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How Personality Disorders Impact Treatment Outcomes For Alcohol Misuse and Depression

Background

Comorbidity

Co-morbid alcohol misuse and mental health problems are a major health concern as they place significant burden on the health care system [1] and are associated with a broad range of negative outcomes, including more severe depressive symptoms, poorer social functioning, increased service utilisation, more days out of role, and poorer treatment outcomes [2, 3]. A weakness of previous comorbidity research is the tendency to focus on two co-occurring disorders only. For example, the associations between alcohol misuse and depressive symptoms have been widely studied [4]. However, research has not addressed more complex clinical presentations, such as where alcohol misuse, personality disorder and depressive symptoms are all present within the same individual [5]. Although prevalence estimates of personality disorders in the general population are approximately 6.5 % [6], estimates in mental health settings are much higher, ranging from 36 to 67 % [7]. Specifically, there appears to be an elevated rate of personality disorders among individuals with alcohol misuse [8, 9] and depression [10, 11].

Existing research on the co-occurrence of personality disorders and either alcohol misuse or depressive symptomatology consists mainly of prevalence based studies that do not address treatment outcomes [12, 13]. The existing studies are also limited by small sample sizes, inconsistent findings [14, 15], and failure to examine particular personality disorder cluster associations, even though these disorders are not expressed homogenously [16]. Gianoli et al. [17] reviewed pharmacological and psychotherapeutic treatment options for individuals with comorbid borderline personality disorder and alcohol misuse, concluding that there are currently few treatments that simultaneously address both sets of symptoms.

There is also ongoing debate about categorical versus dimensional approaches to the assessment of personality disorders [18], and about the relative merits of different assessment techniques [19]. We have previously expressed a preference for dimensional approaches [20], because they offer greater flexibility across clinical and non-clinical settings, and potentially facilitate a more integrative strategy for better characterising complex comorbidities [21].

Interventions and treatment outcomes

Although it has been suggested by the World Health Organization that alcohol use disorders and major depression may require concurrent treatment [22], few randomized controlled trials e.g., [23–26] have used integrated psychological interventions for these co-occurring problems; see Kelly et al. [27] for a review of comorbid treatments for substance abuse and psychiatric conditions.

In the first study of its kind, Baker et al. [28] compared integrated (i.e., targeting both alcohol and depression) and single-focused (only alcohol or depression) outpatient treatment programs comprising of motivational interviewing (MI) and cognitive behaviour therapy (CBT) for alcohol misuse and/or depressive symptoms. Based on short-term, post-treatment outcomes (i.e., at 18-weeks), the authors reported that integrated treatment was associated with a reduction in drinking days and greater improvement in depressive symptoms. Although a dimensional screener for personality disorders was included in the baseline phase of this study, outcomes related to this assessment were not reported.

People with co-occurring alcohol misuse and mental health problems are often excluded from existing treatment studies [28, 29]. To date, no studies have investigated alcohol misuse, depressive symptomatology, and psychosocial functioning treatment outcomes in a sample of individuals with these co-occurring problems and personality disorder. However, the available evidence suggests that the presence of personality disorders is associated with a greater degree of psychiatric and alcohol use severity [30–32].

Poorer response to treatment for depression has been found among people with co-occurring personality disorders and depression [11]. Higher rates of probable personality disorders (particularly borderline, antisocial, and avoidant personality disorders) have also been linked to lower smoking abstinence rates following group-based CBT, although it is proposed that different personality disorders may impact on initial treatment response and maintenance of abstinence [33]. Treatment outcome studies also report higher rates of attrition [34], lower compliance [32] and poorer outcomes on alcohol use measures at follow-up [15] among individuals with comorbid alcohol misuse and personality disorders. Among clients attending substance misuse services, higher rates of psychopathology (e.g., psychosis, affective and anxiety disorders) and service use have also been reported for those with co-occurring personality disorders [12]. On the other hand, several treatment studies suggest that comorbid personality disorders may not negatively affect alcohol misuse treatment outcomes [35, 36]. The clinical picture may be further complicated by the lack of research on effective evidence-based treatment for personality disorders in this context [37].

Given the relatively high prevalence of co-existing personality disorders, alcohol misuse and depressive symptoms, and the lack of previous research investigating treatment outcomes when these disorders co-occur, it is also important to generate greater understanding of the ways they interact in order to develop effective interventions.

The current study

We undertook secondary data analysis of composite data from two large randomised controlled trials in an effort

to achieve key preliminary insights into the complex interaction between personality disorder cluster scores, alcohol misuse and depressive symptoms. Specifically, we investigated whether baseline personality disorder cluster scores are associated with overall changes in alcohol use, depressive symptoms and functioning, and treatment-related changes at the 6- and the 12-month follow-up, for individuals in treatment for comorbid alcohol misuse and depressive symptomatology.

As hypothesised in the parent studies [28, 38, 39], we expected that participants would display overall improvement between the baseline and follow-up phases on each of the treatment outcome measures. Specifically, we hypothesised that longer (10-session) interventions would result in greater improvements than a brief intervention (comparison condition), that integrated treatment would have greater benefit than single-focused treatment (because interrelationships between comorbid conditions could be better addressed), and that alcohol-focused and depression-focused treatments would have greater impacts on changes in alcohol use and depressive symptoms, respectively. Of particular relevance for the current paper, we also hypothesised that across these outcomes there would be less improvement among participants with higher personality disorder cluster scores, given that specific treatment strategies relating to these issues were not provided in any intervention.

