PROGRESSIVE STAGE TRANSITION DOES MEAN GETTING BETTER: A FURTHER TEST OF THE TRANSTHEORETICAL MODEL IN RECOVERY FROM ALCOHOL PROBLEMS

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ABSTRACT

Aims To test two central assumptions of the Transtheoretical Model (TTM) regarding recovery from alcohol problems: (1) individuals making a forward transition from pre-action to action stages will show greater drinking improvements than those remaining in pre-action stages ; and (2) individuals remaining in pre-action stages will not demonstrate improvements in drinking outcomes.

Design and setting Large, multi-centre, RCT of treatment for alcohol problems (UKATT).

Measurements Stage of change, drinks per drinking day (DDD) and percentage days abstinent (PDA) at baseline, three months and 12 months follow-up.

Findings In support of TTM assumption 1, improvements in drinking outcomes were consistently greater among clients who showed a forward stage transition (*d* = 0.68) than among those who did not (*d* = 0.10). Two tests of assumption 2 showed a significant improvement in drinking outcomes in non-transition groups, inconsistent with the TTM, one test showed a significant deterioration and the other showed equivalent drinking outcomes across time. An explanation is offered why, under the relevant assumption of the TTM, clients in non-transition groups showed small changes in drinking outcomes.

Conclusions In contrast to a previous study by Callaghan and colleagues, our findings largely support the TTM account of recovery from alcohol problems in treatment. The discrepancy can be explained by the use in our study of a more reliable and valid method for assigning stage of change.

Keywords Alcohol problems, UKATT, treatment, Transtheoretical Model, stage of change, stage transitions

INTRODUCTION

Using data from Project MATCH [1], Callaghan, Taylor and Cunningham [2] recently tested two central assumptions of the Transtheoretical Model (TTM) of behaviour change [3] regarding movement through the stages of change posited by this model in the process of recovery from alcohol problems. In the TTM, stages of change describe the stages through which a person moves in an intentional effort to resolve an addictive disorder, with each stage representing a set of specific tasks the person must address to make progress [3,4]. From "precontemplation" through "contemplation", "preparation" and "action" to "maintenance", the person is assumed to pass from one stage to the next, with the "relapser" re-entering the cycle at either the precontemplation or contemplation stages. In addition to stages of change, the TTM includes other central constructs. Processes of change facilitate movement through the stages and represent change principles deriving from various theories of psychotherapy [5]; levels of change, ranging from symptom/situational to intrapersonal, assume that individuals are in different stages of change with respect to different problem areas [5].

While popular among clinicians and many researchers in the addictions field, the TTM has been criticised [6-10]. Although the full TTM is wider than the concept of the stages of change, it is this component of the model that has attracted most of the popularity and the criticism. Also, the findings reported by Callaghan and colleagues [2] concern only one implication of the stage of change construct, albeit the crucial implication that movement from pre-action to action stages should be related to changes in the behaviour of interest.

The two TTM assumptions tested by Callaghan et al. were: "(i) individuals making a forward transition to the action-oriented stages (i.e., preparation/action) will manifest greater drinking improvements than their counterparts remaining in the pre-action stages (i.e., precontemplation, contemplation); and (ii) individuals remaining in the pre-action stages across time will not demonstrate clinically relevant improvements in drinking outcomes" (p.1588). These assumptions

were tested in data from both the aftercare and outpatient arms of Project MATCH and on two primary outcome variables – Percent Days Abstinence (PDA) and Drinks per Drinking Day (DDD), generating eight tests of predictions from the stage of change construct.

Six of these eight tests failed to support the TTM. Treated individuals who had progressed to action-oriented stages did not manifest greater improvements in drinking behaviour than those remaining in pre-action stages; individuals remaining in pre-action stages did show statistically significant and clinically important improvements in drinking behaviour. The authors concluded that "our findings challenge not only the criterion validity associated with stage movement in the TTM account of alcoholism recovery, but also recent TTM-based substance abuse treatment approaches which systematically promote forward stage transition as a primary clinical goal and marker of therapeutic success" (p.1588).

