC, Rossi JS, Prochaska JO. Relapse situations and self-efficacy: an integrative model. Addict Behav 1990;15:271–83.

[25] DiClemente CC, Prochaska JO, Gilbertini M. Self-efficacy and the stages of self change of smoking. Cogn Ther Res 1985;9:181–200.

[26] Belding MA, Iguchi MY, Lamb RJ, Lakin M. Stages and process of change among polydrug users in methadone maintenance treatment. Drug Alcohol Depend 1995;39: 45–53.

[27] Migneault JP, Pallonen UE, Velicer WF. Decisional balance and stage of change for adolescent drinking. Addict Behav 1997;22:339–51.

[28] McConnaughy EA, DiClemente CC, Prochaska JO, Velicer WF. Stages of change in psychotherapy: a follow-up report. Psychotherapy 1989;4:494–503.

[29] McConnaughy EA, Prochaska JO, Velicer WF. Stages of change in psychotherapy: measurement and sample profiles. Psychother Theory Res Pract 1983;20:268–375.

[30] DiClemente CC, Hughes SO. Stages of change profiles in outpatient alcoholism treatment. J Subst Abuse 1990;2: 217–35.

[31] Carney MM, Kivlahan DR. Motivational subtypes among veterans seeking substance abuse treatment: profiles based on stages of change. Psychol Addict Behav 1995; 9:135–42.

[32] El-Bassel N, Schilling RF, Ivanoff A, Chen D, Hanson M, Bidassie B. Stages of change profiles among incarcerated drug-using women. Addict Behav 1998;23:389–94.

[33] Willoughby FW, Edens JF. Construct validity and predictive utility of the stages of change scale for alcoholics. J Subst Abuse 1996;8:275–91.

[34] Migneault JP, Velicer WF, Prochaska JO, Stevenson JF. Decisional balance for immoderate drinking in college students. Subst Use Misuse 1999;34:1325–46.

[35] Kadden RK, Longabaugh R, Wirtz P. The matching hypotheses: rationale and predictions. In: Babor TF, Delboca FK, eds. Treatment matching in alcoholism. New York: Cambridge University Press, 2003:81–102.

[36] Project MATCH Research Group. Project MATCH secondary a priori hypotheses. Addiction 1997;92: 1671–88.

[37] Project MATCH Research Group. Matching alcoholism treatments to client heterogeneity: treatment main effects and matching effects on drinking during treatment. J Stud Alcohol 1998;59:631–9.

[38] Abellanas L, McLellan AT. 'Stage of change' by drug problem in concurrent opioid, cocaine, and cigarette users. J Psychoact Drugs 1993;25:307–13.

[39] Rollnick S, Heather N, Gold R, Hall W. Development of a short Readiness to Change questionnaire for use in brief, opportunistic interventions among excessive drinkers. Br J Addict 1992;87:743–54.

[40] Budd R, Rollnick S. The structure of the Readiness to Change Questionnaire: a test of Prochaska and DiClemente's transtheoretical model. Br J Health Psychol 1996;1:365–76.

[41] Hile MG, Adkins RE. The impact of substance abuser's readiness to change on psychological and behavioral functioning. Addict Behav 1998;23:365–70.

[42] Heather N, Rollnick S, Bell A. Predictive validity of the Readiness to Change questionnaire. Addiction 1993;88: 1667–77.

[43] McMahon J, Jones BT. Post-treatment abstinence survivorship and motivation for recovery: The predictive validity of the readiness to change (RCQ) and negative alcohol expectancy questionnaires. Addict Res 1996;4:161–76.

[44] Kavanaugh DJ, Sitharthan T, Sayer GP. Prediction of results from correspondence treatment of controlled drinking. Addiction 1996;91:1539–45.

[45] Miller WR, Tonigan JS. Assessing drinkers' motivations for change: the Stages of Readiness and Treatment Eagerness Scale (SOCRATES). Psychol Addict Behav 1996;10:81–9.

[46] Isenhart CE. Motivational subtypes in an inpatient sample of substance abusers. Addict Behav 1994;19:463–75.

[47] Carey KB, Maisto SA, Carey MP, Purnine DM. Measuring readiness to change substance misuse among psychiatric outpatients: I. Reliability and validity of self-report measures. J Stud Alcohol 2001;62:79–88.

[48] Vik PW, Culbertson KA, Sellers K. Readiness to change drinking among heavy drinking college students. J Stud Alcohol 2000;61:674–80.