Methods
Data sources
This study combined data from two randomized controlled clinical trials co-ordinated by the Centre for Brain and Mental Health Research, University of Newcastle, New South Wales, Australia. Study 1, the Self-Help for Alcohol/ other drug use and DEpression (SHADE) project, included 273 participants with comorbid depressive and drug and alcohol problems [39]. Study 2, the Depression and Alcohol Integrated and Single-focused Interventions (DAISI) project, recruited 284 participants with comorbid depressive symptoms and alcohol misuse [28]. Referrals for both studies were accepted from a broad range of sources, including self-referral and referrals by health professionals (e.g., public drug treatment and mental health outpatient clinics, general practices, and non-government support agencies). See Baker et al. [28, 38] and Kay-Lambkin et al. [39] for further details, including full descriptions of the interventions. Several previous reports have also utilised combined SHADE/DAISI datasets, including analyses examining: associations with tobacco smoking [40], hopelessness and suicidal ideation [41, 42]; and the psychometric properties of the Drug Use Motives Questionnaire [43]; see Handley et al. [41]; Section 2.2 for further comment on the rationale for combining these data sources.

Across the two parent studies, a range of manualised MI/CBT based interventions designed to reduce alcohol consumption and/or improve depressive symptoms were delivered. These included a single 90-min brief integrated intervention (BI), followed by either: 1) no further treatment; or 9 further sessions of 2) integrated (alcohol- and depression-focused) therapy (delivered either by a therapist or computer program), 3) alcohol-focused therapy, or 4) depression-focused therapy; in addition, a person-centred (supportive counselling) therapy was offered as a control condition in the SHADE study. Participants provided informed consent and received $20 reimbursement on each assessment occasion (i.e., baseline and follow-up assessments, but not treatment sessions).

Design and participants
This study involved a secondary analysis of a subset of data from the two randomised controlled clinical trials described above. Subset inclusion criteria for the current study were: (i) hazardous alcohol consumption in the 12 months before baseline (≥ an average of four 10 g ethanol drinks per day for men, ≥ two per day for women); (ii) a BDI-II score ≥ 17; and (iii) assignment to a therapy that specifically targeted alcohol misuse and/ or depressive symptoms; consequently SHADE study participants receiving the person-centred therapy intervention were not included in the current study, nor were participants with only cannabis related substance use problems. Among those who were eligible for the current analysis ($N = 398$), the majority had a DSM-IV alcohol dependence disorder (347/379, 92 %) and/or major depression (303/391, 78 %) during the last 12 months.

In addition, potential participants were excluded from the current analysis if they had insufficient data for the primary measures, including: (i) missing personality disorder data at baseline; or (ii) an absence of outcome data at 6- or 12-month follow-up (i.e., none of the primary outcome measures at any follow-up: alcohol consumption, depressive symptomatology or global level of functioning).

Measures
A description of the full set of assessments employed across the parent studies and the rationale for their use have been reported elsewhere [28, 38, 39]. The current analysis focused on the following subset of measures.

Substance misuse, depressive symptoms, and functioning
A range of measures were used to quantify the duration and severity of existing conditions and measure primary outcomes. *The Structured Clinical Interview for DSM-IV-TR* (SCID) [44] was used at baseline to diagnose alcohol dependence and abuse and major depressive episodes in the last 12 months. The *Opiate Treatment Index* (OTI) [45] estimated the average occasions of daily alcohol use

in the previous month at baseline and follow-up. Depressive symptoms were assessed at baseline and follow-up using the *Beck Depression Inventory II* (BDI-II) [46]. The *Global Assessment of Functioning* scale (GAF) [47] provided a clinician-rated indicator of functioning at baseline and follow-up.

International Personality Disorder Examination Questionnaire (IPDEQ) [48]

The parent studies screened participants at baseline for possible Axis II personality disorders using the International Personality Disorder Examination Questionnaire (IPDEQ). The World Health Organization developed the IPDEQ self-report screener based on the International Personality Disorder Examination (IPDE) [48], which is a semi-structured clinician administered interview. The 59-item version of the IPDEQ screener includes items assessing the nine ICD-10 personality disorders: Cluster A – paranoid and schizoid; Cluster B – dissocial, impulsive, borderline and histrionic; and Cluster C – anankastic, anxious and dependent. This instrument was chosen over other possible personality disorder screeners as it is relatively short, yet has been shown to have satisfactory psychometric properties [20]. The current analysis used the IPDEQ cluster scores for each participant, as per the dimensional scoring method described in Lewin et al. [20]. This level of analysis has been shown to have greater predictive power for continuous treatment outcomes than simple categorical assignments [20, 49]. For the current analysis, higher dimensional IPDEQ scores indicate a greater likelihood of personality disorder; other researchers have also used the IPDEQ screener as an indicator of probable personality disorder e.g., [33].

Data analysis

Data were analysed using SPSS for Windows (version 19; Chicago, IL., USA). Pearson correlations were used to examine simple associations among continuous measures. Single sample t-tests were used to compare IPDEQ profiles with national survey data, while generalized estimating equations were used to examine overall changes between baseline and follow-up phases at 6- and 12-months.