Data from the *United Kingdom Alcohol Treatment Trial* (UKATT) [11] provided an opportunity to replicate the findings reported by Callaghan and colleagues [2]. We were able to use the same dependent measures of treatment outcome and essentially the same the method of analysis as the earlier study. However, there were two unavoidable differences. First, Callaghan and colleagues conducted independent sets of analyses on each of the two arms of Project MATCH (aftercare and outpatient) whereas UKATT had only one arm. However, in UKATT stage of change was measured on three occasions – baseline, three and twelve month follow-ups –enabling us to conduct two sets of analyses on stage of change transitions, ie, from baseline to three month follow-up and from three to twelve month follow-up.

Secondly, the way in which stage of change was measured differed between the two studies. Project MATCH used an alcohol-specific version of the *University of Rhode Island Change Assessment* (URICA) [12] but, instead of allocating participants to stages of change, predicted drinking outcomes by a baseline readiness score calculated by summing contemplation, action and maintenance subscale scores and subtracting the precontemplation subscale score [13,14]. The Callaghan et al.

study used an approximation of stage status based on dividing readiness scores in each arm of the Project MATCH sample into tertiles corresponding roughly to precontemplation, contemplation and preparation/action stages of change [15]. In this way, shifts in stage status from pre to post treatment could be examined. In UKATT, stage of change was assessed by the *Readiness to Change Questionnaire [Treatment Version]* (RCQ[TV] [16,17] as described below.

METHOD

Overview of data source: United Kingdom Alcohol Treatment Trial (UKATT)

UKATT was a pragmatic, multi-centre, randomised controlled trial with open follow-up at three months after entry and blind follow-up at twelve months. Two treatment modalities were compared: an adaptation of Motivational Enhancement Therapy (MET) [18] scheduled for three sessions and Social Behaviour and Network Therapy (SBNT) [19] scheduled for eight sessions. Main treatment outcomes, an economic evaluation, the results of tests of client-treatment matching hypotheses and UKATT procedures, including recruitment of participants, screening, inclusion/exclusion criteria, randomisation, follow-up arrangements and details of treatments and therapists were reported earlier [11, 20, 21, 22].

A total of 742 clients entered the trial (MET = 422; SBNT = 320). 74.1% were male, 95.6% White and mean age was 41.6 years (sd=10.1). 10.0% had a university degree or equivalent, 35.7% had no qualifications of any kind and only 34.8% were in full-time employment. 54.1% were in a current relationship. The sample showed a moderate to severe level of dependence [23] and a slightly above average level of alcohol-related problems for a British treatment sample [24]. Follow-up rates were 93% at three months and 83% at twelve months.

Key measures

Drinking: PDA and DDD

As in Project MATCH [13], PDA and DDD were the primary outcome variables in UKATT and were derived from *Form 90* [25]. It has been debated whether clients who are totally abstinent at follow-

up should be assigned a DDD value of zero [1, 13] or regarded as missing on this variable [11, 26]. As we wished to replicate Callaghan and colleagues' analysis, we followed them in using the former procedure here. As in the earlier report, however, we carried out a supplementary analysis in which DDD was calculated by excluding clients abstinent at follow-up. These tests showed the same pattern as those reported in the Results section below and will not be commented on further.

We used values of PDA and DDD from three time-points - baseline, three and twelve months follow-up. Thus we conducted two sets of analyses on two TTM assumptions, one set on the transition from baseline to three months stage of change and another on the transition from three months to twelve months stage of change. This resulted in eight separate tests.

Stage of change: Readiness to Change Questionnaire [Treatment Version] (RCQ[TV])

Stage of change was assessed by the RCQ[TV], a version of the original RCQ [27) adapted for individuals receiving treatment for alcohol problems. We used the improved, 12-item version of the instrument based on an analysis of UKATT data [17]. The RCQ[TV] gives subscale scores for three stages of change – precontemplation, contemplation and action – with each subscale represented by four items. Respondents are asked to what extent they agree or disagree with each item on a 5-point Likert scale. Each item is scored between -2 (strongly disagree) and +2 (strongly agree) and scores on each subscale therefore range between -8 and 8. Respondents are assigned to a stage of change according to the subscale showing the highest score, with ties being decided in favour of the stage farthest along the cycle of change.

