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ORIGINAL ARTICLE

Post-treatment Stage of Change Predicts 12-month Outcome of Treatment for Alcohol Problems

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Abstract — **Aims:** To evaluate relationships between clients' self-reported 'stage of change' and outcomes after treatment for alcohol problems. **Methods:** Using data from the 'United Kingdom Alcohol Treatment Trial', clients who had received at least one session of treatment and who had complete data ($n = 392$) entered the analysis. Two continuous measures of drinking behaviour (% days abstinent (PDA) and drinks per drinking day (DDD)) and categorical outcomes at the 12-month follow-up were compared between clients in Pre-action and Action stages of change at either pre- or post-treatment assessment. Multiple and logistic regression analyses examined the relationships between stage of change and treatment outcomes, evaluating the strength of these relationships by controlling for likely confounders. **Results:** Pre-treatment stage of change did not predict outcome but post-treatment stage of change predicted PDA and DDD at the 12-month follow-up. In unadjusted and adjusted analyses, clients in Action at post-treatment were two to three times more likely to show a favourable categorical outcome, variously defined, than those in Pre-action. There were no differences between clients who had received Motivational Enhancement Therapy and those who had received Social Behaviour and Network Therapy in proportions maintaining or moving towards Action from before to after treatment. **Conclusions:** These findings confirm previous reports that motivational variables predict outcome of treatment but add that such a relationship is seen for post-treatment stage of change. For therapists, it would seem important to monitor the client's stage of change—which in good clinical practice often occurs in informal ways—and have strategies to deal with low motivation to change whenever it occurs throughout treatment. The findings are also consistent with a 'common factors' perspective on effective treatment for alcohol problems.

INTRODUCTION

In the attempt to improve the effectiveness of treatment for alcohol problems, the study of predictors of treatment outcome is important for several reasons. It can identify aspects of the treatment process that are related to positive outcomes, thus making possible a better understanding of how successful treatment works. If the predictor or predictors in question are modifiable, this may help to make treatment more effective (Adamson *et al.*, 2009). It can also lead to greater accuracy in prognosis and can identify specific client groups who have poorer outcomes and may therefore need a treatment approach different from that under study. While potential predictor variables may consist of features of the treatment system or may be properties of the client–therapist interaction, the most obvious class of predictors is client characteristics assessed either at treatment entry or at some point during the course of treatment.

Although the transtheoretical model (TTM) developed by Prochaska and DiClemente (1986) has been criticized (e.g. Davidson, 1998; Sutton, 2001; West, 2005), it remains popular with researchers and practitioners, and continues to generate a large scientific and professional literature (Heather and Hönekopp, *in press*). While the full TTM is broader than the concept of stages of change (Prochaska *et al.*, 1992), it is this component of the model that has attracted the major part of both the popularity and the criticism. One criticism of the stage of change construct that is relevant to the present study concerns the implication that individuals who are farther along the cycle of change at any one time (i.e. closer to the Maintenance stage) will be more likely to have changed their behaviour when followed up in the future. It is claimed that evidence for this relationship is weak and inconsistent (Littell and Girvin, 2002; West, 2005). For example, West (2005) asserts that 'there appears to be no convincing

evidence that moving an individual closer to Action results in sustained behaviour change at a later date' (p. 1037).

These criticisms notwithstanding, the literature on the TTM includes studies showing the ability of the stages of change and related readiness to change measures to predict the outcome of behaviour change interventions. For example, Norcross *et al.* (2011) recently conducted a meta-analysis of 39 studies of psychotherapy directed at a range of disorders using a range of therapeutic methods. They reported clinically significant effect sizes for the association between stage of change and psychotherapy outcomes of various kinds and concluded that 'the amount of progress clients make during treatment tends to be a function of their pre-treatment stage of change' (p. 143).