For the major analyses, the primary outcome measures were expressed as change from baseline (i.e., follow-up phase minus baseline scores). Notwithstanding, our focus here was essentially on clinical change at discrete time points, with longer-term benefits (i.e., changes at 12-months) seen as the primary clinical outcome point, and intermediate benefits (i.e., changes at 6-months) viewed as being of lesser importance. Two-step hierarchical linear regressions were used to assess the contributions of socio-demographic, personality disorder and treatment related predictors to change (from baseline) at 6- and 12-months, whilst controlling for baseline scores for the set of

outcome measures. Three planned (Helmert) orthogonal treatment condition (TC) contrasts were included at Step 1 in each of these analyses: Contrast TC1, BI vs. 10 sessions (i.e., Group 1 vs. the other 3 groups); Contrast TC2, integrated- vs. single-focused (i.e., Group 2 vs. the last 2 groups); and Contrast TC3, alcohol- vs. depression-focused (i.e., Group 3 vs. the last group); this approach parallels that reported previously for the DAISI trial [38]. All interaction variables were based on continuous standardised scores for the selected predictors (i.e., product variables) and were entered at Step 2 in the regression analyses. To aid interpretation, significant interactions were examined visually by dividing each of the component predictor variables into three approximately equal sub-groups (e.g., Low, Medium and High) and plotting mean scores for the resulting cross-tabulated subgroups for the outcome variables of interest.

Importantly, separate regression models were examined using overall IPDEQ scores and associated interactions; parallel analyses substituted the set of individual cluster scores and associated interactions, providing an opportunity to identify their unique contributions to prediction (i.e., whilst controlling for the other clusters). As a partial control for the number of statistical tests, the threshold for significance was set at $p < 0.01$; however, trends at $p < 0.05$ are also reported.

Results

Baseline characteristics

The pattern of participation in the parent studies and current analysis is summarized in Fig. 1. There were 398 eligible participants (i.e., who met the subset inclusion criteria), of whom 290 (73 %) were retained in the current analysis. Among those with insufficient data ($N = 108$), 54 did not have baseline personality disorder data, 36 did not have any outcome data for at least one of the follow-up assessments, and 18 failed to meet both of these criteria. There were no significant differences in baseline characteristics between those who were retained in the current analysis and those with insufficient data; however, the latter subgroup attended fewer treatment sessions (2.98 vs. 5.40, $t_{(391)} = 5.30$, $p < .001$).

Baseline demographic, symptomatology and substance use data for the selected sample is presented in Table 1. The mean age was 44.58 years and just over half (55 %) were men. Participants had left school at a mean age of 16.18 years and half (54 %) were receiving welfare support at baseline. They averaged 15.08 years of age when they first used alcohol and reported consuming 10.50 standard drinks per day in the month before assessment, well in excess of national recommended guidelines [50]. Participants' mean BDI-II score was also indicative of severe depression (>30).

Fig. 1 Flow of participants through the parent studies and current analysis
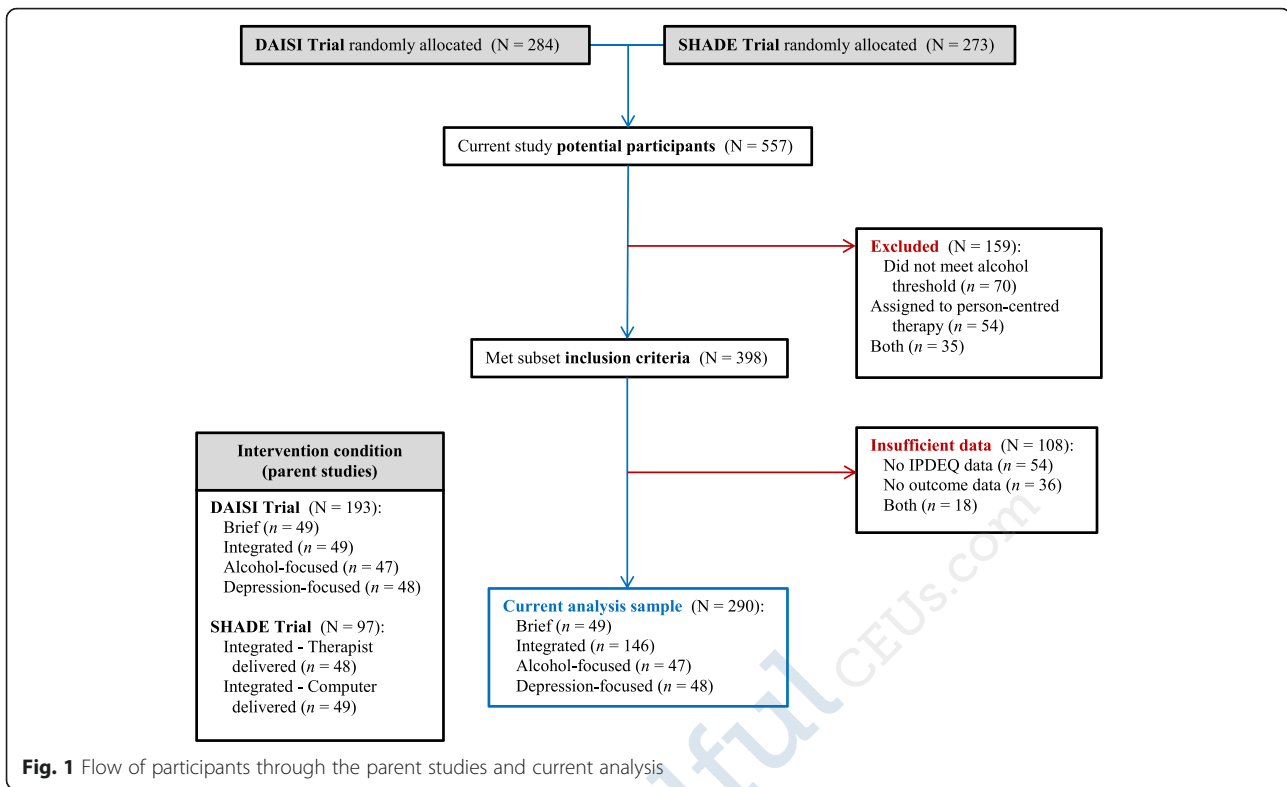
Personality disorder characteristics