Sample used in the current study

As in Callaghan et al.'s procedure, we confined the analysis to clients in pre-action stages (ie, precontemplation or contemplation) either at baseline or three month follow-up. In both cases, clients making a transition from pre-action to the action stage were assigned to a transition group, while those remaining in pre-action stages were assigned to a non-transition group. For the baseline to three month follow-up comparisons 290 clients with non-missing data on drinking variables were

available in pre-action stages (*N*=173 in the transition group and 117 in the non-transition group) and for the three to twelve month comparisons 141 clients with non-missing data were available in pre-action stages (*N*=49 in the transition group and 92 in the non-transition group).

Analytical issues

Statistical analysis

To test predictions from the TTM assumption 1, we conducted four ANCOVAs with transition group versus non-transition group as the independent variable. DDD at three months, DDD at twelve months, PDA at three months and PDA at twelve months were dependent variables. Each analysis used a single covariate: DDD at baseline, DDD at three months, PDA at baseline or PDA at three months. This ANCOVA approach is more powerful than ANOVA with repeated measures [28,29]. TTM assumption 1 predicts that DDD would be lower for clients in the transition group than for those in the non-transition group after DDD at the earlier time-point had been considered as a covariate; TTM assumption 1 also predicts that PDA would be higher for clients in the transition group than for those in the non-transition group after PDA at the earlier time-point had been considered as a covariate.

Following recent guidelines [30], we also report effect sizes (Cohen's *d*) for changes in drinking outcomes. Here, positive effect sizes indicate an amelioration of drinking outcomes over time while negative effect sizes indicate a worsening. Effect sizes derived from test statistics may conflate the magnitude of an effect and its homogeneity across participants [31] and to avoid this we computed *d* directly from means and standard deviations.

Statistical hypothesis testing usually seeks to demonstrate that there is a *difference* between means. Clearly, this strategy cannot be applied to TTM assumption 2 which states that clients remaining in pre-action stages across time will *not* show clinically relevant improvements in drinking outcomes. If we wish to demonstrate that two groups do not meaningfully differ, a test of equivalence is needed [32]. In a first step, one decides which maximal deviation between group means is regarded as

practically irrelevant. Such a decision is always somewhat arbitrary but we used d = |0.2|as a criterion. That is, we regard a difference in PDA or DDA of one fifth of a standard deviation or less over time as clinically irrelevant. A test of equivalence establishes if an observed difference between two groups is significantly smaller than the criterion (d = |0.2|in our case); therefore, a significant result indicates equivalence. If a difference in drinking outcome observed over time is greater than d = |0.2|, this speaks directly against equivalence and no further testing of equivalence is required [32]. However, in this case we tested whether drinking outcomes had changed over time by using a paired-samples t test.

Consideration of covariates

We did not include treatment modality as a covariate in the above analyses (or any variable other than the level of the dependent variable at the earlier time-point) for similar reasons to those stated by Callaghan et al. [2]. First, there is no theoretical reason to believe that the relationship between stage of change transitions over time and outcome of treatment should vary according to the type of treatment received. Secondly, there was very little difference in the UKATT data between outcomes from the two types of treatment studied [11] and no client-treatment matching effects involving readiness to change or stage of change [21]. Similar theoretical and empirical considerations apply to other variables that might have been considered as covariates in the analyses reported here.

RESULTS

RCQ[TV] subscale scores

Table 1 shows means and standard deviations of RCQ[TV] subscale scores at three time-points, together with values for Cronbach's alpha [32] in each case. These scores are reported for all participants with valid scores at each time-point.

TABLE 1 ABOUT HERE

Stage of change assignment

Table 2 shows numbers of clients assigned to each of three stages of change at three month follow-up given their stage assignment at baseline. Also shown in Table 2 are numbers of clients assigned to each stage at twelve month follow-up given their stage of change at three months.

TABLE 2 ABOUT HERE

Testing assumption 1: forward transition from pre-action stages to the action stage marks improvement in drinking

Baseline vs. three months follow-up

DDD. Descriptive statistics for DDD at baseline and three month follow-up can be found in Table 3. The ANCOVA revealed a significant main effect of forward transition on DDD at month three after controlling for the effect of DDD at baseline ($F_{1,\ 287}$ = 24.0, p < .001). This clearly supports the TTM prediction. Improvement in the transition group (d = 0.67) was considerably larger than improvement in the non-transition group (d = 0.26), see Figure 1.