With regard to the treatment of alcohol problems, a number of studies have reported relationships between stage of change or readiness to change measured at pre-treatment and aspects of treatment outcome (Isenhart, 1997; Hewes and Janikowski, 1998; Connors *et al.*, 2000; Stotts *et al.*, 2003; Demmel *et al.*, 2004; Hernandez-Avila *et al.*, 2004). Relevant findings from Project MATCH were that 3 years after treatment began, motivation as measured by a subset of items from the 'University of Rhode Island Change Assessment' (URICA: DiClemente and Hughes, 1990) and readiness to change as measured by the 'Stage of Change Readiness and Treatment Eagerness Scale' (SOCRATES: Miller and Tonigan, 1996) had main effects on both primary drinking outcomes used in the trial—drinks per drinking day (DDD) and percent days abstinent (PDA)—and accounted for a larger proportion of the variance in outcomes in the outpatient arm of the trial than any other client attribute investigated (Project MATCH Research Group, 1998). In the review of predictors of outcome of treatment for alcohol problems by Adamson *et al.* (2009), motivation, including measures of stage of change and readiness to change, was reported to be one of the most consistent predictors overall.

The 'United Kingdom Alcohol Treatment Trial' (UKATT) provides an opportunity to further examine the potential value of motivational variables in the prediction of alcohol treatment outcomes (UKATT Research Team, 2005). The central aims of this pragmatic randomized controlled trial were to compare the effectiveness and cost-effectiveness of two modalities of treatment for alcohol problems, 'Motivational Enhancement Therapy' (MET) (Miller *et al.*, 1992) and 'Social Behaviour and Network Therapy' (SBNT) (Copello *et al.*, 2009), delivered over a course of 12 weeks. A measure of client readiness to change, and the resulting stage of change designation, was available at three time-points during the trial—pre-treatment, 3-month follow-up and 12-month follow-up.

Previous UKATT studies have: (a) found no support for a matching hypothesis that clients with a low initial level of readiness to change would have better outcomes when treated with MET than with SBNT (UKATT Research Team, 2008) and (b) shown that clients making a forward transition in stage of change from Pre-action to Action stages had greater improvements in drinking, both in terms of frequency and intensity of daily drinking, than those remaining in Pre-action stages (Heather *et al.*, 2009). This applied to stage transitions from baseline to the 3-month follow-up and from the 3-month to 12-month follow-up, such that drinking improvements and stage of change transitions were correlated with each other over the same time-intervals.

The present study is based on a secondary analysis of UKATT data and is thus exploratory in nature. The aims were (i) to examine relationships between stage of change, measured either at pre-treatment or at post-treatment, and longer-term treatment outcome at the the 12-month follow-up, in terms of both continuous measures of alcohol consumption and a categorical measure of outcome comprising both drinking and problems and (ii) to evaluate the strengths of any observed associations between pre- and post-treatment stage of change and longer-term positive outcomes.

METHODS

Data source: UKATT

UKATT was carried out at five treatment centres around Birmingham, Cardiff and Leeds, including NHS, social services and joint NHS/non-statutory facilities. MET was scheduled for three sessions and SBNT for eight, though all treatment was terminated at 12 weeks after initial assessment whether or not all sessions had been completed.

A total of 742 clients entered the trial (MET = 422; SBNT = 320). 74.1% were male, 98.6% '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 34.8% were in full-time employment. 59.2% were either married and/or living with a partner or unmarried but in a current relationship. Mean score on the *Leeds Dependence Questionnaire* (Raistrick *et al.*, 1994) was 15.7 (SD = 8.1), indicating a moderate to severe level of dependence in the sample as a whole. Mean score on the 'Alcohol Problems Questionnaire' (APQ: Drummond, 1990) was 11.05 (SD = 4.78), indicating a slightly above average level of alcohol-related problems for a British treatment sample. All the clients had attended treatment voluntarily and none

had been coerced to attend by the courts or employers. Further details of sample characteristics at baseline, as well as main trial outcomes, may be found in the UKATT Research Team (2005). Follow-up rates were 93% at 3 months and 83% at 12 months and there were no significant differences in follow-up rates between treatment groups, nor differences in any treatment outcomes.

