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ORIGINAL ARTICLE

The Minnesota Model: A Clinical Assessment of Its Effectiveness in Treating Anxiety and Depression Compared to Addiction

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Abstract
The current study compared and assessed the effectiveness of the Minnesota model in reducing psychological symptoms of anxiety and depression among two groups: individuals with clinically diagnosed addiction only (n = 29) and individuals with clinically diagnosed anxiety/depression in the absence of addiction (n = 25). Anxiety and depression were measured using the Generalised Anxiety Disorder 7 and the Patient Health Questionnaire 9, respectively. Two one-way analyses of covariance found no significant differences in post-intervention anxiety and depression scores when comparing the addiction group and the anxiety/depression group ($F(1, 51) = 0.075$, $p = 0.786$ and $F(1, 51) = 0.302$, $p = 0.585$, respectively). Reliable change index calculations also indicated that both the addiction group and the anxiety/depression group exhibited clinically significant reductions in anxiety and depression following treatment. These findings are considered in light of key methodological limitations, and the theoretical and therapeutic implications are discussed.

Keywords Addiction · Anxiety · Depression · Minnesota model

Background Context

Rates of anxiety disorder and major depression amongst individuals with addiction are approximately twice those of the non-addicted population (Hasin et al. 2005; Kushner et al. 2000). Subclinical levels of anxiety and depression are also strongly associated with addiction (Gilman and Abraham 2001). According to the self-medication hypothesis, this comorbidity occurs because many individuals with anxiety and/or depression attempt to manage distressing

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affective states with alcohol and/or other drugs (Suh et al. 2008). The self-medication hypothesis has been authenticated by prospective studies (Wolitzky-Taylor et al. 2012), suggesting that addiction treatments should seek to improve psychological wellbeing as a means of fostering abstinence (Terra et al. 2006). Accordingly, the effectiveness of the Minnesota model in nurturing sobriety has been attributed to its focus on enhancing emotional wellbeing (Gilbert et al. 2005). From this, it can be inferred that the Minnesota model would be an effective treatment for anxiety and depression in the absence of addiction, although existing literature has omitted to assess this possibility. Throughout this paper, addiction will be used as an umbrella term to refer to alcohol and substance misuse.

The Minnesota Model

Twelve-step inpatient approaches are residential treatments rooted in the principles of Alcoholics Anonymous, a mutual aid fellowship for individuals with alcoholism (Anderson et al. 1999). They take a holistic approach, advocating prolonged group affiliation, learning from others and cognitive restructuring (Stone et al. 2017). The Minnesota model is one of the most widely administered 12-step inpatient approaches for addiction (Gallagher et al. 2017), in which individuals are required to stay for 28 days (Anderson et al. 1999). As part of the Minnesota model, individualised treatment plans are formulated by a multidisciplinary team of professionals (Harrison and Asche 2001). Treatment consists primarily of group psychotherapy, but also includes one-to-one psychotherapy, psychoeducation, assignments, family involvement and fellowship attendance (Harrison and Asche 2001).

Efficacy of the Minnesota Model

Gallagher et al. (2017) conducted a longitudinal study testing the efficacy of the Minnesota model in treating alcoholism by following individuals throughout treatment and at a 6-month follow-up. Outcomes were assessed using the Alcohol Use Disorders Identification Test, a 10-item questionnaire assessing alcohol consumption and drinking behaviour. A good treatment outcome was defined as total abstinence, abstinence with a minor lapse, or controlled drinking. Of those who completed treatment, 81.5% had a good treatment outcome at the 6-month follow-up, indicating that the Minnesota model is highly efficacious in treating alcoholism.

Although Gallagher et al.'s (2017) findings highlight the efficacy of the Minnesota model in reducing alcohol misuse, they used a narrow definition of recovery based solely on alcohol consumption. Therefore, recovery was assumed to be synonymous with abstinence and psychological wellbeing was deemed secondary to addiction (Neale et al. 2014). Contrarily, White (2007) asserts that addiction cannot be treated unless the psychological factors underpinning it are simultaneously addressed. This is also implicit in Alcoholics Anonymous, which distinguishes between individuals in recovery and 'dry drunks', who are abstinent but continue to behave and think dysfunctionally (White 2007). Neale et al. (2014) substantiated this claim with a qualitative study that assessed the views of individuals who were abstinent following addiction treatment. All individuals endorsed the view that recovery could not be achieved unless psychological wellbeing was improved. Accordingly, future research assessing the effectiveness of the Minnesota model in promoting addiction recovery should incorporate less tangible outcome measures, such as psychological wellbeing.