As shown in Table 2, all three mean dimensional scores and the overall personality disorder score for the IPDEQ were significantly higher for participants in the current sample than for those in the national sample reported in Lewin et al. [20]; in each case, the IPDEQ means for the current sample were approximately twice those of the national sample. Correlations between IPDEQ dimensional scores were of a similar magnitude between the three clusters (Clusters A and B: $r = 0.40$; Clusters A and C: $r = 0.44$; and Clusters B and C: $r = 0.34$). These correlations were also comparable to the subset IPDEQ values reported in Lewin et al. [20], based on clinical data from substance users in two community based intervention studies, including 130 people with psychosis and comorbid substance use problems [51] and 155 regular amphetamine users [52].

Treatment outcome measures
Overall changes in primary outcomes between phases

Estimated mean changes in OTI alcohol scores, BDI-II scores and GAF scores between phases are shown in Table 3. Overall, there was a significant reduction in alcohol use (OTI score) and depressive symptomatology (BDI-II total score) and an improvement in functioning (GAF score) at the 6- and the 12-month follow-ups, relative to baseline. However, improvements between 6- and 12-months were modest, with only changes in

depression scores reaching statistical significance ($p = 0.008$). As detailed in Table 3, for all three measures, the observed patterns could also be described as 'curvilinear' (i.e., significant linear and quadratic components of change).

Predictors of change in alcohol use (OTI)

The predictors of OTI change scores at the 6- and the 12-month follow-up are shown in Table 4. As is often the case, baseline OTI scores were strongly associated with OTI change scores at 6- or 12-month follow-up (β = -.790, -.789 respectively); that is, higher baseline scores were associated with more marked improvements. There was also a tendency for those with poorer baseline functioning (GAF) to display greater reductions in alcohol use by 6-months (β = .094), and for females to experience greater reductions in alcohol consumption at 12-months than males (β = -.104). Baseline IPDEQ scores were not predictive of change in alcohol consumption at either follow-up phase. However, among the single-focused treatments, the alcohol-focused intervention tended to produce greater short-term benefits (contrast TC3 at 6-months, β = -.091). There were no significant interaction effects in the alcohol change analyses.

Predictors of change in depressive symptomatology (BDI-II)

The predictors of BDI-II change at the 6- and the 12-month follow-up are shown in Table 5. Once again,

Table 1 Baseline characteristics of the selected sample (*N* = 290)

Characteristic	Mean (SD, range) or N (%)
Demographic characteristics	
Age (years)	44.58 (10.54, 20-73)
Gender - Male	160/290 (55.2 %)
Country of birth - Australia	236/289 (81.7 %)
Marital status - Single, never married	77/289 (26.6 %)
Children – One or more children	201/289 (70.6 %)
Age left school (years) (*N* = 287)	16.18 (1.32, 12-21)
Post-school qualification	209/280 (74.6 %)
Receiving welfare support	155/288 (53.8 %)
Current symptomatology	
Alcohol Use Disorders (AUDIT) total	26.32 (6.77, 10-40)
Beck Depression Inventory (BDI-II) total (*N* = 285)	30.92 (8.72, 17-55)
Global Assessment of Functioning (GAF) score (*N* = 275)	56.6 (10.32, 25-75)
SCID Axis 1 diagnosis – during last 12 months	
Alcohol abuse only	10/288 (3.5 %)
Alcohol dependence (with abuse)	263/288 (91.3 %)
Major depressive disorder	219/288 (76 %)
Mean occasions of use per day (last month; OTI)	
Alcohol	10.50 (8.14, 0.17-68)
Cannabis	1.35 (5.89, 0-70)
Tobacco	10.81 (12.98, 0-50)
Substance use history – age first used (years)	
Alcohol (*N* = 272)	15.08 (4.26, 2-48)
Cannabis (*N* = 221)	18.94 (7.01, 8-56)
Tobacco (*N* = 247)	15.34 (4.52, 6-43)

Note: *SCID* Structured Clinical Interview for DSM-IV-TR, *OTI* opiate treatment index; *DUMQ* Drug Use, Motives questionnaire

higher baseline BDI-II scores were associated with more marked reductions in BDI-II scores at 6- and 12-month follow-up (standardised regression weights, β = -.454, -.451 respectively). On the other hand, higher baseline alcohol scores tended to be associated with less improvement in

Table 2 Comparisons with IPDEQ dimensional scores from national sample (*N* = 290)