Measures

Drinking: PDA and DDD

PDA and DDD were the primary outcome variables in UKATT and were derived from 'Form 90' (Miller, 1996a). PDA is a measure of drinking frequency and is calculated as the proportion of days of alcohol abstinence in a specified time-period, 90 days in UKATT, expressed as a percentage. DDD is a measure of drinking intensity and is calculated by dividing the total number of standard drinks (one UK standard drink or 'unit of alcohol' = 8 g ethanol) consumed within a specified time-period (e.g. 90 days) by the number of drinking days, i.e. the number of days on which any drinking took place. A score of zero was assigned to clients who were totally abstinent at the follow-up in order to reflect changes in drinking intensity over time in the overall follow-up sample, including those who were totally abstinent at follow-up. Thus, the drinking measures used in this analysis (PDA and DDD) were based on the 90 days preceding either baseline, 3-month or 12-month follow-up assessment.

Categorical outcome

Form 90 data were combined with reported alcohol-related problems, as measured by the APQ applied to the 90 days prior to assessment, to derive a categorical measure of outcome at follow-up. This composite measure, as developed by Heather and Tebbutt (1992), is based on the assumption that the overall aim of treatment for alcohol problems is to reduce the client's alcohol-related problems and that reductions are best expressed as a proportion of the number of problems at intake. The measure consists of six categories: 'Abstinent'—no alcohol consumption in the past 90 days; 'Non-problem Drinking'—drinking within the assessment window combined with a score of zero on the APQ; 'Much Improved'—drinking together with a positive APQ score but with a reduction on the APQ from baseline to follow-up of at least two-thirds; 'Somewhat Improved'—drinking but with a reduction in APQ score of one-third or more but less than two-thirds; 'Same'—reduction in APQ score of less than one-third or an increase in APQ score of less than one-third and 'Worse'—increase in APQ score of one-third or more. This categorical outcome classification has been used previously in research by Miller (1996b), Heather *et al.* (2000), Heather and Dawe (2005) and Adamson *et al.* (2010).

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

Stage of change was assessed by the revised edition of the RCQ[TV] (Heather and Hönekopp, 2008; see Appendix 1). This 12-item version of the instrument gives scores based on four items each for three stages of change—Precontemplation, Contemplation and Action. 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 for each stage therefore range between −8 and +8. Respondents were assigned to a stage of change by the ‘quick method’, i.e. according to the scale showing the highest score, with ties being decided in favour of the stage farthest along the cycle of change (i.e. Action > Contemplation > Precontemplation) (Heather and Hönekopp, in press).

Sample used in the current study

Because this is essentially a study of treatment process, only those clients who had attended for at least one treatment session were included in the analysis. For these clients, the 3-month follow-up interview represented the post-treatment assessment. This sample comprised 392 clients who had full data on the variables of interest at three points (pre-treatment, post-treatment and the 12-month follow-up) as necessitated by our research questions. Of the 602 participants who were successfully followed up at both 3 and 12 months, 104 (17.3%) had received no treatment and were excluded from the analysis. Of the remaining 498 participants, 106 (22.4%) had missing data for stage of change and/or the APQ at pre-treatment, post-treatment or 12-month follow-up.

There were no significant differences between those who were included in the analysis and the remainder of the sample ($n=350$) for gender, age, ethnicity, employment status, marital status or parenthood. However, those included were significantly more likely to have been educated to degree level or equivalent (12.2 vs. 7.4%; $\chi^2=4.26$, $P=0.036$) and less likely to have no educational qualifications (30.4 vs. 41.7%; $\chi^2=9.90$, $P=0.002$). They also showed a significantly lower mean score on the ‘Leeds Dependence Questionnaire’ (15.1 vs. 16.4; $t=2.15$, $P=0.032$) and the ‘Alcohol Problems Questionnaire’ (10.4 vs. 11.7, $t=3.71$, $P<0.0005$). For drinking variables at baseline, there was no significant difference between these groups for PDA (included, mean = 28.0; excluded, mean = 29.5; $t=0.74$, $P=0.46$) but the difference for DDD approached significance (included, mean = 23.7; excluded, mean = 25.7; $t=1.83$, $P=0.068$).