TABLE 3 ABOUT HERE

FIGURE 1 ABOUT HERE

PDA. Descriptive statistics for PDA at baseline and three month follow-up can be found in Table 3. The ANCOVA revealed a significant main effect of forward transition on PDA at month three after controlling for the effect of PDA at baseline ($F_{1,\ 287}$ = 38.7, p < .001). Again, this clearly supports the TTM prediction. Improvement in the transition group (d = 0.86) was much larger than improvement in the non-transition group (d = 0.24), see Figure 2.

FIGURE 2 ABOUT HERE

Three months vs. twelve months follow-up

DDD. Descriptive statistics for DDD at three and twelve months follow-ups can be found in Table 3. The ANCOVA revealed a significant main effect of forward transition on DDD at month twelve after controlling for the effect of DDD at month three ($F_{1, 138} = 7.6$, $p = .007$). This is fully in line with the TTM prediction; improvement in the transition group ($d = 0.32$) was larger than improvement in the non-transition group ($d = 0.03$), see Figure 3.

FIGURE 3 ABOUT HERE

PDA. Descriptive statistics for PDA at three and twelve months follow-up can be found in Table 3. The ANCOVA revealed a significant main effect of forward transition on PDA at month twelve after controlling for the effect of PDA at month three ($F_{1, 138} = 34.7$, $p < .001$). This is again in line with the TTM prediction; substantial improvement in the transition group ($d = 0.46$) is contrasted with a worsened outcome in the non-transition group ($d = -0.22$), see Figure 4.

FIGURE 4 ABOUT HERE

Integration of results

When effect sizes for changes in drinking outcomes over time were weighted for sample size and averaged across both dependent variables (DDD and PDA) and across both time-spans (baseline to three month follow-up and three to twelve month follow-up), we found $d = 0.68$ for clients showing a forward transition and $d = 0.10$ for clients who did not show a forward transition.

Testing assumption 2: no improvement in drinking in the absence of forward stage transition

Baseline vs. three month follow-up

Descriptive statistics for both DDD and PDA at baseline and three months follow-up in the non-transition group are shown in Table 3. For clients who did not show forward transition from baseline to three months follow-up, a decrease in DDD from baseline to month three was observed ($d = 0.26$). Because this was larger than our criterion for equivalence ($d = |0.2|$), it follows that DDD outcomes

were not equivalent [32]. An additional paired-samples *t* test revealed that the improvement in DDD was significantly larger than zero (t_{116} = 3.7, p < .001). Similarly, the observed increase in PDA from baseline to month three (d = 0.24) was larger than our criterion for equivalence (d = |0.2|). An additional paired-samples *t* test revealed that the improvement in PDA was significantly larger than zero (t_{116} = 2.6, p < .001). These results go against TTM assumption 2 (see Figures 1 & 2).

Three month vs. twelve month follow-up

Descriptive statistics for both DDD and PDA at three and twelve months follow-up in the non-transition group are shown in Table 3. The change observed in DDD from months three to twelve (d = 0.03) was smaller than our criterion for equivalence (d = |0.2|). Consequently, we ran a test for equivalence [32] which proved to be significant (z = 1.93, p = .027). Thus, DDD at months three and twelve can be seen as equivalent, supporting the TTM prediction (see Figure 3).

For the same clients, a decrease in PDA was observed between follow-ups at month three and month twelve (d = -0.22, see Figure 4). As this was larger than our criterion for equivalence (d = |0.2|), it follows that PDA outcomes were not equivalent [32]. An additional paired-samples *t* test revealed that the observed deterioration in drinking outcome was significantly larger than zero (t_{91} = 2.0, p = .049). Interpretation of this finding is discussed below.

Investigating changes in drinking in the non-transition groups

The three observed changes in drinking outcomes in the non-transition groups run against TTM predictions. To investigate these changes further, we tested the hypothesis that degree of change in drinking would be related to changes in pre-action readiness to change viewed as a continuous measure. We first calculated pre-action readiness scores by subtracting the subscale score for precontemplation from that for contemplation. We then calculated the change in this pre-action readiness score from baseline to three month follow-up and from three to twelve month follow-up. Finally, we ran correlations (product-moment) between these pre-action readiness change scores and changes in DDD and PDA for both time intervals.