Temporal Sequencing of Addiction and Anxiety/Depression

An increasing consensus in the literature is that psychological vulnerabilities, such as anxiety and depression, underpin addiction. This is concordant with the self-medication hypothesis, which posits that some individuals find extreme emotional states overwhelming and rely on the psychopharmacologic effects of alcohol or substances for emotional regulation (Khantzian 2003).

An alternative explanation is provided by the substance-induced enhancement theory, which postulates that multiple episodes of withdrawal from alcohol or substances precipitate anxiety and depression (Grant et al. 2004). Some individuals also experience protracted withdrawal, which occurs when withdrawal symptoms persist for weeks or months subsequent to detoxification, and only abate following a prolonged period of abstinence (Martinotti et al. 2008). This challenges the self-medication hypothesis and suggests that anxious and depressive symptomatology can be a consequence of addiction.

Nonetheless, the fact that anxious and depressive symptomatology can be heightened by withdrawal does not disprove the self-medication hypothesis. Clarification regarding this comorbidity may have important implications for treatment. If addiction is preceded by anxiety and depression, and treatment works by targeting these factors, it is implicit that the Minnesota model may be effective for individuals with anxiety and depression in the absence of addiction. This highlights the need for prospective studies to establish the direction of this relationship (Fatséas et al. 2010).

Wolitzky-Taylor et al. (2012) studied high school students deemed to be at high risk of developing an emotional disorder in the future, based on high levels of neuroticism. Participants were assessed through structured clinical interviews, conducted annually over a 4-year period. Consistent with the self-medication hypothesis, clinical and subclinical levels of anxiety and depression consistently predicted the onset of addiction. This relationship was unidirectional, as pre-existing manifestations of addiction were not related to a greater likelihood of developing anxiety and depression in the future.

Implications for Treatment

The deleterious effect of anxious and depressive symptomatology on addiction suggests that the primary focus of treatment should be individuals' emotional wellbeing (Kodl et al. 2008). Although it has not been empirically tested, Bradizza et al. (2006) suggest that psychological wellbeing is addressed by the Minnesota model and that this is key to its success. Gilbert et al. (2005) state that the rationale behind administering the majority of psychotherapy in a group format in the Minnesota model is that group participation addresses anxiety, depression, isolation and shame, all of which are attributable to the nature of addiction (Gilbert et al. 2005). Hence, the Minnesota model is assumed to work in accordance with Howard et al.'s (1993) model of therapeutic change. This involves a sequential, mediational process occurring in three phases. First, the individual must enhance their psychological wellbeing (remoralisation), which then results in symptomatic relief (remediation). Finally, the individual must replace dysfunctional coping strategies with more adaptive ones (rehabilitation).

Assuming that the Minnesota model works in accordance with Howard et al.'s (1993) model, it is implicit that it may effectively treat anxiety and depression in the absence of addiction. This is highly plausible, given that individuals with anxiety and depression often have difficulties with interpersonal functioning and support (McDermut et al. 2001), which the

Minnesota model is thought to directly address. However, the effectiveness of the Minnesota model in treating anxiety and depression has not yet been assessed in the existing literature.

The Current Study

The current study utilises outcome data from a rehabilitation centre that employed the Minnesota model to treat individuals with a clinical diagnosis of addiction (and no clinically diagnosed anxiety or depression) and individuals with a clinical diagnosis of anxiety and/or depression (and no clinically diagnosed difficulties with addiction). Though the Minnesota model is an addiction treatment, the rehabilitation centre administered it to clients presenting with clinically diagnosed anxiety/depression without addiction based on the assumption that the treatment works by targeting these difficulties. The study aimed to compare and assess the effectiveness of the Minnesota model in reducing anxious and depressive symptomatology amongst the two groups outlined.

Although the rehabilitation centre also treats individuals with a clinical diagnosis of both addiction and anxiety/depression, this group was not included in the current study. This was based on literature suggesting that addiction is rooted in anxiety and depression, even at subclinical levels (Gilman and Abraham 2001; Wolitzky-Taylor et al. 2012), and because the study aimed to assess whether the Minnesota model can effectively treat anxiety and depression in the absence of addiction. Consistent with the suggestions that improvements in anxiety and depression are vital for addiction recovery, and that the Minnesota model fosters abstinence by addressing emotional wellbeing, treatment success was assessed using psychometric measures of anxiety and depression. Measures of substance and alcohol consumption were not included, as individuals engaging in treatment were assumed to be abstinent.