Cluster	IPDEQ dimensional scoring		t	df	Sig. (2-tailed)
	Current analysis	National sample			
	Mean (SD, SE)	Mean (SE)			
Cluster A	0.41 (0.155, 0.009)	0.22 (0.002)	20.57	288	*p* < .001
Cluster B	0.37 (0.155, 0.009)	0.15 (0.002)	24.18	289	*p* < .001
Cluster C	0.49 (0.177, 0.010)	0.22 (0.002)	25.56	289	*p* < .001
Overall PD	0.42 (0.126, 0.007)	0.19 (0.001)	31.09	289	*p* < .001

Note: *IPDEQ* International Personality Disorder Examination Questionnaire; *t* single sample *t*-test comparing mean scores for current study against national sample means

depression at 6-months (β = .117). Higher baseline IPDEQ Cluster C scores were predictive of smaller improvements in BDI-II depressive symptomatology at 6- and 12-month follow-up (β = .194, .187 respectively). This relationship was also reflected in the association between baseline IPDEQ overall scores and BDI-II changes at 6- and 12-month follow-up (β = .215, .216 respectively).

There were no significant treatment group differences in BDI-II change scores at 6-month follow-up. However, longer treatments produced more marked improvements in depression at 12-months, relative to the BI condition (contrast TC1, β = .216). As shown in Table 5, there were no significant interaction effects at 6-months, although there were three trend level interaction effects at 12-months. The differential benefit at 12-months of the longer interventions was less marked for those with higher Cluster A scores (Cluster A x TC1, β = -.160). Moreover, among the longer interventions, single-focused (vs. integrated) interventions tended to be relatively less effective at 12-months for those with higher Cluster A scores (Cluster A x TC2, β = -.166), and for those with higher IPDEQ overall scores (Overall score x TC2, β = -.138); this latter interaction effect is described more fully in the *Discussion* (and illustrated in Fig. 2).

Predictors of change in functioning (GAF)

The prediction of GAF change scores at the 6- and the 12-month follow-up is presented in Table 6. Higher GAF scores at baseline (i.e., better functioning) were associated with smaller improvements in functioning at 6- and 12-month follow-up (β = -.527, -.500 respectively). Additionally, higher baseline IPDEQ overall scores were associated significantly with less improvement in GAF scores at 6- and 12-month follow-up (β = -.231, -.244 respectively); and, at 12-months this effect was due primarily to the influence of baseline IPDEQ Cluster C and Cluster A scores (β = -.108, -.164 respectively). As with change in BDI-II scores, longer treatments produced more marked improvements in functioning at 12-months, relative to the BI condition (contrast TC1, β = -.164). There was also a tendency for greater differential benefit in functioning at 6-months from integrated interventions (vs. single-focused ones) for those with lower Cluster A scores (Cluster A x TC2, β = -.143).

Discussion

This study strengthens our understanding of the complexities associated with co-occurring alcohol misuse, depressive symptoms and personality disorder. In broad terms, we sought to investigate whether dimensional personality disorder cluster scores were associated with changes in selected outcomes at the 6- and the 12-month follow-up among outpatients in treatment for comorbid alcohol misuse and depression.

Table 3 Estimated mean changes between phases for alcohol misuse, depression, and functioning ($N = 290$)

Phase comparison	Alcohol use (per day) (OTI)			Beck Depression Inventory (BDI-II)			Global Assessment of Functioning (GAF)		
	Est. mean change (SD)	W^2	Sig. (2-tailed)	Est. mean change (SD)	W^2	Sig.(2-tailed)	Est. mean change (SD)	W^2	Sig. (2-tailed)
6-months vs. Baseline	-4.94 (9.98)	70.97	$p < .001$	-11.70 (13.87)	205.58	$p < .001$	6.71 (14.71)	59.90	$p < .001$
12-months vs. Baseline	-5.19 (9.89)	79.49	$p < .001$	-13.72 (13.91)	281.32	$p < .001$	8.22 (14.75)	89.61	$p < .001$
12-months vs. 6-months	-0.24 (7.09)	0.34	.563	-2.02 (13.04)	6.98	.008	1.52 (13.88)	3.44	.064

Note: Change scores are expressed as the subsequent phase minus the earlier phase. Estimated mean changes and Wald chi-square (W^2) statistics are from generalized estimating equations utilising all available data. Expressing these changes across phases in orthogonal polynomial terms (as opposed to pair-wise comparisons): all of the linear components of change were statistically significant (with equivalent W^2 statistics to the 12-months vs. Baseline comparisons), as were all of the quadratic components of change (OTI: $W^2 = 31.65$, $p < .001$; BDI-II: $W^2 = 50.94$, $p < .001$; GAF: $W^2 = 12.91$, $p < .001$)

Treatment effects in this combined dataset

Our first set of hypotheses referred to patterns of change in the outcome measures. As expected, participants' scores on the OTI, BDI-II and GAF improved across phases, particularly between baseline and the 6-month follow-up. With respect to key treatment related hypotheses derived from the parent studies: longer interventions were more effective than the BI condition at 12-months, contributing to larger reductions in depression and improvements in functioning; collectively, single-focused treatments produced reasonably comparable changes to integrated treatment; and, within the single-focused treatments, alcohol-focused treatment tended to be relatively more effective for alcohol use outcomes, at least in the short-term. These findings are consistent with those reported recently for comparable phases of the DAISI project [38].