The resulting correlation coefficients were: baseline to three months follow-up, change in pre-action readiness x change in DDD, r = .303, N= 117, p < .0005; change in pre-action readiness x change in PDA, r = -.128, N= 117, p = .085; three to twelve month follow-up, change in pre-action readiness x change in DDD, r = -.089, N= 92, p = .198; change in pre-action readiness x change in PDA, r = -.313, N= 92, p = .001. Thus, two correlations were significant at the .001 level or beyond and were in the direction expected from the hypothesis that improvements in drinking are directly related to improvements in pre-action readiness to change. One other correlation (with PDA from baseline to three months) approached significance and was in the expected direction.

DISCUSSION

We attempted to replicate the findings reported by Callaghan et al. [2] but obtained different results. In testing predictions from the TTM assumption 1 in data from the Project MATCH out-patient arm and using repeated measures ANOVAs, Callaghan and colleagues failed to find a significant interaction between transition group and time for either DDD or PDA, thus disconfirming predictions from the TTM. In data from the Project MATCH after-care arm, however, significant group x time interactions were found, consistent with predictions from the TTM. Nevertheless, Callaghan and colleagues concluded that their findings failed to support TTM assumption 1.

While this conclusion might be questioned, our findings regarding assumption 1 unequivocally support the TTM. All four comparisons between transition and non-transition groups were significant and confirmed predictions from the TTM. Over both time-periods, participants who had progressed from pre-action stages to action stages, as allocated by the RCQ[TV], showed significantly greater improvements in both DDD and PDA than those who had remained in pre-action stages. When all four effect sizes stemming from these tests were averaged, the effect among clients showing a forward transition (d = 0.68) was considerably greater than for clients not showing a forward transition (d = 0.10). Thus, in terms of the title of this article and of its predecessor [2], our

findings show that progressive stage transition, at least in the way we measured it, *does* mean getting better with respect to drinking outcomes.

The interpretation of findings on predictions from TTM assumption 2 is more complicated. Callaghan et al. reported that all four of their equivalence tests on predictions from this assumption failed to support the TTM in that clients remaining in pre-action stages showed significant improvements on drinking outcomes. In our tests using the baseline to three month follow-up data, we too found significant (but comparatively small) improvements in DDD and PDA among clients remaining in pre-action stages. These findings go against predictions from the TTM in respect of assumption 2.

In tests of predictions from assumption 2 in the three to twelve month follow-up data, a test of statistical equivalence on the DDD outcome showed that there was no change on this variable in the non-transition group, as predicted by the TTM. However, for PDA, we observed a significant *decrease* (ie, a deterioration) in the non-transition group from three to twelve month follow-up. Since there is nothing in the TTM to suggest that clients remaining in pre-action stages should show a deterioration in drinking frequency, this finding is clearly inconsistent with the TTM. It is also inconsistent with Callaghan et al.'s findings advanced in refutation of the TTM since they reported a significant increase in PDA in both sets of data they examined.

Although not predicted by the TTM, significant improvements in drinking behaviour in the non-transition groups may not be inconsistent with the model when the way in which stage of change is measured and allocated is considered. Here, stage of change was decided by the highest RCQ[TV] subscale score. Accordingly, clients were assigned to the non-transition category because, on the second occasion, they endorsed precontemplation or contemplation items more strongly than action items. Although some of these participants showed relatively modest improvements in drinking, these were clearly not sufficient to bring about a stronger endorsement of action items

over precontemplation or contemplation items. Similar considerations may apply to the method of allocating stage of change in the Callaghan et al. study.

Regarding the increase in drinking frequency shown by the non-transition group from three to twelve months follow-up, this suggests that some individuals, perhaps having made an attempt to quit or cut down drinking and having failed, may have reverted to the precontemplation stage at the later follow-up. If so, this implies that decreases in PDA should be correlated with decreases in a continuous measure of readiness to change confined to pre-action subscale items. Similarly, increases in DDD should be correlated with decreases in pre-action readiness to change. The same reasoning applies to improvements in drinking shown in the non-transition group from baseline to month three assessments. In general terms, these correlations should be apparent, if this hypothesis is correct, whether or not the non-transition groups as a whole showed significant changes in drinking behaviour and irrespective of the direction of those group changes. Thus, we should expect to find significant correlations across clients between changes over time on two measures: pre-action readiness and DDD or PDA.