At the rehabilitation centre where data were collected, all individuals are combined into one group for the administration of treatment. The only difference in treatment administration is that the anxiety/depression group receive 100 min of individual therapy per week, whereas the addiction group receive 30 min of individual therapy per week. As the Minnesota model is a 28-day treatment programme, individuals in the anxiety/depression group received an additional 280 min of individual therapy throughout their treatment episode, compared to individuals in the addiction group. This decision was made by the rehabilitation centre and may have been based on research comparing the efficacy of group and individual therapy for individuals with addiction and individuals with anxiety/depression. In a study comparing the efficacy of individual and group therapy for addiction, Marques and Formigoni (2001) concluded that the two treatments were similarly efficacious. Contrarily, Cuijpers et al. (2008) conducted a meta-analysis of studies comparing the efficacy of individual and group therapy for depression and concluded that individual therapy was more effective.

The current study asks two questions: how does the Minnesota model impact anxiety and depression in the addiction group compared to the anxiety/depression group? And does the Minnesota model yield clinically significant reductions in anxiety and depression for individuals in the addiction group and individuals in the anxiety/depression group? Based on research suggesting that addiction is underpinned by poor psychological wellbeing, the Minnesota model is predicted to have a similar impact on anxiety and depression across the two groups (hypothesis 1). Additionally, based on suggestions that the Minnesota model enhances psychological wellbeing, treatment is predicted to yield clinically significant reductions in anxiety and depression in both groups (hypothesis 2).

Due to financial constraints, it was beyond the scope of this study to employ analytic procedures that test for equivalence, the optimal method to test hypothesis 1. Instead, null-hypothesis significance testing was adopted to look for similarities in the effectiveness of the Minnesota model between the two groups. Although it does not allow equivalence to be inferred (Lakens 2017), null-hypothesis significance testing can be employed to assess whether significant differences in effectiveness are apparent, making it a suitable alternative. More rigorous analytic approaches for future research will be considered later.

Method

Ethical approval for the current study was obtained from the University of Bath Psychology Ethics Committee.

Respondents

To establish the sample size required to detect meaningful effects, an a priori power analysis using G*Power 3.1 was conducted. When inputting an alpha value of 0.05, a power value of 0.95, and an eta squared of 0.59 (computed by averaging the effect sizes from nine studies assessing the efficacy of the Minnesota model in fostering abstinence), the power analysis highlighted that a minimum of 40 respondents would be needed to adequately detect effects within this study.

Data were extracted from a database of individuals who had engaged in treatment at the rehabilitation centre. Respondents were selected based on the following criteria. For the reasons outlined in the 'The Current Study' section, the client must have admitted for treatment with a clinical diagnosis of either addiction or anxiety/depression and must not have entered treatment with a clinical diagnosis of both. Secondly, the client must have engaged in the full 28-day Minnesota model treatment programme. Finally, the client must have completed the Generalised Anxiety Disorder 7 (GAD-7) and the Patient Health Questionnaire 9 (PHQ-9) pre-intervention and post-intervention. Using these criteria, a sample of 54 respondents was obtained (the number of respondents excluded based on these criteria is unknown). Therefore, based on the a priori power analysis, the sample size allows for the detection of meaningful effects. In the addiction group, there were 15 male respondents with a mean age of 36.47 (standard deviation (SD) = 12.28) and 14 female respondents with a mean age of 32.93 (SD = 10.04). In the anxiety/depression group, there were 12 male respondents with a mean age of 33.25 (SD = 11.62) and 13 female respondents with a mean age of 39.85 (SD = 10.40).