Table 4 Predictors of change in alcohol use from baseline: 6- and 12-month outcomes ($N = 237$ and 222)

Predictor	Outcome: Change in Alcohol use (OTI) at 6-months				Outcome: Change in Alcohol use (OTI) at 12-months			
	Simple correlation	ΔR^2	Standardized regression weight	Sig.	Simple correlation	ΔR^2	Standardized regression weight	Sig.
Step 1		.655				.652		
Age	-.051		.025	.552	.019		.082	.066
Gender (M = 1, F = 2)	-.063		-.053	.190	-.160		-.104	.015*
Baseline alcohol use (OTI)	-.783		-.790	< .001	-.781		-.789	< .001
Baseline depression (BDI-II)	.072		-.043	.314	.055		-.045	.308
Baseline functioning (GAF)	-.130		-.094	.027*	-.096		-.084	.060
Baseline IPDEQ:								
Cluster A	-.013		-.033	.473	.003		.019	.696
Cluster B	.046		.077	.104	.035		.069	.160
Cluster C	.055		.056	.205	.041		.025	.603
Overall score[a]	.045		.077	.073	.039		.086	.055
Treatment condition (TC) contrasts:								
TC1: Brief vs. 10 sessions	.091		.078	.054	.045		.012	.767
TC2: Integrated- vs. single-focused	-.041		-.027	.501	-.046		-.056	.182
TC3: Alcohol- vs. depression-focused	-.109		-.091	.023*	-.094		-.064	.126
Step 2		.007				.015		
Interactions between cluster scores and TC contrasts (m = 9)								
Interactions between IPDEQ overall score and TC contrasts (m = 3)[a]								
		($R^2 = 0.662$)				($R^2 = 0.667$)		

Note: IPDEQ, International Personality Disorder Examination Questionnaire. Change scores = follow-up phase minus baseline; *Trend ($p < .05$). [a]From a separate hierarchical regression including IPDEQ overall score (Step 1) and associated interactions (Step 2); only significant or trend level interactions are reported (m = number of interactions examined)

Table 5 Predictors of change in depression from baseline: 6- and 12-month outcomes (N = 236 and 219)

Predictor	Outcome: Change in Depression (BDI-II) at 6-months				Outcome: Change in Depression (BDI-II) at 12-months			
	Simple correlation	ΔR^2	Standardized regression weight	Sig.	Simple correlation	ΔR^2	Standardized regression weight	Sig.
Step 1		.245				.302		
Age	.052		.026	.677	.030		.011	.868
Gender (M = 1, F = 2)	-.062		.021	.730	-.100		-.009	.888
Baseline alcohol use (OTI)	.165		.117	.048*	.127		.096	.106
Baseline depression (BDI-II)	-.397		-.454	< .001	-.415		-.451	< .001
Baseline functioning (GAF)	.007		-.086	.174	.014		-.068	.292
Baseline IPDEQ:								
Cluster A	.077		.060	.377	.101		.110	.108
Cluster B	.011		.018	.798	-.022		-.032	.653
Cluster C	.144		.194	.003	.148		.187	.005
Overall score[a]	.102		.215	.001	.095		.216	0.001
Treatment condition (TC) contrasts:								
TC1: Brief vs. 10 sessions	.127		.090	.135	.248		.216	< .001
TC2: Integrated- vs. single-focused	-.016		.002	.972	-.061		-.012	.840
TC3: Alcohol- vs. depression-focused	-.045		-.040	.504	-.096		-.089	.134
Step 2		.036				.059		
Interactions between cluster scores and TC contrasts (m = 9)								
Cluster A x TC1					-.100		-.160	.015*
Cluster A x TC2					-.143		-.166	.019*
Interactions between IPDEQ overall score and TC contrasts (m = 3)[a]								
Overall score x TC2					-.107		-.138	.022*
	(R^2 = 0.280)				(R^2 = 0.360)			

Note: IPDEQ, International Personality Disorder Examination Questionnaire. Change scores = follow-up phase minus baseline; *Trend (*p* < .05). [a]From a separate hierarchical regression including IPDEQ overall score (Step 1) and associated interactions (Step 2); only significant or trend level interactions are reported (m = number of interactions examined)

The strong associations between baseline scores for the three outcome measures and the corresponding change scores at 6- and 12-months were not surprising, for a range of reasons: because there is a mathematical relationship between difference scores and their constituent parts (e.g., baseline scores are involved in both values); and because samples selected on the basis of more extreme values (here, higher baseline alcohol use and depression scores) would be expected to show some 'regression to the mean' effects.

More importantly, as discussed below, this secondary analysis of the combined clinical trials dataset sheds additional light on these treatment effects and associations by examining the contributions of personality disorder cluster scores to the overall prediction of change and to the efficacy of the treatments provided. The presence of some personality disorder profiles negatively impacted on overall change during the follow-up period (primarily Cluster C) as well as treatment-related outcomes (primarily Cluster A), especially in regards to depressive symptoms and psychosocial functioning. These insights have several clinical implications, particularly the potential to inform the development of effective interventions for this comorbid population.