This *ad hoc* hypothesis received some support. When attention was confined to non-transition groups, two of the four correlations in question were highly statistically significant in the predicted direction. Although the remaining correlations were not significant, one approached significance in the expected direction. Thus more evidence is needed to confirm this attempted explanation of small changes in drinking outcome among individuals who do not show a transition from pre-action to action stages as measured by questionnaire. It should be noted that a similar phenomenon in samples in treatment for dependence on marijuana has been reported [34].

Given that our findings are generally supportive of the TTM and therefore stand in contrast to those reported by Callaghan and colleagues, how can this discrepancy be explained? One explanation might be that it is due to differences in the samples used. Precontemplators (31% and 35% in the aftercare arm respectively) were much more frequent in the Callaghan et al. sample than in ours (cf.

Table 2). It is not clear whether these differences in proportions of precontemplators reflect genuine differences in levels of readiness to change between samples or whether they arise from differences in measuring stage of change (see below). Assuming the former, however, there appears to be no reason why the results of tests of assumptions 1 and 2 from the TTM should depend on the initial balance of precontemplators and contemplators in the samples; whatever the initial level of stage of change, participants making a transition to action stages should show greater improvements in drinking behaviour than those who do not. A similar argument applies to any other differences between the samples that might be proposed to account for the discrepancy in findings, eg, national or cultural differences with respect to alcohol consumption and problems or differences in treatment protocols and regimes.

A more likely explanation concerns measurement techniques and the use of two different instruments to measure stage of change – the URICA and the RCQ[TV]. The measurement and allocation of stage of change is clearly a difficult task and no solution to it can be considered perfect. The algorithm method in which people are allocated to stages on the basis of how recently they have changed behaviour or how soon they intend to change, used more often in the field of smoking cessation, has been criticised as arbitrary and illogical [9,10]. Questionnaire methods include the URICA [12,35], the two forms of the RCQ [16,17,27] and the SOCRATES [36]. In the last-named case, the three scales identified by factor analysis in the instrument development (called recognition, ambivalence and taking steps) were not dissimilar from, but not the same as, those described by DiClemente and Hughes [12].

The development and research applications of the URICA have always been beset by problems in translating responses to the questionnaire into a valid and reliable designation of stage of change. In the initial development study by McConnaughy et al. [35] among out-patients receiving psychotherapy, four distinct stages of change were identified by principal components analysis. A cluster analysis was then carried out on standardised scores on each of the four scales and resulted

in an 18 cluster solution, subsequently refined to seven major and two minor client profiles. Using the same approach to the URICA responses of adults attending outpatient alcoholism treatment, DiClemente and Hughes [12] found five distinct profiles labelled precontemplation, ambivalent, participation, uninvolved and contemplation. These profiles appear only loosely related to the original TTM stages of change upon which the URICA was based. Other studies of the URICA, using a variety of treatment populations, have reported numbers of cluster profiles ranging between two and nine [37-41]. Thus there is very little consensus or standardisation in the literature regarding measurement of stage of change based on the URICA.

The latest method of using URICA responses to allocate stage of change was described by DiClemente *et al.* [15]. Researchers first calculated a continuous measure of readiness to change by adding mean scores on the contemplation, action and maintenance subscales and subtracting the mean precontemplation subscale score, yielding a continuous score ranging from -2 to +14. In each of the two Project MATCH treatment arms the sample was then simply divided into three groups of equal frequency that were then assumed to parallel stages of precontemplation, contemplation and preparation/action and permitted the assignment of each participant to one of these three stages. Unresolved issues arising from this approach are discussed by Callaghan and Taylor [42] and more general problems with the validity of the URICA by Callaghan et al. [34].

DiClemente and colleagues [eg, 43] argue that it is not possible simply to use the highest subscale score to assign stage of change. However, this is the method used in the RCQ[TV] and it seems to work satisfactorily in psychometric terms. In the development of the 15-item questionnaire [16] principal components analysis did not support the inclusion of preparation or maintenance stages. However, the measurement of precontemplation, contemplation and action stages was shown to be adequate for research and clinical purposes, although further work was deemed necessary to strengthen the reliability of the contemplation scale. Significant relationships were found between allocated stage of change and level of alcohol consumption, length of time in treatment, whether or

not the participant had previously received treatment for an alcohol problem and outcome of the current treatment episode. Deficiencies of the contemplation subscale were corrected in the development of a revised, 12-item edition of the RCQ[TV] based on the large database available from UKATT [17]. There was ample evidence for the construct validity of the revised instrument and a strong relationship between stage of change allocation at the end of treatment at three months follow-up and outcome at twelve months. All this suggests that the RCQ[TV] represents a simpler and more efficient method for measuring stage of change than the URICA. The highly significant relationships reported in this article between stage of change assignment and changes in drinking behaviour are further evidence in themselves for the validity of the RCQ[TV].