Statistical analysis

Relationships involving the categorical treatment outcome composite variable and those between stages of change at different points were initially examined with χ^2 tests with continuity corrections as necessary. Subsequently, logistic regression models were fitted to produce both crude and adjusted estimates of effects of post-treatment stage of change on three different binary composite outcomes in the form of odds ratios (ORs). These constitute investigations of possible effects on different definitions of treatment outcome, each of interest in its own right. The first set of adjusted models incorporated baseline measures of stage of change, PDA and DDD, as well as treatment site and randomized group. The second set replaced baseline measures of PDA and DDD with post-treatment measures of the same variables. The measures included in the adjusted models were selected to take account of likely confounders of the relationship between post-treatment stage of change and treatment outcome. Multiple regression models were fitted for both continuous drinking outcome measures (PDA and DDD) in

the same manner. All tests were two-sided and the 5% level was taken to indicate significance, without correction for multiple testing.

RESULTS

Stages of change pre- and post-treatment

At pre-treatment assessment, 190 (48.5%) clients were in the Action stage and 202 (51.5%) were in the Contemplation stage, with none in Precontemplation. At the post-treatment assessment, 277 (70.7%) were allocated to Action, 112 (28.6%) to Contemplation and 3 (0.8%) to Precontemplation. For the purposes of further analysis, the three clients in Precontemplation post-treatment were combined with those in Contemplation to form a ‘Pre-action’ group, resulting in a dichotomous Action vs. Pre-action variable at both pre-treatment and post-treatment assessments.

Pre-treatment stage of change and 12-month outcome

The top section of Table 1 shows means and standard deviations (SDs) for PDA and DDD at pre-treatment and 12-month follow-up for clients classified either in Action or in Pre-action at pre-treatment assessment. There were no significant differences between pre-treatment Action and Pre-action groups for DDD or PDA outcomes at the 12-month follow-up ($P>0.1$ for both).

The top section of Table 2 shows the relationship between pre-treatment stage of change and composite outcome at the 12-month follow-up. While clients in Pre-action at pre-treatment showed a slightly worse outcome than those in Action, this was not close to statistical significance ($\chi^2=4.99$, $df=5$, $P=0.417$). The lack of any associations in these analyses precluded the need for further investigation in multivariate models. Thus, pre-treatment stage of change is not associated with longer-term treatment outcome.

Table 1. Pre- and post-treatment stage of change and continuous outcome measures

	PDA* Pre- treatment	PDA* 12-month follow-up	DDD* Pre- treatment	DDD* 12-month follow-up
Stage of change at pre-treatment				
Action ($n=190$)				
Mean	33.6	53.1	24.9	14.6
SD	26.3	36.9	15.2	14.7
Pre-action ($n=202$)				
Mean	22.9	48.2	22.6	14.8
SD	24.9	37.1	12.9	12.8
Stage of change at post-treatment				
Action ($n=277$)				
Mean	29.5	55.6	22.3	12.7
SD	26.8	36.2	12.4	13.2
Pre-action ($n=115$)				
Mean	24.6	38.4	27.2	19.6
SD	24.3	36.2	17.1	13.7
Total ($n=392$)				
Mean	28.0	50.5	23.7	14.7
SD	26.1	37.0	14.1	13.7

*Drinking measures based on the 90 days prior to assessment.

Table 2. Pre- and post-treatment stage of change and treatment outcome categories

	Outcome category at 12-month follow-up ^a						Total
	Abstinent	Non-problem drinker	Much improved	Somewhat improved	Same	Worse	
Stage of change at pre-treatment							
Action	32 16.8%	26 13.7%	25 13.2%	32 16.8%	60 31.6%	15 7.9%	190 100.0%
Pre-action	23 11.4%	20 9.1%	27 14.1%	42 20.5%	75 37.7%	15 7.3%	202 100.0%
Stage of change at post-treatment							
Action	47 17.0%	40 14.4%	41 14.8%	57 20.6%	72 26.0%	20 7.2%	277 100.0%
Pre-action	8 7.0%	6 5.2%	11 9.6%	17 14.8%	63 54.8%	10 8.7%	115 100.0%
Total	55 14.0%	46 11.7%	52 13.3%	74 18.9%	135 34.4%	30 7.7%	392 100.0%

^aAPQ score based on the 90 days prior to assessment.