Materials

The GAD-7 was employed to measure anxious symptomatology. The GAD-7 is a seven-item questionnaire used for the diagnosis of generalised anxiety disorder and as an assessment of its severity (Spitzer et al. 2006; Löwe et al. 2008). Respondents report how often each item in the questionnaire has been troubling them over the past two weeks (Spitzer et al. 2006). An example item from the GAD-7 is 'feeling nervous, anxious or on edge'. Respondents score each item as either 0 (not at all), 1 (several days), 2 (more than half the days) or 3 (nearly every day). GAD-7 scores of 0 to 4, 5 to 9, 10 to 14 and 15 to 21 represent normal, mild, moderate and severe anxiety, respectively (Spitzer et al. 2006). Spitzer et al. (2006) found that the GAD-

7 has strong internal reliability when measuring anxiety levels (Cronbach's α = 0.92). Furthermore, when using a mental health professional interview as the criterion standard, a GAD-7 score of ≥ 10 yields a sensitivity score of 89% and a specificity score of 82% for moderate anxiety, illustrating high criterion validity (Spitzer et al. 2006).

The PHQ-9 was employed to measure depressive symptomatology. The PHQ-9 is a nine-item questionnaire used for the diagnosis of depression and as an assessment of its severity (Kroenke et al. 2001). Respondents report how often each item in the questionnaire has been troubling them over the past 2 weeks. An example item from the PHQ-9 is 'feeling down, depressed or hopeless'. Respondents score each item as either 0 (not at all), 1 (several days), 2 (more than half the days) or 3 (nearly every day). PHQ-9 scores of 0 to 4, 5 to 9, 10 to 14, 15 to 19 and 20 to 27 represent minimal, mild, moderate, moderately severe and severe depression, respectively (Kroenke et al. 2001). The PHQ-9 has high internal reliability when measuring depression, as Cronbach's α = 0.89 (Kroenke et al. 2001). Furthermore, using a mental health professional interview as the criterion standard, Kroenke et al. (2001) demonstrated that a PHQ-9 score ≥ 10 yielded a sensitivity of 88% and specificity score of 88% for moderate depression, illustrating high criterion validity.

Design

A between-groups design was adopted whilst controlling for respondents' pre-intervention scores on the GAD-7 and the PHQ-9 to reduce repeated measures effects. Secondary data, collected from clients who engaged in treatment at the rehabilitation centre, are being utilised. The independent variable is whether the respondent was in the addiction group or the anxiety/depression group. Participants were assigned to these groups according to their clinical diagnosis on admission into treatment, as determined by the admitting psychiatrist. The dependent variables when testing hypothesis 1 are the post-intervention scores on the GAD-7 and the PHQ-9. The dependent variables when testing hypothesis 2 are the changes in GAD-7 and PHQ-9 scores from pre-intervention to post-intervention.

Although individuals in the anxiety/depression group received more individual therapy than those in the addiction group, individual therapy time could not be included as a covariate within the current study. Although individual therapy time represents a continuous form of measurement, the data are dichotomous (30 min or 100 min), as the amount of individual therapy per week was fixed for both groups (Coolican 2014). Thus, there was no within-group variation, only between-group variation, meaning individual therapy time could not be disentangled from treatment group allocation and could not be included as a covariate.

Procedure

On both admission into treatment and upon discharge, all clients are asked to fill in the following questionnaires: PHQ-9, GAD-7, Eating Disorder Examination Questionnaire, Alcohol Use Disorders Identification Test and a Drug Use Questionnaire. The latter three questionnaires were not relevant to the current study. Data for respondents who met the eligibility criteria were extracted from the rehabilitation centre's database and an anonymised dataset was produced, comprising of the respondents' scores on the GAD-7 and PHQ-9 both pre-intervention and post-intervention, their age, gender and whether they entered treatment for addiction or anxiety/depression.

Results

Statistical Treatment

Anxiety A one-way ANCOVA was employed to compare the post-intervention anxiety scores on the GAD-7 for those in the addiction group and those in the anxiety/depression group, whilst controlling for baseline scores (Coolican 2014; Howell 2010). The current study did not seek to analyse the significance of baseline anxiety scores on treatment outcome; thus, a baseline model was not employed. Controlling for baseline anxiety scores using the ANCOVA helped to ensure that the results were a more accurate depiction of the effectiveness of treatment, rather than the significance of pre-intervention anxiety scores on treatment outcome. Consequently, however, the current study is unable to draw conclusions regarding the impact of pre-intervention scores on treatment outcome. ANCOVA assumptions, both statistical and related to study design, were sufficiently met (Field 2013).

Although visual inspection of boxplots indicated that there were three outlying data points in this dataset, test comparisons using the raw anxiety dataset and a winsorised dataset (as prescribed by Howell (2010)) illustrated that the outliers were having a minimal impact on the analysis, as the overall ANCOVA significance values were similar for both datasets. As a result of this, and because the outliers represented true scores on the GAD-7, results were drawn from the ANCOVA on the raw dataset.