In the discussion of their findings disconfirming the TTM, Callaghan and colleagues [1] write: "Our findings may be due more to the inadequacy of the URICA than faults in the core assumptions of the Transtheoretical Model, and the use of a refined stage-of-change measure may permit more definitive conclusions to be drawn about the TTM (pp. 1594-5)." The findings of the present study support this suggestion and imply that it is the greater reliability and validity of the RCQ[TV] compared with the URICA, at least with regard to the method of assigning stage status, that is responsible for the discrepancy between the findings of the present study and that of Callaghan and colleagues [2].

With regard to the two assumptions under test, a clear confirmation of predictions from assumption 1 is the stronger form of evidence on which to base conclusions about the validity of the TTM since the model must predict, in any circumstances, that individuals who progress from pre-action to action stages of change will show greater improvements in drinking behaviour than those who do not. While predictions from assumption 2 that individuals remaining in pre-action stages will not show improvements in drinking were not entirely supported in our data, this is less crucial because it may be possible theoretically to reconcile these observations with the TTM, although the conjecture advanced here at present lacks sufficient empirical backing. It should be stressed again that the

improvements shown by participants in the non-transition groups were much smaller and relatively insignificant compared with those shown in the transition groups and that this observation can only be interpreted as supporting the TTM.

The support provided here for central assumptions of the TTM has broader implications for an appraisal of the model and its application in treatment. If, as has been strongly suggested here, progressive stage transitions are accompanied by the improvements in drinking behaviour that are the main objective of treatment for alcohol problems, this lends credence to those systematic treatment approaches [eg, 44-46] in which the promotion of forward movement along the cycle of change is seen as the primary clinical goal.

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Table 1: Means, standard deviations and values of Cronbach's alpha for RCQ[TV] subscale scores at 3 time-points

		Baseline	3 months follow-up	12 months follow-up
Precontemplation	**Mean**	-4.9	-3.3	-2.8
	sd	3.1	3.8	4.1
	α	0.69	0.76	0.77
	N	708	619	540
Contemplation	**Mean**	5.2	3.5	3.1
	sd	2.8	3.7	4.2
	α	0.64	0.74	0.82
	N	714	631	538
Action	**Mean**	4.3	4.6	3.6
	sd	3.6	3.4	4.0
	α	0.84	0.88	0.87
	N	712	626	542

Table 2: Stage-transition matrices from Baseline to 3 Month Follow-up and from 3 Month to 12 Month Follow-up

	3 Month Follow-up stage of change		
	Precontemplation	**Contemplation**	**Action**
Baseline stage of change			
Precontemplation	0	0	0
Contemplation	4	114	173
Action	5	70	199
	12 Month Follow-up stage of change		
	Precontemplation	**Contemplation**	**Action**
3 Month Follow-up stage of change			
Precontemplation	2	3	1
Contemplation	3	86	49
Action	17	91	208

Table 3: Means (SD) for two drinking outcomes (DDD and PDA) at baseline, 3 and 12 months follow-up for clients who did or did not make a forward stage transition.

		Drinks per Drinking Day (DDD)			Percentage Days Abstinent (PDA)		
		Baseline	Month 3	Month 12	Baseline	Month 3	Month 12
Forward transition baseline to month 3	Yes	22.5 (12.2)	14.6 (11.2)		25.0 (25.7)	50.9 (34.0)	
	No	26.0 (14.5)	22.3 (13.5)		21.4 (23.5)	27.8 (29.6)	
Forward transition months 3 to 12	Yes		19.4 (10.8)	15.5 (13.5)		40.7 (30.8)	56.3 (37.3)
	No		24.7 (14.9)	24.2 (14.1)		27.3 (29.4)	21.0 (26.0)