Post-treatment stage of change and 12-month outcome

The lower section of Table 1 shows means and SDs for PDA and DDD at pre-treatment and the 12-month follow-up for clients classified as being either in Action or in Pre-action at post-treatment assessment. There were highly statistically significant differences between the Action and Pre-action groups for PDA (17% [95% confidence interval (CI) 9–25%], $P < 0.001$) and for DDD (7 [4–10] drinks per day, $P < 0.001$). Inclusion of design and baseline covariates in the model attenuated these differences, though they did remain highly statistically significant (PDA 13% difference [6–21%], $P = 0.001$; DDD 5 [2–8] drinks per day, $P < 0.001$). All differences were in the expected direction. These differences did not survive adjustment for post-treatment behavioural variables ($P > 0.1$ in both cases).

The lower section of Table 2 shows the relationship between stage of change designation at post-treatment and composite treatment outcome at 12-month follow-up. This relationship was also highly significant ($\chi^2 = 34.61$, $P < 0.0005$). This was further explored by creating three binary definitions of positive outcome, comprising: (i) those who were abstinent or non-problem drinkers only; (ii) those who were at least much improved and (iii) those who were at least somewhat improved. Aggregating the data in Table 2, it can be seen that 31% (87/277) of those in Action achieved the most stringent definition of positive outcome compared with 12% (14/115) of those in Pre-action. Similarly, 46% (128/277) of those in Action were at least much improved compared with 22% (25/115) of those in Pre-action. Finally, the proportions attaining the weakest definition of positive treatment outcome, being at least somewhat improved, were 67% (185/277) of those in Action compared with 37% (42/115) of those in Pre-action.

ORs for the magnitude of the effects of post-treatment stage of change on these definitions of positive outcome are presented in Table 3. Those in Action at the end of treatment were approximately three times more likely to have a positive longer-term outcome than those in Pre-action in both the unadjusted analyses and in those adjusting for baseline motivational and alcohol consumption variables. When alcohol consumption at the conclusion of treatment is controlled for,

Table 3. Size of post-treatment stage of change effects on three treatment outcome categories at the 12-month follow-up

	ORs	95% CI	P-value
<i>Unadjusted analyses</i>			
Abstinent or non-problem drinkers only	3.30	1.79–6.10	<0.001
At least much improved	3.09	1.87–5.11	<0.001
At least somewhat improved	3.50	2.22–5.51	<0.001
<i>Adjusted for baseline data</i>			
Abstinent or non-problem drinkers only	2.71	1.44–5.11	0.002
At least much improved	2.87	1.71–4.83	<0.001
At least somewhat improved	3.42	2.12–5.52	<0.001
<i>Also adjusted for 3-month drinking data</i>			
Abstinent or non-problem drinkers only	1.74	0.88–3.48	0.112
At least much improved	1.74	0.99–3.05	0.055
At least somewhat improved	2.20	1.31–3.71	0.003

the independent effect of post-treatment stage of change on longer-term outcomes attenuates to an approximate doubling of the likelihood of achieving a positive outcome and is no longer statistically significant in relation to the more stringent definitions of positive outcome. It is important to note however that, compared with those in Pre-action at post-treatment assessment, clients in Action were over twice as likely to report at least some improvement at the 12-month follow-up even when the effects of baseline stage of change and of baseline and contemporaneous levels of drinking frequency and intensity were controlled for.