To assess whether the Minnesota model yielded clinically significant reductions in GAD-7 scores for the two groups, reliable change index (RCI) calculations were performed. The RCI calculates whether changes in psychological outcomes from pre-intervention to post-intervention can be deemed clinically significant. In doing so, it is able to account for the magnitude of the clinically significant change and the possibility of measurement error (Wise 2004). If the RCI score is greater than or equal to 1.96, which corresponds with a confidence level of 95%, the change can be considered clinically significant (Ferguson et al. 2002).

Depression For the same reasons outlined in the 'Anxiety' section, a one-way ANCOVA was also employed to compare the post-intervention depression scores on the PHQ-9 for those in the addiction group and those in the anxiety/depression group, whilst controlling for baseline scores (Coolican 2014; Howell 2010). ANCOVA assumptions, both statistical and related to study design, were sufficiently met (Field 2013).

A Shapiro-Wilk test indicated that the standardised residuals for the overall model were not normally distributed ($p = 0.012$) and, although there were no standardised residuals with standard deviations greater than ± 3, visual inspection of boxplots indicated that there were two outlying data points. In response, test comparisons were run: a one-way ANCOVA was conducted on the raw depression dataset and on a winsorised dataset. However, winsorising the outliers did not yield a normal distribution ($p = 0.022$). A square root transformation was then applied to both the raw and winsorised dataset, as visual inspection of histograms demonstrated that the data were moderately, positively skewed (Coolican 2014). Following this, both the transformed raw data and the transformed winsorised data met the assumption of normality ($p = 0.573$, $p = 0.668$, respectively). However, there were minimal differences in the overall ANCOVA significance values for both datasets. As a result of this, and because the outliers represented legitimate scores on the PHQ-9, the transformed dataset, without winsorisations, was utilised.

Subsequently, the data violated Levene's test of homogeneity of variance ($p = 0.04$). However, an ANCOVA is robust to moderate violations of homogeneity of variance (Nimon 2012), providing that the ratio between the two sample sizes is less than 2:1, highlighting that an ANCOVA is still appropriate in the current study (Golinski and Cribbie 2009). Moreover, it was more appropriate to utilise the transformed data, which only moderately violated the homogeneity of variance assumption, rather than the non-transformed raw data which violated the normality assumption more severely (Nimon 2012).

RCI calculations were performed to determine if individuals in the addiction group and individuals in the anxiety/depression group exhibited clinically significant reductions in PHQ-9 scores following treatment. The raw depression data were used for these calculations, as the transformed scores are not representative of true changes in scores on the PHQ-9.

Descriptive and Inferential Statistics

Anxiety Table 1 demonstrates that there are minimal differences in the post-intervention GAD-7 scores when comparing the addiction group and the anxiety/depression group, as illustrated by the unadjusted and adjusted means. A one-way ANCOVA demonstrated that, after adjusting for pre-intervention GAD-7 scores, there was no statistically significant difference in post-intervention GAD-7 scores when comparing the addiction group and the anxiety/depression group, $F(1, 51) = 0.075$, $p = 0.786$, $\eta^2_p = 0.001$. The η^2_p value indicates that only 0.1% of the variance in post-intervention GAD-7 scores can be explained by engagement in different treatment groups (Richardson 2011). The ANCOVA also highlighted that pre-intervention GAD-7 scores had a significant impact on post-intervention GAD-7 scores, $F(1, 51) = 17.252$, $p < 0.005$, $\eta^2_p = 0.253$. The η^2_p value indicates that pre-intervention GAD-7 scores explained 25.3% of the variance in post-intervention GAD-7 scores.

RCI calculations indicate that individuals in both the addiction group and the anxiety/depression group exhibited clinically significant reductions in anxiety scores on the GAD-7 following treatment, as RCI = 8.42 and RCI = 8.39, respectively.