[49] Bandura A. Keynote address: Moving into forward gear in health promotion and disease prevention. Presented at the meeting of the Society of Behavioral Medicine, St Petersburg, FL, 1995.

[50] Hodgins DC, Ungar J, el-Guebaly N, Armstrong S. Getting back on the wagon: reasons and strategies for terminating alcoholic relapses. Psychol Addict Behav 1997;11:174 – 81.

[51] Snow MG, Prochaska JO, Rossi JS. Processes of change in alcoholics anonymous: maintenance factors in long-term sobriety. J Stud Alcohol 1994;55:362 – 71.

[52] Isenhart CE, Van Krevelen S. Relationship between readiness for and processes of change in a sample of alcohol dependent males. J Subst Abuse 1998;10:175 – 84.

[53] Tejero A, Trujols J, Hernandez E, Perez de los Cobos J, Casas M. Processes of change assessment in heroin addicts following the Prochaska and DiClemente transtheoretical model. Drug Alcohol Depend 1997;47:31 – 7.

[54] Carey KB. Substance use reduction in the context of outpatient psychiatric treatment: a collaborative, motivational, harm reduction approach. Commun Mental Health J 1996;32:291 – 306.

[55] McCrady BS, Epstein EE. Addictions: a comprehensive guidebook. London: Oxford University Press, 1999.

[56] Miller WR, Rollnick S. Motivational interviewing: preparing people to change addictive behavior. New York: Guilford Press, 1991.

[57] Noar SM, Laforge RG, Maddock JE, Wood MD. Rethinking positive and negative aspects of alcohol use: suggestions from a comparison of alcohol expectancies and decisional balance. J Stud Alcohol 2003;64:60 – 9.

[58] DiClemente CC, Carbonari JP, Montgomery RP, Hughes S. The alcohol abstinence self-efficacy scale. J Stud Alcohol 1994;55:141 – 8.

[59] Migneault J. A transtheoretical investigation of immoderate drinking in a college population [Doctoral Dissertation]. Kingston, RI: University of Rhode Island; 1995.

[60] Maddock JE, Laforge RG, Rossi JS. Short form of a situational temptation scale for heavy, episodic drinking. J Subst Abuse 1999;11:281 – 8.

[61] Finney JW, Monahan SC. The cost-effectiveness of treatment for alcoholism: a second approximation. J Stud Alcohol 1996;57:229 – 43.

[62] Miller WR, Benefield G, Tonigan JS. Enhancing motivation for change: a controlled comparison of two therapist styles. J Consult Clin Psychol 1993;61:455 – 61.

[63] Miller WR, Brown JM, Simpson TL, et al. What works? A methodological analysis of the alcohol treatment outcome literature. In: Hester RK, Miller WR, eds. Handbook of alcoholism treatment approaches: effective alternatives. Needham Heights, MA: Simon & Schuster, 1995:12 – 44.

[64] Brownell KD, Marlatt GA, Lichtenstein E, Wilson GT. Understanding and preventing relapse. Am Psychol 1986;7:765 – 82.

[65] Brown VA, Melchior LA, Panter AT, Slaughter R, Huba GJ. Women's steps of change and entry into drug abuse treatment: a multidimensional stages of change model. J Subst Abuse Treat 2000;18:231 – 40.

[66] Samet J, O'Connor P. Alcohol abusers in primary care: readiness to change behavior. Am J Med 1998;105:302 – 6.

[67] Snow MG, Prochaska JO, Rossi JS. Stages of change for smoking cessation among former problem drinkers: a cross-sectional analysis. J Subst Abuse 1992;4:107 – 16.

[68] Miller WR, Hester RK. Treatment for alcohol problems: toward an informed eclecticism. In: Hester RK, Miller WR, eds. Handbook of alcoholism treatment approaches: effective alternatives, 2nd edn. Needham Heights, MA: Simon & Schuster, 1995:1 – 11.

[69] Read JP, Kahler CW, Stevenson J. Bridging the gap between alcoholism treatment research and practice: identifying what works and why. Prof Psychol Res Pract 2001;32:227 – 38.

[70] Baker A, Boggs TG, Lewin TJ. Characteristics of regular amphetamine users and implications for treatment. Drug Alcohol Rev 2001;20:49 – 56.

[71] Prochaska JO, Norcross JC. Stages of change. Psychother Theory Res Pract Training 2001;38:443 – 8.