Patterns of within-treatment motivational changes

The previous analyses have shown that 12-month outcome was predicted by post-treatment stage of change and not by pre-treatment stage of change. Thus, the success or otherwise of treatment appears to depend on the stage of change reached when treatment is concluded and not the stage occupied when it begins. It is, therefore, of interest to examine patterns of movement between Pre-action and Action stages of change from before to after treatment and their relative frequencies. Table 4 shows these data for the four possible combinations of Action and Pre-action at pre- and post-treatment.

Table 4. Stage of change from pre- to post-treatment

Stage movement from pre- to post-treatment	MET	SBNT	All clients
Action – Action	76 (32.9%)	70 (40.8%)	146 (37.2%)
Action – Pre-action	28 (12.1%)	16 (11.7%)	44 (11.2%)
Pre-action – Action	76 (32.9%)	55 (33.0%)	131 (33.4%)
Pre-action – Pre-action	51 (22.1%)	20 (14.5%)	71 (18.1%)
All clients	231 (100%)	161 (100%)	392 (100%)

Table 4 also shows frequencies and percentages of patterns of stage movement both for the group of clients who received MET and for those who received SBNT. There was no significant difference at baseline between the proportions of participants in Pre-action according to treatment group (MET 55.0%; SBNT 47.5%; $\chi^2 = 1.78$, $P = 0.18$), while the difference in this proportion between treatment groups at post-treatment assessment approached significance (MET 34.3%; SBNT 26.3%; $\chi^2 = 2.75$, $P = 0.097$), with a higher proportion in Pre-action among those receiving MET. However, it can be seen from Table 4 that there was little difference in types of stage movement between the two treatment modalities. Thus, it appears that MET is no more effective than SBNT at moving clients who are not ready to change at the beginning of treatment to being ready to change at the end of it, nor is it more effective than SBNT at maintaining readiness to change from the beginning to the end of treatment (see Table 4 for details).

DISCUSSION

The most general conclusion from the findings reported above is that they support a motivational conceptualization of the nature of alcohol problems and their resolution (Heather, 1992). They also add support to previous findings on the ability of the stage of change construct, as measured in this case by the RCQ[TV], to predict future drinking behaviour. Thus, clients who were making active attempts at behaviour change shortly after the end of formal treatment for alcohol problems had better outcomes roughly 9 months later than those who were not ready to take action. In contrast to some previous findings (see Introduction), in our data pre-treatment stage of change showed no relationship to treatment outcome.

The novel aspect of these findings is that prediction of treatment outcome concerns stage of change recorded at the end of treatment, not at the beginning. To our knowledge, this is the first time such a result has been reported. Indeed, findings from Project MATCH in this regard were the opposite of those reported here, in that a readiness score at baseline predicted drinking outcomes, whereas the same measure taken at the end of treatment failed to do so (Carbonari and DiClemente, 2000). On the other hand, a profile analysis of Project MATCH data carried out by Carbonari and DiClemente (2000) resulted in findings with some similarities to those we report here. These authors attempted to differentiate between abstinence, moderate and heavy drinking outcome groups on the basis of their group profiles over four stage of change variables, confidence and temptation self-efficacy measures and measures of processes of change recorded either at baseline or at the end of treatment. Using

this method, they found that the end-of-treatment profile for those in the longer-term abstinence outcome group showed relatively higher scores on the Action stage subscale and therefore concluded that 'Those who would go on to remain abstinent were more strongly endorsing action (at end of treatment)' (p. 815).

In our data, approximately one-third of those clients who were attempting to change their drinking at the time of the post-treatment assessment showed a successful outcome of either total abstinence or non-problem drinking at the 12-month follow-up. In unadjusted analyses and those adjusted for pre-treatment drinking and stage of change, clients in Action at post-treatment were approximately three times more likely to show a favourable outcome at the 12-month follow-up than those in Pre-action at the post-treatment assessment. All such findings were highly statistically significant. Even when the frequency and intensity of drinking recorded at the time of the post-treatment assessment were controlled for, stage of change continued to be a significant predictor of which clients would show at least some improvement at the 12-month follow-up. On continuous measures of drinking behaviour, those in Action at post-treatment showed better outcomes than those in Pre-action of the magnitude approximately of an increase by a half in PDA (unadjusted and adjusted between-group difference of 17–13%) on mean baseline values (28%) and a reduction by a quarter in DDD (between-group difference of 7–5 drinks) on mean baseline values (23.7 drinks). Given the complexity of the post-treatment environment and the large number of variables known to affect treatment outcome (Moos *et al.*, 1990), as well as the complicated needs of those who enter treatment (Cunningham and McCambridge, 2012), these differences are of some clinical significance.