Depression Table 2 demonstrates that there were minimal differences in post-intervention PHQ-9 scores when comparing the addiction group and the anxiety/depression group, as illustrated by the unadjusted and adjusted means. A one-way ANCOVA demonstrated that, after adjusting for pre-intervention PHQ-9 scores, there was no statistically significant difference in post-intervention PHQ-9 scores when comparing the addiction group and the anxiety/depression group, $F(1, 51) = 0.302$, $p = 0.585$, $\eta^2_p = 0.006$. The η^2_p value indicates that only 0.6% of the variance in post-intervention PHQ-9 scores can be explained by engagement in

Table 1 Descriptive statistics for post-intervention GAD-7 scores, with pre-intervention GAD-7 scores as the covariate

Group	*N*	Pre-mean	Pre-SD	Post-mean	Post-SD	Adj. mean	Std. error
Addiction	29	14.03	4.84	6.79	6.07	6.86	0.86
Anxiety/depression	25	14.32	5.26	6.60	4.15	6.52	0.92

Note. *Pre-mean* pre-intervention mean, *Pre-SD* pre-intervention standard deviation, *Post-mean* post-intervention mean, *Post-SD* post-intervention standard deviation, *Adj. mean* adjusted mean, *Std. error* standard error

Table 2 Descriptive statistics for post-intervention PHQ-9 scores, with pre-intervention PHQ-9 scores as the covariate

Group	*N*	Pre-mean	Pre-SD	Post-mean	Post-SD	Adj. mean	Std. error
Addiction	29	17.10	6.52	6.66	3.86	6.84	0.82
Anxiety/depression	25	18.84	6.26	7.12	5.29	6.91	0.88

Note. *Pre-mean* pre-intervention mean, *Pre-SD* pre-intervention standard deviation, *Post-mean* post-intervention mean, *Post-SD* post-intervention standard deviation, *Adj. mean* adjusted mean, *Std. error* standard error

different treatment groups (Richardson 2011). The ANCOVA also highlighted that pre-intervention PHQ-9 scores had a significant impact on post-intervention PHQ-9 scores, $F(1, 51) = 7.940$, $p = 0.007$, $\eta^2_p = 0.135$. The η^2_p value indicates that pre-intervention PHQ-9 scores explained 13.5% of the variance in post-intervention PHQ-9 scores.

RCI calculations indicate that both the addiction group and the anxiety/depression group exhibited clinically significant reductions in depression scores on the PHQ-9 following treatment, as RCI = 12.73 and RCI = 13.32, respectively.

Discussion

The current study compared and assessed the effectiveness of the Minnesota model in reducing anxious and depressive symptomatology amongst individuals with addiction and individuals with anxiety/depression in the absence of addiction. The results indicated that, whilst controlling for pre-intervention GAD-7 and PHQ-9 scores, there were no significant differences in post-intervention GAD-7 and PHQ-9 scores following treatment, when comparing the two groups. This was further evidenced by changes in diagnostic categorisation on the GAD-7 and PHQ-9 for both treatment groups following treatment. The average pre-intervention GAD-7 scores for both treatment groups were in the range of moderate anxiety and reduced to mild anxiety post-intervention. Correspondingly, the average pre-intervention PHQ-9 scores for both treatment groups were in the range of moderately severe depression and reduced to mild depression post-intervention. Moreover, the results indicate that the reductions in GAD-7 and PHQ-9 scores following treatment are clinically significant for both treatment groups. These results highlight the positive impact of the Minnesota model on psychological wellbeing and illustrate its effectiveness in treating anxiety and depression in the absence of addiction.

Comparison with Existing Literature

These results substantiate past suggestions that the Minnesota model enhances psychological wellbeing by reducing anxious and depressive symptomatology (Gilbert et al. 2005). The results also bolster the stances of Neale et al. (2014) and White (2007), that recovery from addiction should encompass psychological wellbeing and not focus solely on addiction behaviours.

The current study offers a possible explanation as to why Gallagher et al. (2017) found that the Minnesota model successfully fostered abstinence for the majority of individuals in their study. This is particularly relevant, because Gallagher et al. (2017) did not identify any strong

predictors of treatment outcome in their study. Their failure to identify strong predictors may have been because anxiety and depression were only measured pre-intervention and not post-intervention. Therefore, whilst they established that pre-intervention scores had little bearing on treatment outcome, they were unable to determine whether changes in anxiety and depression throughout treatment influenced participants' ability to achieve abstinence. The current study highlights that the Minnesota model significantly reduces anxious and depressive symptomatology, which, according to the self-medication hypothesis, is likely to have a determinate impact on future sobriety. Therefore, it may be that the Minnesota model enhanced psychological wellbeing amongst the participants in Gallagher et al.'s (2017) study, and that this improvement was a strong predictor of abstinence. To confirm this, further research is required to see if changes in addiction and psychological wellbeing correlate following the use of the Minnesota model.