Limited associations between personality disorder and alcohol outcomes

IPDEQ scores showed limited associations with changes in alcohol use, with no statistically significant effects (see Table 4); that is, there was no evidence that baseline personality disorder severity impacted on subsequent changes in alcohol consumption. Likewise, unlike the change prediction analyses for depression and functioning, there were no significant interactions between
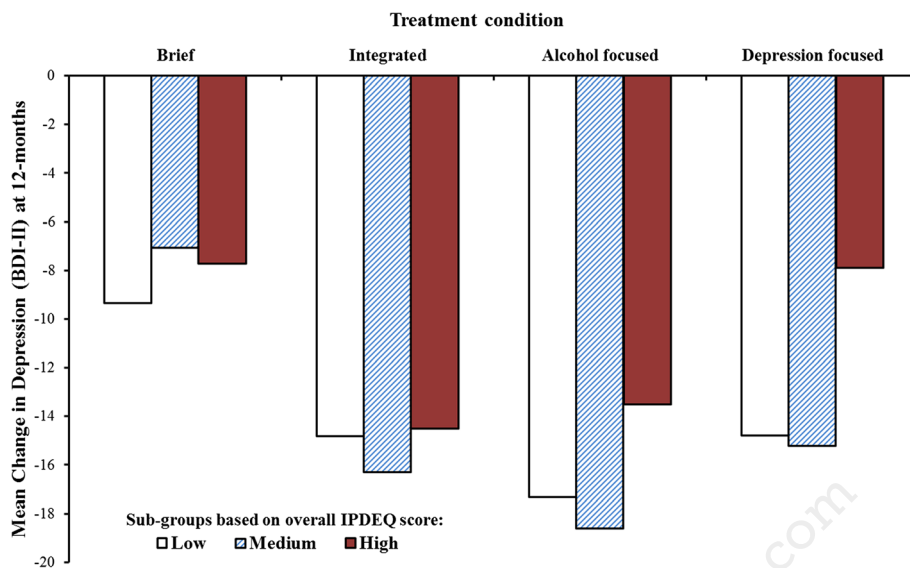
Fig. 2 Change in depression (BDI-II) at 12-months by treatment condition and IPDEQ sub-group (N = 231)

IPDEQ scores and treatment condition effects in the alcohol change analyses. This is consistent with earlier research suggesting a limited impact of comorbid personality disorders on alcohol related treatment outcomes [35, 36].

Framing the set of alcohol-related findings more positively: by 6-months, there was an estimated 4.94 drinks per day mean reduction in alcohol consumption; the BI tended to be almost as effective as the longer interventions (with some additional evidence that the alcohol-focused treatment variant was relatively better); and comorbid personality disorder profiles made little contribution. Consequently, from a stepped-care perspective in particular e.g., [53], brief MI/CBT based interventions addressing alcohol misuse should probably be initiated regularly, regardless of personality disorder characteristics (with monitoring of initial treatment responses); similarly, individuals with personality disorders should not be routinely excluded from alcohol misuse treatment.

Associations between personality disorder, depression and functioning outcomes

Participants with higher baseline IPDEQ overall scores and Cluster C scores experienced smaller improvements in depression at 6- and 12-months (see Table 5). Additionally, the beneficial impacts of longer interventions and single-focused interventions on changes in depression at 12-months tended to be reduced among participants with higher baseline personality disorder cluster scores, particularly Cluster A scores. For example, as illustrated in Fig. 2, the mean benefit associated with the BI was approximately an 8 point reduction in BDI-II scores at 12-months, compared with a more marked, 15 point reduction for the longer interventions; however, participants within the top

third of overall IPDEQ scores who were assigned to the depression-focused intervention fared no better than those in the BI condition (i.e., mean improvement around 8 points). Awareness of such possible impacts, by clinicians and their clients, may be an important component of treatment. That is, for individuals with more pronounced personality disorder cluster profiles, simply gaining a better understanding of depressive symptoms and the factors that affect mood, substance misuse and treatment response (as per the integrated intervention condition) may aid recovery.

Consistent with the established impairment in psychosocial functioning for those with personality disorders [31, 54], we also found that higher baseline IPDEQ overall scores were predictive of lower improvement in GAF scores at the 6- and the 12-month follow-up (see Table 6). Furthermore, higher baseline Cluster A and C scores were associated with poorer GAF improvement at 12-month follow-up. Additionally, the impact of single-focused interventions on functioning at 6-months tended to be reduced among participants with higher baseline Cluster A scores; once again, this highlights the potential value of integrated interventions, which may be the preferred approach for individuals with personality disorders.

These observations provide some support for our overall hypothesis that higher personality disorder cluster scores would be associated with poorer outcomes. The social deficits particular to these individuals are not likely to be addressed by standard (non-concurrent) treatments for depressive symptoms and alcohol misuse. Although individuals with personality disorders are more likely to seek treatment for their depression or alcohol use disorder than for their personality pathology [55], it is feasible that

Table 6 Predictors of change in functioning from baseline: 6- and 12-month outcomes ($N = 239$ and 221)