The ability to predict treatment outcome in these findings was restricted to only part of the range of the stage of change construct, i.e. to the dichotomy of Pre-action vs. Action stages of change. For psychometric reasons, the development of the RCQ[TV] was confined to Precontemplation, Contemplation and Action stages and did not include Preparation and Maintenance (Heather and Hönekopp, 2008). Moreover, in a voluntary treatment sample, few in Precontemplation could be expected and this was confirmed in the present data. For clinical purposes, the crucial distinction for assessment is between those who are not ready to take action to resolve their alcohol problem and those that are (Heather and Hönekopp, 2008) and this distinction has proved useful in previous research concerning the validity of predictions from the TTM (e.g. Callaghan *et al.*, 2007; Heather *et al.*, 2009).

The relationship between post-treatment stage of change and outcome was no longer consistently statistically significant in the most stringent analyses incorporating control for contemporaneously assessed behavioural measures, and the ORs were attenuated to an approximate doubling of the likelihood of a positive outcome. It should be noted that this type of analysis is highly conservative, in that adjusting for these behavioural measures assumes that their influence does not lie on the causal pathway to successful outcome. This is unlikely to be so, as motivational and behavioural change can be expected to be highly interwoven before, during and after treatment. Those in Action have already reduced their drinking, or been trying to, during treatment. The

relationship between motivation and behaviour is thus in reality much more complex than has been modelled in these analyses, being highly dynamic and variable over time.

The finding that treatment outcome was much better predicted by stage of change post-treatment than pre-treatment suggests that a key process in the treatment of alcohol problems is a movement towards, or a continuation in, active efforts at change by the client during the course of treatment and afterwards. This is consistent with overall approaches to treatment that see its primary goal as being to enhance motivation and promote movement along the cycle of change described by the TTM (Connors *et al.*, 2001; Velasquez *et al.*, 2001; Tober and Raistrick, 2007). It is also likely that monitoring of the client's motivational state, albeit often in informal ways, and developing strategies to deal with low motivation to change already occurs in good clinical practice. Indeed, this has been viewed as a core element of treatment within sessions, as well as between them, where there is 'an ongoing task of matching the topic of conversation, or strategy being used, to the shifting needs and readiness to change of the client' (Rollnick, 1998). However, the analysis reported here makes this practice more explicit and demonstrates its effects on treatment outcome.

As shown by Table 4, the most common pattern in stages of change pre-treatment to post-treatment was for clients to be in Action at both assessments, accounting for over one-third of all cases. Also common was the movement forward from Pre-action at pre-treatment to Action at post-treatment, accounting for a further one-third of cases. A substantial minority of clients (18%) remained in Pre-action over the course of treatment. Finally, a smaller minority (10%) moved backward with regard to stage of change. The existence of these different patterns suggests that stage of change should be monitored through the course of treatment and different strategies developed in response to each of the patterns.

Movement from Pre-action to Action stages is an explicit aim of MET and it would, therefore, be expected that more clients would show this pattern in the MET group than in the SBNT group. However, as shown by Table 4, this expectation was not confirmed and there is no evidence to support the hypothesis that MET is more effective than SBNT at generating stage movements during treatment that are associated with good outcome at the 12-month follow-up.