Although not statistically tested, the results of the current study suggest that the extra individual therapy received by the anxiety/depression group did not have a determinate impact on treatment outcome, as the addiction group and the anxiety/depression group demonstrated similar anxiety and depression levels both pre-intervention and post-intervention. Though this appears contrary to Cuijpers et al.'s (2008) finding that individual therapy is superior to group therapy for depression, closer inspection of their results highlights that the benefits of individual therapy over group therapy were small ($d = 0.2$). Moreover, Cuijpers et al. (2008) found that the greater improvements in depression demonstrated by those engaging in individual therapy, compared to those engaging in group therapy, were not maintained at any of the follow-up assessments subsequent to treatment. Thus, the similarities in post-intervention anxiety and depression scores between the two groups in the current study are unsurprising.

The significant reductions in anxious and depressive symptomatology exhibited by the addiction group in the current study appear to contradict the substance-induced enhancement theory. Based on findings that individuals usually enter addiction treatment when their addiction has hit 'rock bottom' (Matzger et al. 2005), the theory implies that psychological wellbeing would decline throughout treatment, during which they are in withdrawal. Assuming that Matzger et al.'s (2005) findings can be directly compared to those of the current study, and that those in the addiction group were experiencing withdrawal, the clinically significant reductions in anxious and depressive symptomatology that they exhibited appear contradictory to the substance-induced enhancement theory. Instead, because the addiction group had pre-intervention anxiety and depression levels comparable to the anxiety/depression group, all of whom were clinically diagnosed with these conditions, the current study's findings appear more compatible with the self-medication hypothesis.

Strengths and Implications

The current study has addressed two areas of research that were previously unexplored. Prior to the current study, no research had assessed the effectiveness of the Minnesota model in reducing anxious and depressive symptomatology. Moreover, the effectiveness of the Minnesota model as a treatment for anxiety and depression in the absence of addiction had not been considered.

The results of the current study suggest that the Minnesota model may be an effective treatment for anxiety and depression in the absence of addiction. This is accentuated when comparing the results from the current study to those of studies examining the efficacy of

cognitive behavioural therapy (CBT), one of the most widely applied and empirically supported treatments for anxiety and depression (Hofmann et al. 2012). Hammond et al. (2012) assessed the efficacy of six sessions of face-to-face CBT for 1791 individuals with anxiety and depression using the GAD-7 and the PHQ-9, respectively. They found that the average GAD-7 score pre-intervention was 10.9 (moderate anxiety), which then reduced to an average score of 5.7 post-intervention (mild anxiety). Moreover, the average PHQ-9 score pre-intervention was 11.6 (moderate depression), which then reduced to an average score of 6.5 post-intervention (mild depression). This highlights that the reductions in GAD-7 and PHQ-9 scores exhibited by individuals in the anxiety/depression group following treatment in the current study are slightly greater than those exhibited by individuals engaging in CBT, highlighting the relative effectiveness of the Minnesota model for individuals with anxiety and depression.

This is particularly important, considering that CBT has different theoretical underpinnings than the Minnesota model. CBT is primarily concerned with targeting irrational thinking and dysfunctional behaviour, thereby placing the onus on the individual to challenge intrusive thoughts and maladaptive behaviours (Brewin 2006). Although the Minnesota model incorporates elements of CBT, such as cognitive restructuring, it also stresses the importance of prolonged affiliation with others and systemic therapy (Stone et al. 2017). Systemic therapy is interpersonal and aims to facilitate recovery by addressing maladaptive relationship dynamics (Carr 2009). This relates to a common criticism of CBT: that it fails to remedy interpersonal disturbances, which is a major determinant of nonresponse to treatment (Robins and Hayes 1993; Litt et al. 2018). Therefore, the Minnesota model may be particularly beneficial for individuals who have problematic relationships with others and may lack social and familial support. This is not to refute the efficacy of CBT or to minimise the drawbacks of the Minnesota model (such as its time-consuming and expensive nature), but to highlight that the Minnesota model may be an alternative treatment that should be considered for anxiety and depression, particularly for individuals with interpersonal disturbances.