Predictor	Outcome: Change in Functioning (GAF) at 6-months				Outcome: Change in Functioning (GAF) at 12-months			
	Simple correlation	ΔR^2	Standardized regression weight	Sig.	Simple correlation	ΔR^2	Standardized regression weight	Sig.
Step 1		.282				.289		
Age	-.023		-.009	.877	-.063		-.042	.504
Gender (M = 1, F = 2)	-.046		-.003	.954	.015		.054	.370
Baseline alcohol use (OTI)	.008		.002	.971	-.058		-.051	.391
Baseline depression (BDI-II)	.151		.037	.549	.134		-.026	.672
Baseline functioning (GAF)	-.480		-.527	< .001	-.435		-.500	< .001
Baseline IPDEQ:								
Cluster A	-.036		-.088	.198	-.081		-.164	.020*
Cluster B	-.048		-094	.163	-.022		-.044	.528
Cluster C	-.092		-.115	.079	-.111		-.108	.005
Overall score[a]	-.080		-.231	< .001	-.092		-.244	< .001
Treatment condition (TC) contrasts:								
TC1: Brief vs. 10 sessions	-.052		-.069	.233	-.183		-.164	.007
TC2: Integrated- vs. single-focused	-.019		.000	.996	.061		.016	.796
TC3: Alcohol- vs. depression-focused	-.080		-.014	.811	.039		.100	.097
Step 2		.034				.023		
Interactions between cluster scores and TC contrasts (m = 9)								
Cluster A x TC2	-.081		-.143	.047*				
Interactions between IPDEQ overall score and TC contrasts (m = 3)[a]								
	($R^2 = 0.316$)				($R^2 = 0.312$)			

Note: IPDEQ, International Personality Disorder Examination Questionnaire. Change scores = follow-up phase minus baseline; *Trend ($p < .05$). [a]From a separate hierarchical regression including IPDEQ overall score (Step 1) and associated interactions (Step 2); only significant or trend level interactions are reported (m = number of interactions examined)

individuals with Cluster C profiles may do so for improvements in psychosocial functioning, particularly in regards to interpersonal relationships. This may be less likely for those with socially introverted tendencies, typical of Cluster A personality disorder. Conversely, a recent study suggests that some Cluster A characteristics may reduce the likelihood of smoking relapse among those who have stopped smoking, because of the reduced impact of social pressures [33].

In the current analyses, there was also a tendency for participants with higher baseline alcohol scores to experience less improvement in depression at 6-months, whereas those with poorer baseline functioning experienced greater reductions in alcohol consumption at 6-months. That is, in the short-term, higher alcohol consumption tended to impact in a similar way to the baseline personality disorder scores, in restricting improvements in 6-month depression, while lower baseline functioning scores were associated

with greater room for improvement in both alcohol consumption and functioning.

Limitations
The major limitation of the current study is that it was a secondary data analysis of selected composite data from two randomised controlled trials that did not specifically focus on personality disorder. Therefore, to confirm our findings, a more comprehensive trial is required that includes a clinician administered structured diagnostic assessment for personality disorder. Inclusion of a measure of personality disorder at the conclusion of the follow-up phases would have also been useful. With respect to our current functioning measure, it should also be acknowledged that the GAF has been removed from DSM-5 in favour of more comprehensive assessments of disability and functioning [56]; however, as noted previously [38],

the GAF has been found to be more reliable in research settings than in routine clinical practice [57].

Utilisation of separate analyses of change scores at the 6-month and the 12-month follow-ups also raises some potential statistical/methodological concerns, since such outcome scores would be expected to be correlated (and other, more powerful statistical approaches might be possible); however, as noted earlier, for the current analyses change at 12-months was regarded as the primary clinical outcome point. For researchers interested in longitudinal profiles across multiple time points (e.g., linear and non-linear components of change) and their predictors and mediators, different analytical approaches would be preferable, which simultaneously consider data from all phases e.g., [58].

Although we observed significant improvement from baseline in OTI, BDI-II and GAF scores, it should also be acknowledged that 12-month impairment remained substantial; suggesting that the scope and intensity of our interventions needs to be revisited. For example, mean alcohol consumption per day at 12 months (5.32 drinks) was still well above recommended levels, and mean BDI-II scores at 12 months (17.2) were indicative of mild-moderate depression, albeit at the threshold for entry to the parent studies.

It should also be noted that all of the interaction effects detected were at trend significance level ($p < 0.05$); consequently, they await replication elsewhere. On the other hand, studies often lack statistical power to detect complex interactions (in this instance, changes over time by dimensional personality disorder cluster scores by treatment condition effects). However, in the 12-month depression analyses, the (Step 2) interaction effects added 5.9 % to the explained variance (see Table 5, and Fig. 2), suggesting that this effect, in particular, may be worthy of closer investigation.

Conclusions

In the current analyses (within the combined dataset), longer (10-session) psychological interventions appeared to be more effective in the longer-term (at 12-months), especially for changing depressive symptoms and improving functioning. Moreover, integrated interventions were also relatively more effective than single-focused ones for individuals with higher personality disorder cluster scores. Consequently, longer integrated interventions may be a sensible general strategy for this subgroup, perhaps delivered within a stepped-care framework [53]. However, the observed moderate contributions of higher personality disorder cluster scores to lower improvements in depression and functioning (at 6- and 12-months) also suggests that we need further refinements to our therapeutic approach.

At the very least, adjunctive components need to be incorporated into our integrated therapy programs to more fully engage individuals with particular personality disorder cluster profiles, in an attempt to counteract the potentially negative consequences associated with these conditions, perhaps with a specific focus on emotion or affect regulation and coping strategies. An integrated framework may also provide opportunities to tailor some intervention components to the characteristics and needs of individual participants. We also encourage researchers and clinicians to more actively consider the influence of particular personality disorder clusters in assessing, treating and monitoring individuals engaged in treatment for co-occurring alcohol misuse and depression.

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