Although MET was not superior to SBNT in promoting motivational change during treatment, the present findings on the importance of clients' motivational state when treatment is ended echoes a seminal finding from the literature on motivational interviewing. Amrhein *et al.* (2003) found that the nature of client speech at the end of sessions was predictive of later drug use outcomes, whereas commitment language earlier in the process had no relationship to later outcomes. A similar finding regarding brief motivational interventions for at-risk drinking was reported by Bertholet *et al.* (2010). These findings, as with those from the present study, are not specific to any particular treatment approach.

If beneficial stage movements are not specific to MET or MI, it is possible that they may reflect a 'common factor' that is shared by all effective treatments for alcohol problems. The existence of such a common factor for the effects of psychotherapy in general was first proposed by Rosenzweig (1936), has been popularly called the 'dodo bird verdict'

(Luborsky *et al.*, 2002) and has been discussed in detail by Wampold (2001). The common factor hypothesis states that theoretically and empirically distinct psychotherapies nevertheless have common factors and it is these factors that account for more of the variance in treatment outcome than more specific, 'technical' components unique to each psychotherapeutic approach (Wampold, 2001). It is not being suggested here that forward movement in stages of change is itself a common factor in effective treatments because stages of change are descriptive rather than explanatory (Heather and Hönekopp, *in press*). However, forward movements in stage of change may represent a marker for the effects of motivational treatment processes that are common to MET, SBNT and other effective treatments for alcohol problems.

Another possibility is that it is not treatment that is driving the motivational change process and that the treatment itself is one among a number of sources of influence within the natural history of attempts at change within treatment populations. This is likely to be the case and qualitative investigation of UKATT client accounts of their change processes supports this proposition (Orford *et al.*, 2006). We suggest that this is in conflict neither with motivational nor with common factors explanations of change and that this perspective should not be taken to imply that treatment itself is unimportant or cannot make a contribution to change.

This exploratory study investigated relationships that were not hypothesized prior to the conduct of the trial. It will be necessary to replicate these findings in other studies of treatment for alcohol problems. Another limitation is that there has been no attempt here to predict the conditions under which forward movement in stages of change occurs. The associations reported here have been found to be strongly robust to the influence of alcohol consumption variables measured pre-treatment but more sophisticated modelling will further test the strength of these associations and provide appropriate controls for time-varying confounders which will assist identification of both mediators and moderators. An analysis of possible determinants of forward stage movements using the UKATT data-set is currently planned and its findings will be reported in due course. Lastly, causal inferences are inappropriate in an observational study of this kind and it is likely that other measured and unmeasured confounders are related to longer-term outcome. The main value of this analysis lies in drawing attention to the previously overlooked assessment of stage of change after the conclusion of formal treatment. Post-treatment motivation deserves to be carefully studied as it may further understanding of how, why and for whom alcohol treatment is effective and how it can be made more effective.

AUTHORS' CONTRIBUTIONS

N.H. was Principal Investigator (Research Co-ordination) of the United Kingdom Alcohol Treatment Trial and, on behalf of the UKATT Research Team, devised the primary analyses on which this paper is based, carried them out and wrote the first draft of the present paper. J.M. carried out additional analyses and contributed to redrafting the paper.

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APPENDIX 1: READINESS TO CHANGE
(TREATMENT VERSION) QUESTIONNAIRE
ITEMS*

1. It's a waste of time thinking about my drinking because I do not have a problem. (PC)
2. I enjoy my drinking but sometimes I drink too much. (C)
3. There is nothing seriously wrong with my drinking. (PC)
4. Sometimes I think I should quit or cut down on my drinking. (C)
5. Anyone can talk about wanting to do something about their drinking, but I'm actually doing something about it. (A)
6. I am a fairly normal drinker. (PC)
7. My drinking is a problem sometimes. (C)
8. I am actually changing my drinking habits right now (either cutting down or quitting). (A)
9. I have started to carry out a plan to cut down or quit drinking. (A)
10. There is nothing I really need to change about my drinking. (PC)
11. Sometimes I wonder if my drinking is out of control. (C)
12. I am actively working on my drinking problem. (A)

*Stage assessed in brackets as follows: PC, Precontemplation; C, Contemplation; A, Action (Heather and Hönekopp, 2008)