Limitations and Future Research

A limitation of the current study is the use of null hypothesis significance testing to assess whether the Minnesota model had a similar impact on anxiety and depression in the addiction group, compared to the anxiety/depression group. The use of null hypothesis significance testing does not allow the null hypothesis to be accepted; it merely indicates the inability of the study to reject it (Streiner 2003). Although the nonsignificant ANCOVA results within the current study may be explained by equivalence of effectiveness, this is not statistically supported, as the alternative hypothesis (that there is a significant difference in effectiveness) is the one being tested (Walker and Nowacki 2011). Thus, firm conclusions cannot be drawn regarding whether the Minnesota model is equally effective in reducing anxious and depressive symptomatology for individuals with addiction and individuals with anxiety/depression in the absence of addiction.

Future research could overcome this limitation by using the ‘two one-sided test’ procedure, which requires the researcher to specify the range of values that they would deem sufficient to infer the equivalence of their results (Walker and Nowacki 2011). This range is fixed using upper and lower equivalence bounds. In this procedure, the null hypothesis is that there is a significant effect outside of the specified equivalence bounds, and the alternative hypothesis is that there is an effect within the specified equivalence bounds (Lakens 2017). Therefore, if the alternative hypothesis is accepted, equivalence of results can be inferred. Future research

should assess the effectiveness of the Minnesota model in reducing anxious and depressive symptomatology in the addiction group, compared to the anxiety/depression group, using the two one-sided test procedure. This would establish whether the nonsignificant ANCOVA results within the current study are indicative of equivalence.

The current study was also unable to control for the differences in the amount of individual therapy received by the two groups. Although extra individual therapy did not appear to have a determinate impact on treatment outcome, this was not empirically tested. Future researchers could administer the Minnesota model to individuals with addiction and individuals with anxiety/depression in the absence of addiction, whilst giving half of each treatment group 30 min of individual therapy per week, and the other half 100 min of individual therapy per week (based on the timings within the current study). To control for the possibility that extra individual therapy may yield greater improvements solely on the basis of more professional contact, individuals receiving 30 min of individual therapy per week could engage in a 70-min active psychological control condition each week.

Although beyond the scope of the current study, a follow-up assessment of respondents beyond discharge from treatment would have illustrated whether the improvements in psychological wellbeing were maintained for both treatment groups and would highlight the impact of such improvements on substance and alcohol consumption amongst the addiction group. Because previous research assessing the long-term effectiveness of the Minnesota model has tended to measure treatment success based on sobriety, it is not possible to speculate whether improvements in psychological wellbeing were maintained. To clearly establish whether the Minnesota model is an effective treatment for anxiety and depression, its long-term effects must be ascertained.

Finally, future research should employ wait-list control groups to minimise the impact of confounding variables on treatment outcome. The lack of any control group in the current study limits the validity of claims made about the effectiveness of the Minnesota model in treating anxiety and depression. Research has highlighted that both waiting for and entering treatment provoke a period of reflection, whereby individuals naturally reflect on the behaviours that contributed to their need for treatment (Graham et al. 2018). This reflection is thought to spur behavioural change in some individuals and may lead them to achieve abstinence, even before they enter treatment (Redko et al. 2006). Therefore, some of the individuals within the current study may have experienced improvements in psychological wellbeing regardless of treatment entry. To control for this possibility, future research should compare individuals engaging in the Minnesota model to wait-list control groups.

Conclusion

Findings regarding the aetiology of addiction have propagated suggestions that the Minnesota model enhances psychological wellbeing, implying that it may also be an effective treatment for anxiety and depression in the absence of addiction. However, prior to the current study, these notions were unexplored. The current study contributes to the literature by corroborating the suggestion that the Minnesota model enhances psychological wellbeing in the addicted population and illustrates that it may also be an effective treatment for anxiety and depression in the absence of addiction. To robustly corroborate these findings, future research should employ the two one-sided test procedure whilst employing control groups and follow-up assessments to ascertain whether improvements in psychological wellbeing are sustained and

correlate with prolonged sobriety. With further empirical support, the Minnesota model may represent a promising treatment for anxiety and depression outside of an addicted population, particularly for individuals with interpersonal disturbances. Overall, these findings suggest that the scope of the Minnesota model is broader than initially speculated.

Compliance with Ethical Standards Ethical approval for the current study was obtained from the University of Bath Psychology Ethics Committee. No animal or human studies were carried out by the authors for this article.

Conflict of Interest The authors declare that they have no conflicts of interest.

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